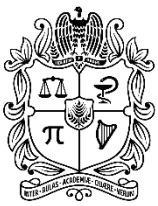

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Inter-organizational e-government services uptake: micro-businesses perspective

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2023

“All truths are easy to understand once they are discovered; the point is to discover them”.

Galileo Galilei

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Abstract

Inter-organizational e-government services uptake:
micro-businesses perspective

Governments have been undertaking digital transformation for many years to offer new ways of interaction to their constituents. However, they face different challenges to migrate users towards digital channels and electronic documents, which are believed to be more cost-efficient for all. Based on the literature review, it is identified that research has been mainly focused on exploring and validating factors influencing acceptance and adoption of e-government self-service applications, and in general it has been conceived it as static phenomenon. Consequently, there is still a lack of "holistic" understanding of the dynamics of the uptake of e-government services.

This thesis presents the research process and the results of a longitudinal critical realist case study conducted in the field of e-government with the aim of understanding the uptake process of inter-organizational e-government services by micro-enterprises. This study moves beyond identifying a list of factors influencing adoption at specific point in time. It offers a mechanism-based explanation, and it captures the processual dynamics of e-government services uptake from microbusinesses perspective in a context of mandatory usage of electronic invoicing.

The proposed explanatory theoretical framework for the uptake of inter-organizational e-government services by microbusinesses consists of four phases: *information seeking, adoption decision and acquisition, implementation, and use and maintenance.* Each stage suggests the presence of mechanisms that interact among them and explain the events that occurred during each phase, and the advance towards the next stage. Eight mechanisms were identified: experience, regulatory, market, intermediation, affordance, expectation, appropriation, and administrative literacy mechanism.

Keywords: e-government, e-services, IOS, e-invoicing, critical realism, mechanisms.

Resumen

Adopción de servicios interorganizacionales de gobierno electrónico: perspectiva de la microempresa

El sector público ha venido transformándose digitalmente por varios años para ser más eficiente y ofrecer nuevas formas de interacción a sus usuarios. Sin embargo, los gobiernos afrontan retos para migrar a sus usuarios hacia el uso de canales digitales y de documentos electrónicos, lo cual se cree es más eficiente económicamente tanto para usuarios como para las entidades públicas. Con base en la revisión de la literatura, se identificó que la investigación sobre la adopción y uso de servicios de gobierno electrónico ha estado enfocada en la identificación de factores que favorecen la aceptación y adopción de estos servicios y que se ha considerado desde una perspectiva estática. Como consecuencia, existe una falta de entendimiento holístico sobre las dinámicas de adopción y uso de servicios de gobierno electrónico.

Esta tesis, presenta el proceso de investigación y los resultados de un caso de estudio longitudinal bajo el paradigma del realismo crítico, el cual fue llevado a cabo en el área del gobierno electrónico con el fin de entender el proceso de adopción y uso de servicios inter-organizacionales de gobierno electrónico por microempresas. Este estudio va más allá de la identificación de factores que influencian la adopción de servicios electrónicos en un momento particular. Este estudio proporciona una explicación basada en mecanismos y captura las dinámicas del proceso de adopción y uso desde la perspectiva de las microempresas en un contexto de uso obligatorio de facturación electrónica.

El modelo propuesto de adopción y uso de servicios inter-organizacionales de gobierno electrónico está formado por cuatro fases: búsqueda de información, decisión de adoptar

y adquisición, implementación y uso y mantenimiento. Cada fase sugiere la presencia de mecanismos que interactúan entre ellos para explicar los eventos ocurridos en cada fase y el avance hacia la siguiente fase. Ocho mecanismos fueron identificados: mecanismo de expectative, mecanismo regulatorio, de mercado, de Intermediación, *affordance*, de expectativa, de apropiación y de conocimiento administrativo.

Keywords: Gobierno electrónico, servicio electrónico, sistemas inter-organizacionales, factura electrónica, realismo crítico, mecanismos.

This doctoral thesis was defended on June 27th, 2023, at 8:00 a.m., and it was assessed by the following examiners:

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Table of contents

List of figures

Pág.

List of tables

Pág.

List of abbreviations

AL	Administrative literacy
CC	Channel Choice
CR	Critical realism / Critical realist
DIAN	Dirección de Impuestos y Aduanas Nacionales *(It is the governmental agency in charge of taxes and customs)*
DOI	Diffusion of Innovations
ECT	Expectation Confirmation Theory
EDI	Electronic Data Interchange
EGDI	Electronic Government Development Index
EGAUM	E-Government Adoption and Utilization Model
ERP	Enterprise Resource Planning
G2B	Government to Business relationship
G2G	Government to Government relationship
GDP	Gross Domestic Product
GT	Grounded Theory
ICT	Information and Communication Technologies
IOS	Inter-Organizational Systems
IS	Information Systems
ISS	Information Systems Success theory
MRT	Media Richness Theory
NRI	Networked Readiness Index
OECD	Organization for Economic Co-operation and Development
PBC	Perceived Behavioral Control
SME	Small and Medium Enterprises
SS	Social Subsystem (within STS)
STS	Socio-Technical Systems
TAM	Technology Acceptance Model
TMR	Theory-Mining Review
TOE	Technology Organizational Environment Framework
TPB	Theory of Planned Behavior
TS	Technical subsystem (within STS)
UBL	Universal Business Language
UN	United Nations
UTAUT	Unified Theory of Acceptance and Use of Technology
VAT	Value Added Tax
XML	Extensible Markup Language

Introduction

This section presents an overview of the doctoral thesis, which is the result of a formal research process in the domain of e-government within the Information Systems (IS) field. As stated by Bélanger & Carter (2012), since Information and Communication Technologies (ICT) support interaction between governments and their constituents, e-government emerges as a new domain for IS (Grönlund & Horan, 2004).

The field of information systems is understood as a result of a nexus of different disciplines such as computer science, management and organization theory, operations research, and accounting, towards the application of computers within organizations (Hirschheim & Klein, 2012). Since this work focused on the uptake of e-government services[1] by microbusinesses it fits well into e-government as a domain of IS.

- **Research background and justification**

E-government is defined as the use of Information and Communication Technologies by public administrations with the aim of improving one or more of the following aspects: (a) delivery of information and services to citizens, businesses, employees, among others; (b) efficiency, effectiveness of the public sector; (c) transparency and participation (Alghamdi & Beloff, 2014; Fang, 2002; Teo et al., 2009). E-government initiatives, thus, seek to improve public service delivery and generate benefits for both, public administrations, and their intended users.

Public administrations have different stakeholders such as employees, citizens, enterprises, nonprofit organizations, public agencies, tourists, among others. For each

[1] In this document the terms e-government service and e-service will be used interchangeably.

stakeholder, the government offers different sorts of services. ‘Service’ is a wide used term, and it can comprise different nature (government, healthcare, education, transportation, and so forth). Although ‘service’ has many definitions it remains that “It involves a negotiated exchange between a provider and an adopter (supplier and customer) for the provision of (predominately) intangible assets” (Chesbrough & Spohrer, 2006, p. 37).

A service in the governmental spectrum can be defined in Chesbrough and Spohrer’s terms: Governmental service as information exchange between the government (as a provider or supplier) and their constituents (as adopters or customers) for the provision of rights (intagible assets).

As a result of ICT development, governmental services have been largely replaced or complemented by electronic services (e-services), also known as e-government services, public e-services, digital services. Based on Lindgren & Jansson (2013), a public e-service is understood as a process of exchange of information between users and governments to fulfill responsibilities or to claim for a right, out of that process value for the user must be created. It is also important to note that based on the value created for the user, the quality of the service is assessed.

With regards to users of e-government services, citizens and businesses are the largest groups of users of governmental services. However, while access to governmental services by citizens is incidental, many of them are used rarely, many times based on the occurrence of life-events (van Velsen et al., 2009), governments and businesses hold contacts frequently. Compared to citizens, the relationship between governmental agencies and businesses is driven by more rules and regulations and more contact points (Jansen et al., 2010).

Despite this, in the electronic government literature, government-to-business (G2B) has received less attention than government-to-citizen (G2C) (Hofmann et al., 2012; Panayiotou & Stavrou, 2021). In a systematic literature review conducted towards research about usage of e-government by citizens and businesses (See appendix H) for the period of time between 2005 and 2018 (50 academic papers selected), it was found that that only 18% of the papers addressed the usage by businesses while 78% by citizens (4% did not specific target group). Irrespective of the reasons for this, G2B is an useful instrument for governmental agencies to monitor more efficiently the extent to

which businesses comply with laws and regulations (Bharosa et al., 2013). From companies' side, one key aim of using e-services is the reduction of the administrative burden and also the reduction of possible mistakes they could make while complying with the regulation (Panayiotou & Stavrou, 2021).

Businesses are responsible for many legal obligations as part of their operation. They interact with governments using ICT in the context of incidental situations or regular administrative tasks (through online self-service applications), but also due to tasks related to regular exchange of information (through inter-organizational e-services) as they must provide governments with large amounts of data. This information provision is not necessarily in the interest of the business but the government due to its own interests, to fulfill with its oversight functions (Arendsen & van Engers, 2004). Thus, particularly G2B information exchange through inter-organizational e-government services are believed to have a high impact in terms of reducing both government spending and businesses administrative burden (Arendsen, van Engers, et al., 2008; Bharosa et al., 2013).

Inter-organizational e-government services are one type of automated information systems, which allow two or more organizations to perform electronic transaction processing based on mutual data exchange as an integrated part of existing business systems (Robey et al., 2008). In the context of e-government particularly refers to the automated exchange of information between the businesses' information systems and governmental information systems (Arendsen, van Engers, et al., 2008). The transaction processing concerns data exchange with regard to e.g., tax filing, social security payments, e-invoicing, customs declarations and statistics (Arendsen, van Engers, et al., 2008). Consequently, inter-organizational e-government services mainly help businesses to fulfill their information reporting responsibilities.

Despite the above mentioned, adoption of these high impact, and often complex, e-services (inter-organizational e-services) is not straightforward. Which is one of the reasons for governments to enforce its usage by making it mandatory (Arendsen, van Engers, et al., 2008). Voluntary adoption of e-services is usually based on perceived needs and preferences. In contrast, the adoption of inter-organizational e-services is primarily influenced by external (legal) powers and to a lesser extent, the organizational

willingness to invest in a relationship with governmental organizations (Arendsen, van Engers, et al., 2008).

Amongst businesses size, Arendsen et al. (2008) state that especially small and medium sized companies (SME) hesitate to invest and adopt e-government services. It is reported that at least nine out of ten companies around the world are considered Micro, Small and Medium sized Enterprises (MSMEs). They contribute less than 40% of the global added value, but they play a role for the dynamics of the economies and for public policy. In Colombia, they represent 99.9% of the enterprises, but contribute only 37% to the Gross Domestic Product (GDP), however, they become critical since they concentrate 81% of employment (CCIT & Fedesarrollo, 2013).

Previous research in the domain of G2B adoption have identified factors that influence usage of e-government services among business users, such research is usually cross-sectional in nature, studies have been conducted at a particular moment of time through surveys or case studies. As a consequence, adoption has been seen as a static decision, ignoring that decisions to use or continue using a certain technology are made along a process (Cataldo et al., 2018; Eze et al., 2018; Schwarz et al., 2014).

Because of the static perspective in studies about businesses adoption of e-government services, we lack a bigger picture, meaning we lack understanding about how and why businesses incorporate and use e-government services over time. Research on businesses uptake of e-government services might assist governmental agencies in designing better e-services and diffusion strategies. Since many factors might be involved in e-government services uptake by businesses and many have been already identified in research through variance theories, the research presented in this dissertation used a mechanism-centered conception based on critical realism to explain the uptake process.

Some scholars argue that a significant portion of the benefits created by e-government services are obtained by the government itself rather than their users. However, many of these gains can only be realized if a ‘critical mass’ of organizations adopts the e-government services (Tung & Rieck, 2005). In this sense, one strategy governments employ is to enforce e-government services usage. However, some studies have shown that, in mandated situations, users who are not willing to accept the new system can slow

down or obstruct its implementation by underutilizing or sabotaging it (Alomar & de Visscher, 2017; Brown et al., 2002). Although it was not the objective of this research to make generalization, the target population of this research consisted of micro-enterprises, a large group of businesses with less than ten employees, under Colombian law. They face lots of challenges to get technology incorporated in their operation and, but in fact, they are obligated to use e-government services and at least one particularly inter-organizational service, e-invoicing. For many of them, implementing e-invoicing means the arrival of technology to the organization.

Among inter-organizational e-government services, this research focused on e-invoicing initiative, the reason for this is that from 2018, Colombia is promoting and enforcing usage of electronic invoicing among businesses, thus providing excellent environment to study the uptake process of this inter-organizational e-government service.

The invoice represents billing and payment information related to commercial transactions. It is also essential to tax administration in relation to value added tax (VAT) inspection. Electronic invoicing is the electronic transfer of this billing and payment information via the Internet or other electronic means between trading partners and governments (Arendsen & Van De Wijngaert, 2011; Haag et al., 2013).

The usage of e-invoicing is expected to bring many benefits for both, businesses, and governments. From business side those benefits include: savings in printing, delivery and storage costs, improvements in traceability and security of operations, improvements in the customer / supplier relationship, care and protection of the environment, among others; from Government side, it is mainly related to reduction of tax evasion (DIAN, 2018).

- **Research problem, research question and purpose of the study**

Based on the research context provided above, a systematic literature review was conducted towards the topic to understand in depth previous research in the area, and at the same time to identify research gaps to be addressed (See appendix H). Based on the literature review, the following inferences were made.

Within the research towards adoption of e-government services by businesses many factors that influence intention to use them have been identified. However, there are some shortcomings that can be mentioned. Firstly, theoretical approaches to study e-government adoption are mainly based on ICT adoption theories developed outside of public sector. They consider acceptance/adoption[2] as static decision, ignoring that decisions to use or continue using a certain technology are part of a process. In general, adoption of e-government services has been mainly studied from variance theory perspective and under positivist research philosophy (Correa Ospina et al., 2021). Thus, from a theoretical perspective, there is one significant gap that needs to be addressed, it is related to the lack of a process view to understand how e-government services are incorporated and used over time by businesses, meaning to go beyond the adoption decision.

On the other hand, some scholars suggest that different factors would influence the usage of e-services at different levels of service maturity (Shareef et al., 2011), and the characteristics of the task exert influence in the channels used by users to interact with governments. Considering that the e-service maturity and the task might play a role in the process towards using e-services, and that at transaction stage, inter-organizational systems are offered to exchange information between businesses and governmental agencies, the scope of the research proposed was then delimited to transactional e-government services (particularly inter-organizational services) and the exchange of invoices information as a specific task.

Moreover, micro businesses (less than 10 employees under Colombian law) are most businesses in the economy (99,9% in Colombia (CCIT & Fedesarrollo, 2013)), thus they are a significant group of users of governmental services and a group of interest for massification of electronic services. This group of users usually struggle towards e-government services adoption (Arendsen, van Engers, et al., 2008). E-government services for business are expected to increase ICT sophistication (a desired effect for micro-businesses in order to reduce the technological gap) and at the same time provide them with a higher level of convenience in their interaction with government (Tung &

[2] Acceptance and adoption some times are employed interchangeably in the academic literature (Hofmann et al., 2012)

Rieck, 2005). In this sense, micro-businesses were the population of interest for this study.

Besides, The Organisation for Economic Co-operation and Development (OECD) (2017) has recommended to Colombian Government reducing their focus only to ICT products or services and considering how the recipients will adopt such products or services to increase the potential value that can be created through digital government initiatives. In coherence with this recommendation, this research takes the perspective of the user.

Thus, based on what has been previously mentioned, this research aimed to study of uptake[3] of inter-organizational e-government services from a process perspective using critical realism as research philosophy. The following research question was postulated: **How do micro-businesses incorporate inter-organizational e-government services into their operation and what are the underlying mechanisms that explain their uptake process?**

The main goal of the research is to explain, from a process view, the uptake process of inter-organizational e-government services by micro-businesses. To reach this goal, three specific objectives are formulated: (1) To identify in the academic literature, constructs, theories, and models related to the uptake of e-government services and characterize them; (2) To describe the uptake process of inter-organizational e-government services through a multiple case study in a group of Colombian micro-businesses; and, (3) To identify mechanisms that explain the uptake process of inter-organizational e-government services by micro-businesses.

- **Scope of the study**

The scope of this study is limited to micro-businesses uptake of inter-organizational services (e-invoicing case). The formulated research problem is narrowed down to Colombian micro-businesses due to their importance for Colombian economy, as they are the largest group of businesses. And e-invoicing inter-organizational service, because its

[3] **Uptake** will be the term used to refer to the incorporation and usage of e-government services as a process that takes place overtime. In other words, in this document, uptake of e-government services refers to the process of adopting (decision towards usage), implementing and using e-services.

massification is at utmost importance for Colombian government and it is still ongoing. In addition, this study focused on user's side, it took the perspective of the businesses (demand side), rather than government (supply side).

Finally, it is also important to notice that there is no ambition towards generalization of the findings (in coherence with critical realism paradigm). There is not the aim of this study to build a definitive model toward the uptake process, but to provide a base in which future theory can be built.

- **Contributions and target audience**

At general level, two contributions from this research can be mentioned. First contribution relates to the process view taken in this research towards the uptake of inter-organizational e-government services by micro-businesses. It means that this research does not focus on one phase or moment in isolation such as adoption decision, implementation or even continued usage. It goes beyond the study of intention to use e-government services, and through a longitudinal critical realist case study, four stages towards the uptake of inter-organizational e-government services were uncovered -information seeking, adoption decision and acquisition, implementation, use and maintenance-.

Given that acceptance/adoption of e-services by businesses has been mainly studied using variance theory (Correa Ospina et al., 2021), meaning examining static relationship between variables. This work offers, from a process perspective, a different lens through which understand the phenomenon of e-government uptake by businesses. It captures temporal dynamics such as sequences, changes, events that unfold over time. It also captures the context in which the process takes place.

The second contribution relates to the critical realist philosophy leading the research. In this sense, this study searched for mechanisms that underpin the uptake process of inter-organizational e-government services rather than factors. Because of ontological depth of critical realism, this work also goes beyond descriptions, and through mechanisms provides a comprehensive understanding of the phenomenon studied that also is different from the factor identification. Based on the findings, eight underlying mechanisms that can be enacted at different stages of the uptake process were identified -Regulatory, market, affordance, expectation, experience, administrative literacy, intermediation, and

appropriation mechanism-. Some of them operate at outer context of the organization whereas some at inner context.

- **Document structure**

The dissertation is structured as follows. The introduction section presents the background and context of this study in terms of justification, research problem, research question, main terms of the study, the structure of the dissertation, and contributions. Chapter 1 introduces the field of study and the specific context where the research was conducted. Literature review towards uptake of e-government services by businesses is also presented.

Discussed in Chapter 2 is research methodology, which is aligned with critical realism paradigm. Fieldwork and analysis were conducted using a longitudinal case study incorporating socio-technical perspective within the process framework. The outcome of the fieldwork is presented in Chapter 3. Chapter 4 presents a mechanism-based explanatory framework of the inter-organizational e-government service uptake by micro-businesses (based on empirical data and existing literature). Finally, Chapter 5 concludes the dissertation, it presents research contributions, limitations, and possible future research.

1. Conceptual and theoretical foundations for the research

This chapter presents the key concepts for the research in terms of e-governments, e-services, uptake of technology. It also presents the Colombian context, which is the country where the research took place, additionally it presents the literature review on businesses adoption of e-government services and a set of postulated mechanisms based on previous empirical research.

1.1 E-Government and public sector service provision

This section discusses on the definitions of e-government and e-services (in the context of public sector, e-government services). Both concepts are widely use throughout this document. This chapter also presents the e-government program in Colombia, the context in which this research was carried on.

1.1.1 E-government

The term e-government emerged in the late 1990s, it was born out of the Internet boom, however, previous references towards the use of IT in governments can be found at least to the 1970s. At that time, it concerned to internal use, such as for office automation, rather than its usage to offer services to citizens (Grönlund & Horan, 2004).

Electronic government or e-government started as a practitioner field. In fact, the expression “electronic government” is believed to have been used officially in The United States governmental reports in 1993 to refer to the change from public administration in industrial era to informational era. In the following years, in countries like Canada, Japan, Singapore, among others, projects and reforms emerged towards adoption of technology (Massal & Sandoval, 2010; Porrúa, 2013). In Latin-American context since late 1990s, in countries like Chile, Colombia and Brazil, governments started to develop e-government

initiatives. By 2010, every country in Latin-American had implemented to some degree electronic government (Porrúa, 2013).

As a field of study, e-government can be understood as a domain of the Information Systems (IS) field[4]. Since ICT support interaction between governments and their constituents, e-government emerges as a domain for IS (Bélanger & Carter, 2012; Grönlund & Horan, 2004). E-government, then arises as a result of various social, technological, political and economic dynamics, such as development and expansion of the internet and the assimilation of the global discourse of the information society (Sandoval, 2011).

According to United Nations, e-government consist of the use of ICTs to deliver government services more effectively and efficiently to citizens and businesses (United Nations, 2021). Fang (2002) identifies eight types or models in an e-government system depending on the stakeholder involved in the interaction with governments and the direction of the interaction (Which side initiates the interaction): Government-to-Citizen (G2C); Citizen-to-Government (C2G); Government-to-Business (G2B); Business-to-Government (B2G); Government-to-Government (G2G); Government-to-Nonprofit (G2N); Nonprofit- to-Government (N2G); and Government-to-Employee (G2E). Out of the use of ICT, governments and stakeholders expect a positive impact on different areas such as service delivery, efficiency, effectiveness, transparency of public sector and citizen's participation. Table 1-1 presents a summary of e-government definitions provided by different authors and institutions. The shadowed cells represent which stakeholder(s) and impact(s) is mentioned in the definition.

[4] It is important to notice that when referred to e-governance, the field of public administration it is especially relevant, but this work is situated in the information systems field.

Table 1-1: E-government definitions

Definition	Stakeholder					Impact		
	Citizens	Businesses	Nonprofit	Public employees	Public entities	Services	Efficiency / Effectiveness	Transparency / Participation
Governmental usage of applications based on the Internet and other information technologies (IT), in conjunction with the processes to improve access and delivery of information and services and improvements in operations (Turner, 2002).					■	■	■	
Use of ICT by governments. In particular, the potential of the Internet and related technologies to transform the structures and functioning of governments (The Organisation for Economic Co-operation and Development [OECD], 2002).					■		■	
Use of ICT by governments, particularly the internet, to provide citizens and businesses with more convenient access to government information and services, in addition to improve the quality of services and providing greater opportunities to participate in institutions and democratic processes (Fang, 2002).	■	■	■	■	■	■		■
It is related to the application of ICT to improve internal (public agencies and civil servants) and external (private sector and citizens) relationships, in order to allow access to information, services and participation (Cardona Madariaga, 2004).	■	■	■	■	■	■	■	■
Combination of IT, organizational changes and skills in public management with the aim of improving the quality of public services, strengthening democratic process (Molnár, 2007).					■	■		■
Use of ICT in public administration to improve information and services offered to citizens, guide efficiency and effectiveness, and increase transparency and participation (Centro Latinoamericano de Administracion para el Desarrollo, 2007).	■				■	■	■	■
Usage of ICT as tools to allow communication between citizens and the State, and between the State agencies (Orihuela & Toshio, 2007).	■				■	■		
Use of ICT to improve access and delivery of government services and operations for the benefit of citizens, businesses, public servants and other interested parties (Teo et al., 2009).	■	■	■	■	■	■	■	
Use of various ICTs to enhance the relationship	■	■			■	■	■	■

between the government and citizens, business and other agencies, by providing effective, efficient and integrated e-services, which will lead to a more democratic system (Alghamdi & Beloff, 2014).								
Application of ICT in government to deliver government services more effectively and efficiently to citizens and businesses (United Nations, 2021).								

Source: Author

Based on the definitions given above, a general definition for e-government can be given, it refers to the application of Information and Communication Technologies in government operations to improve its relationship with its stakeholders (citizens, businesses, employees, governmental agencies, among others) while achieving some goals: better services, more efficiency and effectiveness, more transparency, openness and, allowing citizens participation (improving democratic processes).

There are different terms or expressions widely used to refer to the use of ICT in governments apart from e-government. They include digital government, online government, electronic governance (e-governance). Particularly, the difference between e-government and e-governance tends to be confuse. Grönlund & Horan (2004) state that e-government refers to what is happening within government organizations that provide services to citizens or companies. While e-governance refers to the whole system involved in managing a society. In other words, governance is a way of describing the links between government and its broader environment - political, social and administrative (Riley, 2004 in Grönlund & Horan, 2004).

Similarly, Orihuela & Toshio (2007) clarifies that even though the concepts of e-government and e-governance share an “optimistic” view of about the usage of ICT by governments, the former refers to the usage of ICT as tools that allow communication between governments and its constituents, and the latter refers to ICT used to allow active participation of the citizens in the political procedures of their country. E-governance then is related to the concept of e-democracy.

Despite their differences, e-government is a term widely accepted even when research takes a governance perspective. The term e-government fits for the research reported in this dissertation, since this research takes the perspective of users (businesses) regarding uptake of inter-organizational e-government services (those offered by public institutions to favor reporting obligations of enterprises).

On the other hand, it is important to note that there are different international rankings looking at the use of ICT within the public sector. They measure variables towards e-government based in its own definitions about e-government. Some of the rankings that can be mentioned include Electronic Government Development Index (EGDI) estimated by United Nations, Networked Readiness Index (NRI) calculated by World Economic Forum, WASEDA - IAC International Digital Government Rankings, and Digital Government Index by OECD (see Table 1-2).

Table 1-2: E-government rankings

International organization	**Index / Ranking**	**Purpose / How is calculated?**	**Frequency**
United Nations	EDGI (E-Government Development Index)	EGDI is a composite indicator that consists of three indexes (Online Service Index, Telecommunication Index and Human Capital Index). They are equally weighted towards e-government.	Biannually
Waseda University (Institute of Digital Government)	WASEDA - IAC International Digital Government Ranking	It considers ten indicators: Network Infrastructure Preparedness, Management Optimization, Online Service, National Portal, Government CIO, E-Government Promotion, E-Participation, Open Government Data, Cyber Security, and the use of Emerging ICT.	Annually
World Economic Forum	Networked Readiness Index	It focuses on the application and impact of ICT in economies. It evaluates the country's performance in four pillars: Technology, People, Governance, and Impact. Each of these is comprised of three sub-pillars, one of them related to government.	Annually

Organisation for Economic Co-operation and Development	Digital Government Index	It is an effort to translate the OECD Digital Government Policy Framework (DGPG) into a measurement tool to assess the implementation of the OECD Recommendation on Digital Government Strategies and benchmark digital government across OECD countries.	--

1.1.2 Services, e-services, and public service delivery

Service and e-service concepts are widely used but they involve plenty of confusion (Ølnes & Jansen, 2015). The origin of the term “service”, as we use it today, goes back to 1930’s U.S. Department of Commerce’s Standard Industrial Classification (SIC) codes, at that time, services was the category for activities that did not fit into agriculture or manufacturing (Chesbrough & Spohrer, 2006).

The nature of services activity is broad (finance, education, health care, transportation, communication, business, government, among others). However, regardless of its nature, it involves a negotiated exchange between a provider and an adopter (supplier and customer) for the provision of (predominately) intangible assets (Chesbrough & Spohrer, 2006).

A **public service** can refer to the information exchange between a governmental agency and a user, or it may be one part of a longer interaction that also includes the provision of a physical service (e.g. applying for child care) (Ølnes & Jansen, 2015). However, a question remains: does a **public e-service** refer to the same being the only difference the channel used to deliver the service? (Ølnes & Jansen, 2015).

When talking about **e-services**, in the context of public sector, Lindgren & Jansson (2013) point out that in literature many “synonyms” can be found: e-government service, e-service, public e-service, digital service, e-public service, online service, website channel, etc. Although e-service can be broadly defined as the provisioning of services through

electronic means, and this definition can be extrapolated to public sector, it does not represent the complexity of electronic service provision in public sector.

Lindgren & Jansson (2013) analyzed e-services in the public sector domain by unpacking the concept of public e-service into three dimensions; (1) service, (2) electronic, and (3) public. They conclude that a **public e-service** is a process of exchange of information between users and governments to fulfill responsibilities or to claim for a right, and because of that process value for the user must be created (it is also important to note that based on the value created for the user the quality of the service is assessed).

Regarding the public nature of government services, Lindgren & Jansson (2013) acknowledges that public services are services provided by public organizations, either directly or by financing private providers. Either way, public services share some characteristics: (1) the public ethos; (2) a restricted choice for users; and (3) a different role of the users as they have certain rights as well as duties.

The definition provided by Lindgren & Jansson (2013), is adopted in this work to refer to e-services provided in the context of e-government programs. As noticed in the title and in the research question, this work uses the concept of "**inter-organizational e-government services**", the term inter-organizational is used to differentiate the type of e-service that businesses must use to fulfill with their duties of information reporting. Regarding e-government services concept, in this work is referred to a process of exchange of information, so enterprises can comply with their obligation of invoices information reporting. However, at the same it is expected enterprises perceive benefits, in other words, value for the companies is created. Reduction of the administrative burden is one the benefits expected as companies will not need to deal with paper-based reporting, in addition it is expected that e-invoicing adds IT sophistication to the enterprises.

Governments usually hold different channels to offer services, such as personal, telephone, paper and recently, with the spread of ICT, electronic channels. In this sense an e-service or an electronically mediated service can be also understood as a technical artifact that is typically Internet-based, it involves interaction, and it is connected to other IS (Lindgren & Jansson, 2013). In the case of this research, because of inter-

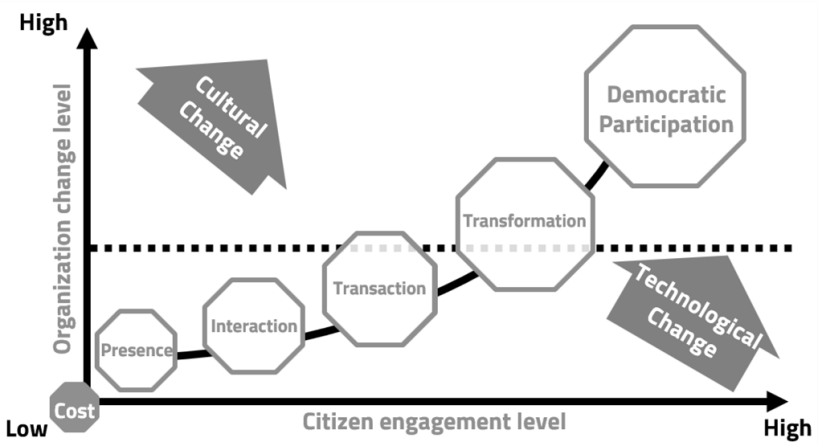
organizational nature, information systems from the company are connected to information systems of the governmental agency.

Additionally, e-government initiatives are usually developed towards phases that correspond to the nature of services that governments offer by electronic means. As stated by Lindgren & Jansson (2013) maturity models are helpful for characterizing public e-services. Many models for e-government development have followed in some way the schema proposed by Cardona Madariaga (2004), from web presence (offering informational services) to allow democratic participation.

Although, e-government stage models have been criticized because they are usually supply-oriented and ignored the side of adoption (Joshi & Islam, 2018), Cardona Madariaga (2004) recognizes that it is required a higher level of users' engagement with the adoption of e-services when the e-services increase their level of sophistication or complexity (Figure 1-1). He states that especially the phases of presence, interaction, and transaction deal with a technological change at the governmental agency while transformation and democratic participation especially deal with a cultural change.

The approach to combine user's adoption into e-government maturity can also be observed in Shareef et al. (2011) and Shareef, Kumar, Kumar, & Dwivedi (2014) work, they state that adoption factors at different levels of service maturity (static/informational, interactional and transactional) are potentially different. Thus, suggesting that research must be conducted keeping that in mind.

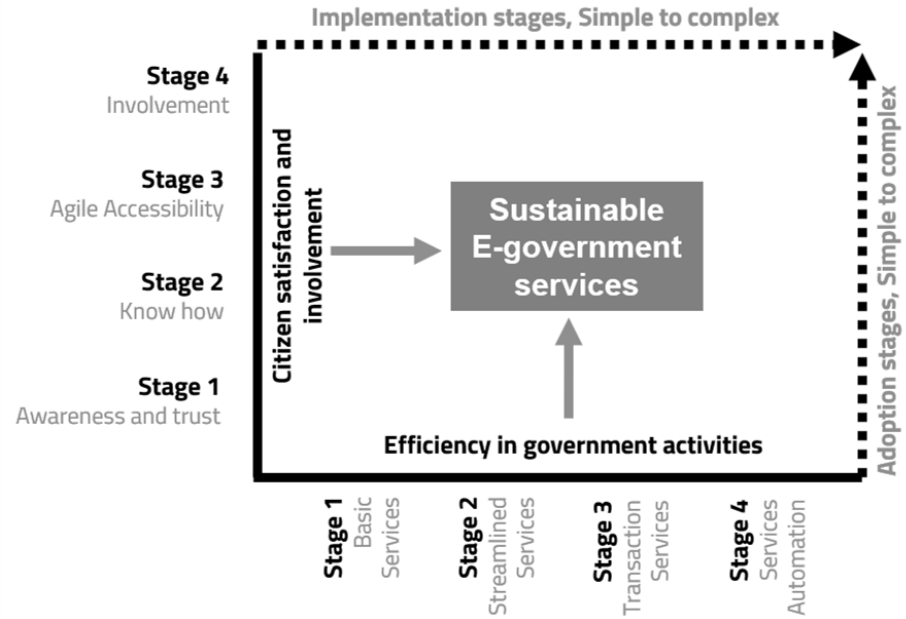
Figure 1-1: e-government stages



Source: Translate from (Cardona Madariaga, 2004)

Joshi & Islam (2018) study also integrates user's adoption into an e-government maturity model (Figure 1-2). In this model, the e-services developed and offered at each stage would require of a process of users' adoption, this goes from awareness and trust in the e-service to involvement in its usage.

Figure 1-2: e-government maturity model



Source: (Joshi & Islam, 2018)

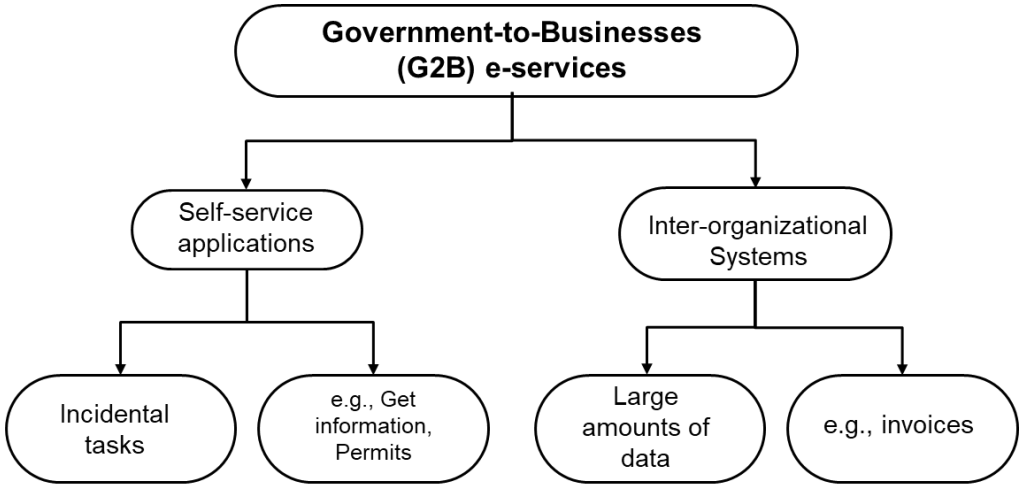
Both models, Cardona Madariaga (2004) and Joshi & Islam (2018) as well as most of the e-government maturity models identify transaction as an stage in e-government development (Irani et al., 2006). Irani et al. (2006) state that transaction stage is delineated at the point at which ICT stop being peripheral to the agency's core activities and it represents an organizational challenge.

Transaction stage represents a broad impact in the organizational context because it is expected to account for saving time, effort and cost of delivery of services and thus, increase of the efficiency of internal government processes (Irani et al., 2006). It also accounts for benefits to external users mainly in terms of saving time (Roseth et al., 2018).

At transaction stage, governmental agencies offer self-service applications to their stakeholders, so, they can perform electronically the paperwork they are responsible for. At this stage also inter-organizational systems can be also used to offer integrated services to end users and to exchange information between businesses and governmental agencies.

As it has been being suggested in this document, e-government services offered to businesses can be classified into two categories: self-service applications and inter-organizational services (Figure 1-3). Self-service e-government services or self-service applications (in the context of public sector) are web forms based, non-integrated data exchange systems, usually accessed for occasional transaction as e.g. permits and the registration of a new company (Arendsen, van Engers, et al., 2008). On the other side, inter-organizational systems refer to automated exchange of information between the businesses' information systems and governmental information systems. Electronic data interchange is expected to bring many benefits such as reduction of businesses' burden (Arendsen, van Engers, et al., 2008).

Figure 1-3: G2B e-services classification

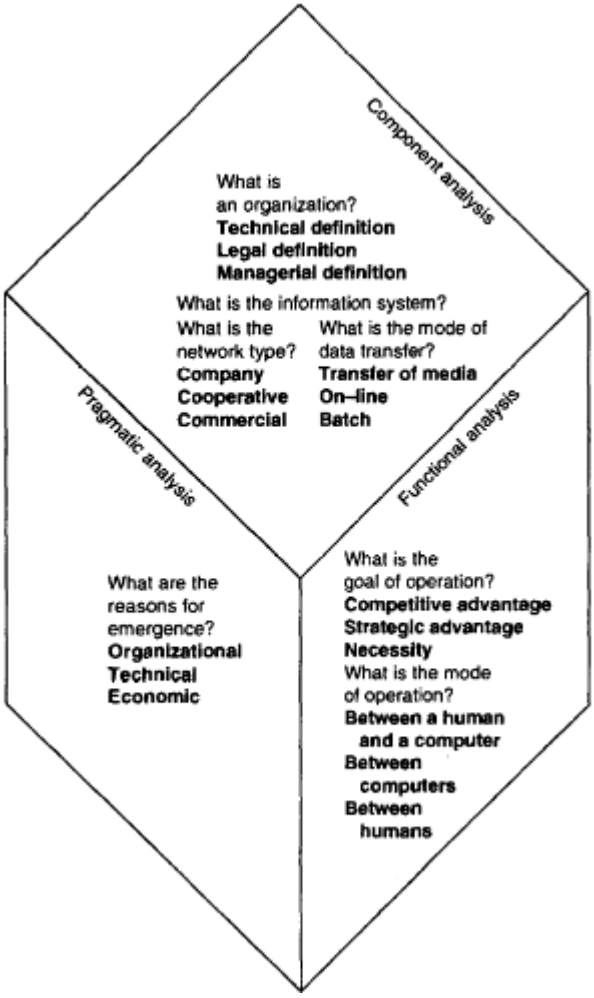


This work focuses on inter-organizational services offered to businesses, those services that should be used to fulfil reporting duties. It configures a particular context since they imply linking organization systems with governmental systems. And among micro-businesses, it usually implies the arrival of a new technology to the organization and to migrate paper-based tasks to electronically supported tasks.

1.1.3 Inter-organizational e-government services: e-invoicing

This research focuses on Inter-organizational e-government services, which can be understood as a form of Inter-organizational systems (IOS). According to Suomi (1992) IOSs can be defined as a "*system feasible because of technical, organizational and economic changes, in which two or more independently managed organizations communicate in a company, cooperative or commercial network in a memory-to-memory fashion without the transfer of physical media; in order to attain operative or strategic goals by means of communication between computers, humans through a computer, or a human and a computer."* This definition is based on the analysis of the concept of inter-organizational systems from a component, pragmatic and functional analysis (see Figure 1-4).

Figure 1-4: Conceptual prism of IOS



Source: (Suomi, 1992)

In a more general view about IOS, these systems can be understood as *"telecommunication-based computer systems that are used by two or more organizations to support the sharing of data, and sometimes applications, among users in different organizations"* (Iacovou et al., 1995, p. 466).

Electronic Data Interchange (EDI) systems are a type of inter-organizational system which allows the movement of information between organizations electronically handled. EDI was developed to lessen businesses paperwork, due to their negative impact on the productivity of many companies. The design assumptions were founded on the idea that a large portion of the regular information shared between organizations is highly structured

and standardized, favoring the possibilities to be handled by machines (MACGREGOR et al., 1993).

EDI involves the introduction of new technology and the substitution of paper by electronic means. Although inter-organizational systems in general or EDI systems in particular, are expected to bring benefits to all parts involved in the inter-organizational relationship (Chwelos et al., 2001; Robey et al., 2008), in the context of e-government it its believe that it is the government the one who benefits the most from the inter-organizational system diffusion among businesses. Businesses might or might not perceived benefits, but it is believed that this kind of systems help them to reduce their administrative burden and to some businesses (such as micro-businesses) also add technology sophistication (Arendsen, Van Engers, et al., 2008; Tung & Rieck, 2005).

It is important also to notice that e-government inter-organizational services also take place among public organizations whether to exchange information between them or to offer integrated e-services. However, this inter-organizational relationship government-to-government (G2G) is out of the scope of this research, as it focuses on government-to-business interactions (G2B).

On the other hand, in the business-to-business (B2B) context, interorganizational systems are expected to generate strategic alliances between two or more organizations. Thus, adoption of an IOS is driven by sharing costs, risks, and resources. It differs from the G2B context, as in the case of public-private sector, regulation determines the inter-organizational relationship. This research focuses on the G2B relationship.

The transaction processing related to frequent data exchange between governments and businesses involves for instance tax filing, social security payments, e-invoicing, customs declarations and statistics (Arendsen, Van Engers, et al., 2008). Since improving governmental efficiency, effectiveness and transparency is an important part of e-government, and the digitalization of documents help to that aim, for several years governments have been launching projects towards the digitalization different kind of documents, electronic invoices is one example of this.

Invoices are an important business document among trading partners. It represents information related to commercial transactions (billing and payment), nevertheless it is also essential to tax administrations (Arendsen & Van De Wijngaert, 2011; Haag et al.,

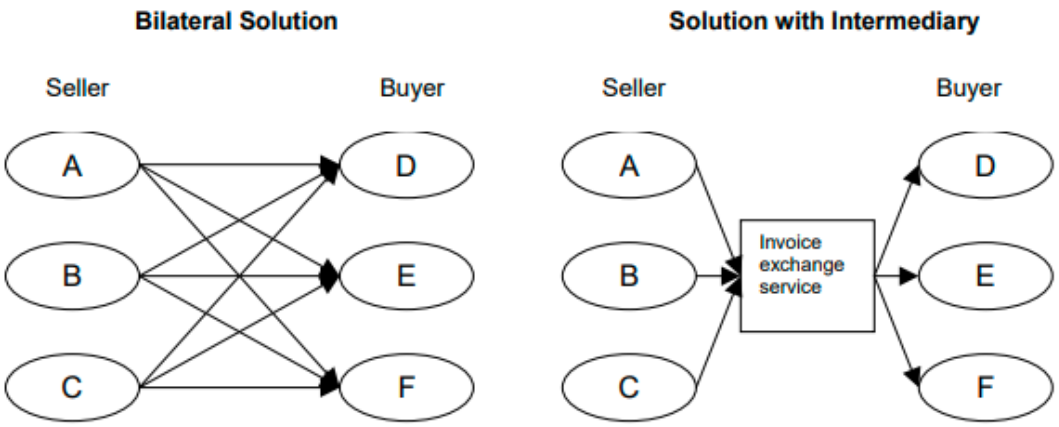
2013). Although invoice document is regulated by governments, e-invoicing adoption can also be studied from the perspective of B2B relationships. However, in the context of this research, adoption of e-invoicing was studied taking mainly into account that, by migrating towards electronic invoicing, businesses should be able comply with their reporting duty obligations easily, but government is interested in the spread of adoption rates as the control exerted towards tax evasion should be also more efficient.

E-invoice is an electronically issued and delivered invoice in a standardized specified format that can be understood by machines with the appropriate specification. Although, usually, it also includes a visual representation in a format readable by humans. A PDF document, a document formatted in word processor, a scanned version of a paper-based invoice, a picture of it is not an electronic invoice.

An e-invoicing system, typically, allows to create the invoice in the correct structure and transfer the document to the recipient, whether the buyer or a good or services or to the public organization requiring the document (in the context of government digitization). The e-invoice can be sent it directly to the recipient (bilateral solution) or using an intermediary (intermediary solution) (Sundström, 2006) (see Figure 1-5).

e-Invoicing can be seen as an application of EDI system. The foundation of EDI is the communication between two business systems eliminating the need for manual processes. Although there are many benefits expected from the use of EDI systems some of their drawbacks involve high expenses and challenges in the communication standards, this is specially problematic around small and medium enterprises (Sundström, 2006).

Figure 1-5: Bilateral and intermediary solution for e-invoicing



Source: (Sundström, 2006).

Among small and medium-sized enterprises, adoption of e-invoicing is considered low (Haag et al., 2013; Olaleye & Sanusi, 2017), especially in voluntary adoption contexts. In some countries such as Colombia, the usage of electronic invoices has become mandatory, which indeed, has spread the adoption rates of electronic invoicing. While in 2017 (voluntary adoption context), only 4% of large-sized enterprises, 1.96% of medium-sized enterprises and 0.0% of small-sized enterprises used e-invoices, by 2021 (mandatory adoption from 2019), 80% of the businesses in Colombia had migrated to e-invoices (SERES, 2017, 2021).

1.2 Literature review on the uptake of e-government services by businesses

A systematic literature review was conducted towards uptake of e-government services by businesses. This section is organized in sections. Section 1.2.1 presents the literature review design. Section 1.2.2. discusses why this research employs the concept of uptake instead of acceptance or adoption. The subsequent section presents different theoretical perspectives found towards uptake (based on related concepts such as acceptance, adoption, usage) of e-government services by businesses (section 1.2.3). Next a summary of results from previous research is presented in terms of factors influencing usage of e-government services by businesses (section 1.2.4). A process of retroduction

based on the results from the literature review is presented in section 1.2.5 where some mechanisms explaining e-government services uptake by businesses are postulated.

1.2.1 Literature review design

Although literature review was a permanent activity during the research. There was an initial systematic literature review with the aim of gaining a comprehensive understanding of the research on usage of electronic services to interact with governments. It included identifying theoretical perspectives, critical success factors, methodologies, among other aspects. The literature review also helped to identify the specific problem to be addressed in this research. By selecting empirical research on business' uptake of e-government services it was possible to hypothesize some mechanisms that might explain the uptake phenomena among businesses.

Literature review was performed following Webster & Watson (2002) and a critical realist methodological approach in a theory-mining review process based on Okoli (2012, 2015). A theory-mining review (TMR) process is "*a literature review that extracts theoretical concepts from its constituent primary studies as a key aspect of the synthesis; it might also extract and synthesize the relationships between these concepts, the explanations of these relationships, and the bounding contextual conditions of the extracted*" (Okoli, 2015). The steps followed, focused on Theory-Contending Review process, are described in Table 1-3.

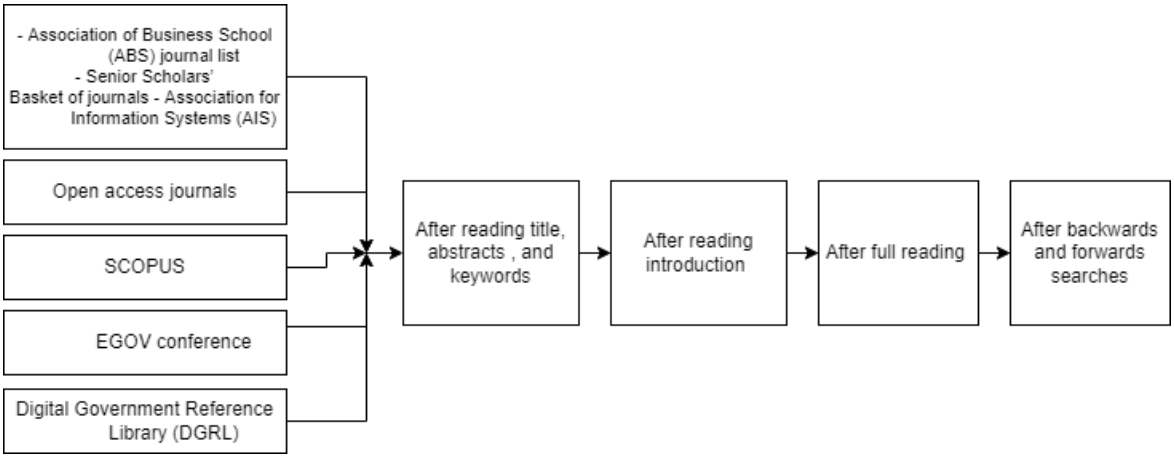
Table 1-3: Theory-mining review process

	Theory-Contending Review scope	**In this research**
1. Identify the Theory-Mining objectives	It focuses explicitly on theoretical relationships as the scope of the review.	The goal of the literature review was to find relevant literature related to usage of e-government services by businesses and to identify theories used in previous research as well as elements in those theories.
2. Guide the review with a research protocol	Design protocol in the order prescribed for pre-review protocols.	Research protocol for literature review followed c.

3. Practical screen criteria must be justified by theory-mining goals	Conceptual and empirical studies.	Title, keywords and abstract were reviewed and **only the papers reporting research on usage of e-government services from a business perspective were included.** However, papers that presented research in progress or those written in different languages from English or Spanish were excluded.
4. Search for the elements of theory	Search for elements of theory	The identification of literature was done by using the following main equation: ("e-government" or "electronic government" or "d-government" or "digital government" or "online government" or "g2b" or "b2g") AND ("business" or "firm" or "enterprise" or "company" or "corporation" or "sme" or "private sector") AND ("acceptance" or "adoption" or "diffusion" or "choice" or "use" or "usage" or “uptake”).
5. Extract the elements of theory	Extract concepts, relationships, explanations, and boundary conditions.	The elements extracted from the documents selected included: general description of study and phenomena, research design, and especially, elements of theory, they, focused on concepts and their relationships such as dependent and independent variables.
6. Apply quality appraisal according to Theory-Mining objectives	Optional.	The quality of the papers was assumed by the sources consulted. They included the Association of Business School (ABS) journal list for the areas of ‘public sector’ and ‘information management’, the Senior Scholars’ Basket of journals from the Association for Information Systems (AIS), the proceedings of the EGOV conference, the Digital Government Reference Library (DGRL) version 15.5 and Scopus.
7. Synthesize theory from the literature	All approaches except meta-analysis.	Although in the literature review different types of theory were founded, the synthesis of the review was done through a retroductive approach to hypothesize mechanism from the factors involved in uptake of e-government services by businesses.
8. Explicitly craft and argue the theoretical contribution	Arguments for explanations of relationships.	The list of hypothesized mechanism that might underlie the uptake process of e-government services by businesses (see section 1.2.5).

Systematic literature review was conducted at two different moments during research in order to update the results in the period of time covered, first time included conceptual and empirical works and the second time it focuses on empirical research, providing foundations towards the hypothesized mechanisms describe in section 1.2.5.

Figure 1-6: Literature review



Search until 2018 (**1742 results)**	541	139	44	**50**
Update to 2021 (**407 results**)	131	47	26	30
e-invoicing search to 2021 **(211 results)**	59	29	17	17

1.2.2 Uptake of e-government services

In this dissertation the concept of uptake of e-government services is employed to refer to the process of incorporation of technology in organizations to respond to regulation related to the digitization of governments. Although, in the literature is usual to find the concepts of acceptance and adoption to refer to the usage of technology, there is no standard definition about those terms, and they are usually used as synonyms as they are highly intertwined.

IT Acceptance is usually referred to the intention to use a given technology, this assertion is highly influenced by Technology Acceptance Model (TAM) (Davis, 1989), since the dependent variable is precisely '**intention to use'** and it is used to predict future

usage. IT Acceptance is also defined as the demonstrable **willingness** within a user group to employ information technology for the tasks it is designed to support (Dillon & Morris, 1996). Following Dillon & Morris (1996), user acceptance is important, since without acceptance users will likely manifest dissatisfaction and they will use the new system in an inefficient manner, which in turn will neglect the expected benefits of the new technology. Similarly, Gonzalez Rubio (2013, p.33) based on different authors defined acceptance as "*The demonstrable willingness of an individual, a user group, or an organization to use the technology for the tasks it is designed to support*".

IT Adoption, on the other hand, can be understood as a decision to use an innovation (Rogers, 1995). But some others defined adoption as the usage itself to the technology (Velleman et al., 2017), which goes beyond the decision. Comparably, de Vaujany (2008, p. 7) defines adoption (in the organizational context) as *"the practices which put an artefact at the disposal of potential organizational users*". Under this view, investment and implementation are part of adoption practices.

Table 1-4 and Table 1-5 present an overview of the definitions given to acceptance and adoption of technology.

Table 1-4: IT acceptance definitions

Author(s)	Definition
(Hendrick et al., 1984 in Gonzalez Rubio, 2013, pp. 33)	"*An individual's psychological state with regard to his or her voluntary or intended use of a particular technology*".
(Dillon & Morris, 1996)	The demonstrable willingness within a user group to employ information technology for the tasks it is designed to support
(Renaud & van Biljon, 2008, p. 211)	*"It is an attitude towards a technology, and it is influenced by various factors"*
(Gonzalez Rubio, 2013, pp. 28–54)	*"Willingness of an individual, a user group, or an organization to use the technology for the tasks it is designed to support"*
(Lallmahomed et al., 2017, p. 59)	*"It refers to the study of factors that would (1) cause an individual to accept or reject a technology, (2) factors that would improve an individual's uptake of a technology and (3) factors that would predict future utilization of a technology"*

Table 1-5: IT adoption definitions

Author(s)	Definition
(Howard and Moore, 1988 citado por Gonzalez Rubio, 2013, pp. 22)	*"The acceptance and continued use of a product, service or idea"*
(Rogers, 1995, p. 21)	*"A decision to make full use of an innovation as the best course of action available".*
(Renaud & van Biljon, 2008, p. 210)	*"Technology adoption is a process that starts with the user becoming aware of the technology, and ends with the user embracing the technology and making full use of it"*
(Bouwman et al., 2005 in Velleman, Nahuis, & Van Der Geest, 2017, p. 175)	*"The phase of investigation, research, consideration and decision making in order to introduce a new innovation in the organization"*
(de Vaujany, 2008, p. 7)	*"The practices which put an artefact at the disposal of potential organisational users"*
(Y. K. Dwivedi et al., 2016, p. 175)	*"Continuous preference for a new system by replacing the old one by starting from awareness and familiarity of the system"*
(Salahshour Rad et al., 2017)	It refers to the acceptance or initial use of the technology.
(Velleman et al., 2017, p. 175)	*"The actual acceptance and the use of a product or technology by its intended users"*

After analyzing the definitions given in Table 1-4 and Table 1-5, it is still difficult to find the boundaries between acceptance and adoption as there are no agreement or standard definition in the academic literature. To avoid the confusion caused by these concepts (acceptance and adoption), and since this research takes a process perspective, the concept of **uptake** was chosen for this research instead of the concepts of acceptance or adoption. In Pettigrew's (1997) view, language plays a role in process research, exposing

processes requires a process vocabulary; the language of states is superseded by an active language of becoming, emerging, developing, transforming, and decaying.

Even though uptake is a noun as acceptance and adoption are, uptake meaning relates with a process or an action more than the other concepts mentioned, acceptance and adoption relate more with a state than a process. Cambridge dictionary defines uptake as "the act of taking something in"[5]. This research studies how microbusinesses take inter-organizational e-government services in. Yet, during the literature review acceptance and adoption terms were also employed as they are related to uptake and usage.

It is also important to note that Schwarz et al. (2014) proposed a model of IT acceptance to go beyond the models that have been mainly static and do not reflect the dynamic emerging process of IT acceptance.

1.3 Theoretical perspectives towards uptake e-government services

As mentioned previously, self-service e-government services are web forms based, non-integrated data exchange, usually accessed for occasional transaction as e.g. permits and the registration of a new company (Arendsen, van Engers, et al., 2008). Citizens are an important group of users of self-service applications. On the other side, inter-organizational e-services within the context of e-government involve electronic transaction processing based on mutual data exchange (e.g. tax filing, social security payments, e-invoicing, customs declarations and statistics) (Arendsen, van Engers, et al., 2008). Therefore, businesses are the target group for inter-organizational services.

Particularly enterprises are advocated to use inter-organizational e-government services, with the main purpose of exchanging or reporting data to governmental entities, and it is expected to reduce their administrative burden (Arendsen et al., 2014). However, adoption of such systems span organizational boundaries, and they can involve significant changes to organizations including working practices and relationships with different partners (Kurnia & Johnston, 2000).

[5] https://dictionary.cambridge.org/us/dictionary/english/uptake

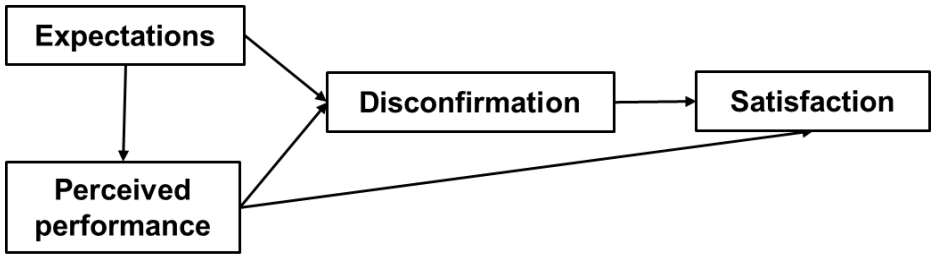
The theoretical lenses used to study usage of self-service applications and inter-organizational e-government services are presented in the next subsections. A brief description of the theory is presented followed by an example of its use in e-government field.

1.3.1 Expectation confirmation theory

Expectation-confirmation theory posits that expectations and perceived performance lead to satisfaction. However, his effect is mediated through positive or negative disconfirmation between expectations and performance. Which leads to satisfaction or dissatisfaction, respectively (Oliver & Oliver, 1980).

The four main constructs in the model are: expectations, perceived performance, disconfirmation, and satisfaction. Expectations reflect anticipated behavior; users use them to evaluate performance and make judgments.

Figure 1-7: Schematic of Expectation Confirmation Theory



Example of ECT in e-government field: Pinem et al. (2018) extended the model to study the antecedents of trust towards continuance intention to use e-government. They found that satisfaction mediates the influence of trust in intention to continue using e-government services.

1.3.2 Theory of Planned Behavior

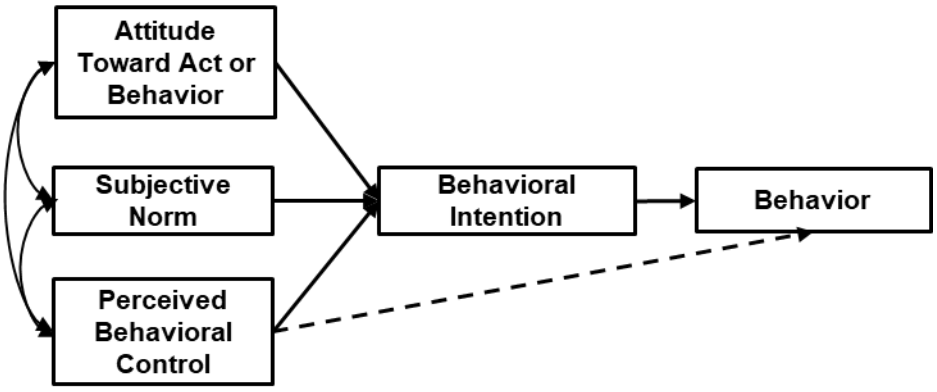
TPB is rooted in the social psychology field, but it is also used to explain acceptance towards a technology. TPB posits that individual behavior is driven by intentions where behavioral intentions are a function of attitudes, subjective norms, and perceive behavioral control (PBC).

Regarding attitude toward the behavior, it is defined as the individual's positive or negative assessment about the consequences of performing a behavior and an

evaluation of the desirability of these consequences. Subjective norm is defined as an individual's perception of whether people (that is important to the individual) think the behavior should be performed. And, perceive behavioral control refers to the evaluation about the presence or absence of the necessary conditions to perform a behavior (Ghazali et al., 2014 based on Ajzen et al., 1986).

Particularly, PBC itself can influence the behavior, PBC is rooted in self-efficacy construct from the work of Bandura and his associates (Bandura, Adams, & Beyer, 1977; Bandura, Adams, Hardy, & Howells, 1980 on Ajzen, 1991); self-efficacy refers to the self-evaluation towards their skills to perform a behavior/action, the individual's confidence in their ability to perform the behavior (Ajzen, 1991; Alruwaie et al., 2012 based on Bandura 1986).

Figure 1-8: Schematic of Theory of Planned Behavior



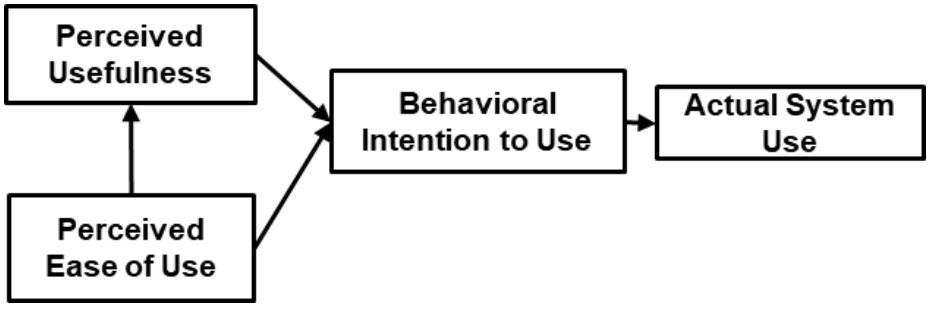
Example of TPB in e-government field: TPB was used by Hung et al. (2012) in the context of inter-entity supply contracts, they adapted TPB and found that perceived usefulness, perceived risk, external influence, interpersonal influence, self-efficacy, and facilitating conditions are critical factors in determining buyer acceptance of G2B e-government services.

1.3.3 Technology Acceptance Model

Technology Acceptance Model (TAM) is one of the theoretical foundation most used across the studies for predicting use of technology. It is an adaptation of the Theory of Reasoned Action (TRA) to the field of information systems. It posits that perceived usefulness and perceived ease of use determine intention to use a system. Perceived Usefulness (PU) is defined as the belief that using a system the performance is going to

improve and Perceived Ease of Use (PEOU) refers to the belief that using a system would be free of effort (Davis, 1989).

Figure 1-9: Schematic of Technology Acceptance Model



Example of TAM in e-government field: Vejačka (2018) modified TAM to study to business users' acceptance of e-government services in Slovakia. He found significant influence of perceived usefulness, amount of information about e-government, perceived quality of services, perceived security, and trust in e-government on acceptance of e-government services by business users.

1.3.4 Diffusion of Innovation Theory

Diffusion of Innovations theory (DOI) theory states that individuals hold different degrees of willingness to adopt innovations and the adoption of an innovation among population is nearly normally distributed over time (Rogers, 1995). Also Rogers (1995) group individuals into five categories, from earliest to latest adopters: innovators, early adopters, early majority, late majority, laggards.

DOI postulates five factors that influence adoption of an innovation that are widely used in IS research to study adoption of technology: relative advantage, compatibility, trialability, observability, and complexity (Rogers, 1995) (see Table 1-6).

Table 1-6: DOI constructs towards adoption of innovations

DOI Construct	**Description**	Influence on adoption
Relative advantage	The degree to which an innovation is perceived to be better than its predecessor.	Positive
Compatibility	The degree to which the potential users perceive an innovation as being consistent with their	Positive

	values, experiences, and needs.	
Trialability	The degree to which an innovation can be experimented.	Positive
Observability	It refers to the visibility of the results of an innovation.	Positive
Complexity	It's the evaluation towards an innovation regarding its difficulty to understand it and use it.	Negative

Example of DOI in e-government field: Drawing on Rogers' Innovation Diffusion Theory and on the literature on network externalities, social influence, and barriers to adoption, Tung & Rieck (2005) developed and a theoretical framework toward adoption decision of electronic government services and tested it among businesses in Singapore. The results show a significant positive relationship between perceived benefits (this construct is related to relative advantage in DOI), external pressure, and social influence and the firms' decision to adopt e-Government services.

1.3.5 Unified Theory of Acceptance and Use of Technology

Like TAM, UTAUT aims to explain user intentions to use a given technology. There are four central constructs in the theory that are considered direct determinants of usage intention (performance expectancy, effort expectancy, social influence, and facilitating conditions) (Venkatesh et al., 2003). Gender, age, experience, and voluntariness of use are posited to moderate the impact of the four key constructs on usage intention and behavior (Venkatesh et al., 2003). Table 1-7 presents the descriptions provided in the context of e-government for the core constructs of the UTAUT.

Table 1-7: UTAUT constructs towards acceptance and use of technology.

UTAUT Construct	**Description**
Facilitating conditions	It is defined as the user believes about the existence of the organizational and technical infrastructure to support the use of the system (Venkatesh et al., 2003)
Social influence	It refers to the user's believes that using e-government

	services would be perceived as socially influential (AL Athmay et al., 2016)
Effort Expectancy	It is related to the ease of use of the system (Al-Shafi & Weerakkody, 2010).
Performance Expectancy	It is the degree to which an user expects gains from the use of e-government services (AL Athmay et al., 2016).

The UTAUT is based on eight models that are employed to explain usage behavior in IS field: theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, a combined theory of planned behavior/technology acceptance model, model of PC utilization, innovation diffusion theory, and social cognitive theory.

Example of UTAUT in e-government field: Soong et al. (2020) integrated TAM and UTAUT to examine Malaysian small and medium-sized enterprises (SMEs) Adoption of electronic government procurement (EGP) in a post-introduction scenario. They found confirm that effort expectancy, performance expectancy and social influences had a direct effect on the adoption of EGP in the private sector.

There is an extension of UTAUT, known as UTAUT 2 (Venkatesh et al., 2012). It is particularly adapted to the customer context. It includes hedonic motivation (enjoyment), price (shows the difference between a consumer use setting and the organizational use setting), and habit (see Table 1-8).

Table 1-8: UTAUT 2 constructs towards acceptance and use of technology

UTAUT2 Construct	**Description**
Hedonic motivation	It is defined as the fun or pleasure derived from using a technology (Venkatesh et al., 2012).
Price	It refers to the consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost of usage (Venkatesh et al., 2012).
Habit	It is defined as the extent to which people tend to perform behaviors automatically because of learning (Venkatesh et al., 2012).

Example of UTAUT2 in e-government field: Lian (2015) propose an integrated model based on the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). He conducted an empirical study to identify the critical factors for the adoption of cloud-based e-invoicing (a novel e-government service in Taiwan). He found that effort expectation, social influence, trust in e-government, and perceived risk have significant effects on the intention to adopt e-invoicing.

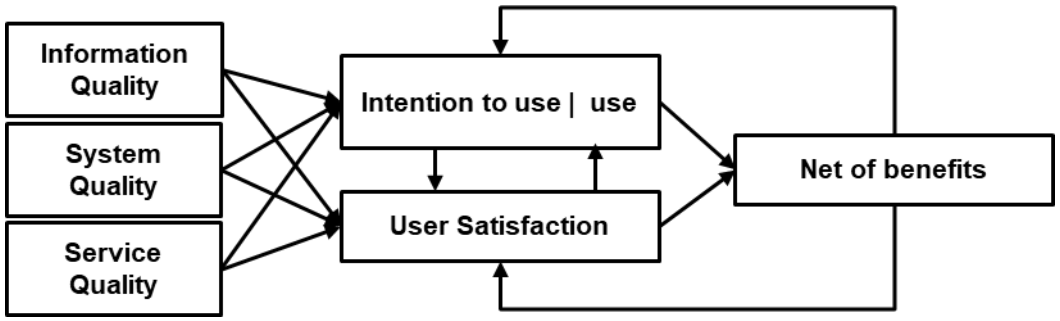
1.3.6 DeLone and McLean's success model of IS

DeLone and McLean's success model of IS (ISS) was proposed in 1992 and updated in 2003 by DeLone & McLean (1992, 2003) to measure the information system success. It takes into account the information, system, and service quality, user satisfaction, current usage and the net of benefits. Table 1-9 presents de description of the constructs given studies conducted in the e-government field and Figure 1-10 shows the updated model.

Table 1-9: ISS constructs towards measuring the success of IS

ISS Construct	Description
Information quality	It refers to the judgement about the ability of the e-service to offer understandable, clear and accurate information (AL Athmay et al., 2016).
Satisfaction	It is defined as the user's level of experience and fulfillment from using e-government services (AL Athmay et al., 2016)
Service quality	Judgment about the difference between service received and user's expectations (Alruwaie et al., 2012).
System quality	It is related to functionality, reliability and flexibility of the system (DeLone & McLean, 2003).

Figure 1-10: Schematic of IS Success Model



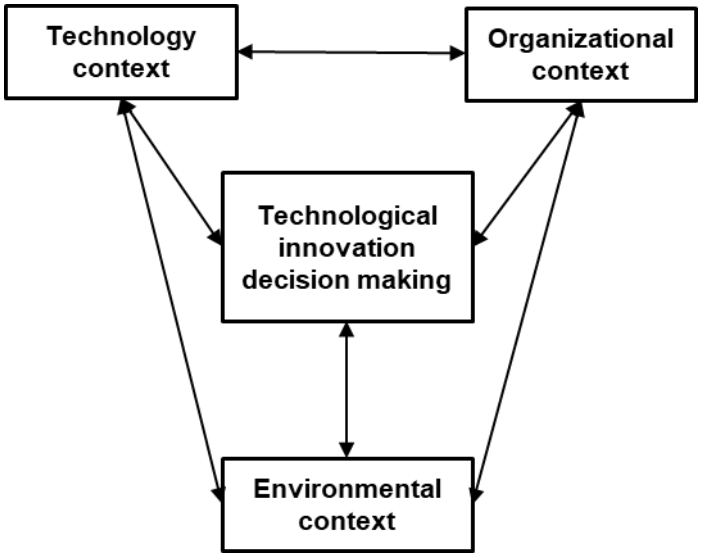
Example of ISS in e-government field: Sambasivan et al. (2010) use an extension of DeLone and McLean's model of IS success, they include trust, facilitating conditions, and web design quality to determine the factors that influence the intention to use and actual usage of a G2B system (electronic procurement system). They found that perceived usefulness, perceived ease of use, assurance of service-by-service providers, responsiveness of service providers, facilitating conditions, and web design (service quality) are strongly linked to intention to use electronic procurement system; and intention to use is strongly linked to actual usage behavior.

1.3.7 Technological, Organizational and Environmental framework

TOE-framework identifies three aspects that influence the process by which an organization adopts and implements a technological innovation: technological, organizational, and environmental context. These three elements present "both constraints and opportunities for technological innovation" (DePietro, Wiarda, & Fleischer, 1990, p. 154 cited in Larsen & Eargle, 2015). Thus, these three elements influence the way a firm sees the need for, searches for, and adopts new technology.

The technological context includes the technologies that are relevant to the firm. They include both equipment as well as processes. The organizational context refers to the characteristics and resources of the firm. The environmental context includes the size and structure of the industry, the firm's competitors, the macroeconomic context, and the regulatory environment (DePietro, Wiarda, & Fleischer, 1990 cited in Larsen & Eargle, 2015).

Figure 1-11: Schematic of TOE framework



Example of TOE-Framework in e-government field: According to Arendsen, Van Engers, et al. (2008), the environmental context is specified by the business sector, governmental influence, and competitors. The organizational context consists out of the firm size, leadership, formal structure, and quality of personnel. The technological context is divided into variables addressing the available infrastructure and technology and indicates the degree to which the organization is willing to adopt the technological innovation (Arendsen, Van Engers, et al., 2008).

1.3.8 E-Government Adoption and Utilization Model

EGAUM was developed based on the literature on e-government adoption, and theories used to analyze acceptance and usage of technologies. The EGAUM model consists of three dependent variables, namely Intention to Use E-Government (ITU), E-Readiness of e-Government (ER) and Actual Adoption and Use of e- Government (AAU). EGAUM also contains four groups of independent variables, which are Personal Factors (PF), Motivational Factors (MF), Technical Factors (TF) and Reliability Factors (RF). These independent variables represent the fundamental factors that have a critical influence on the adoption and usage levels of e-government (Alghamdi & Beloff, 2014).

Figure 1-12: Schematic of EGAUM

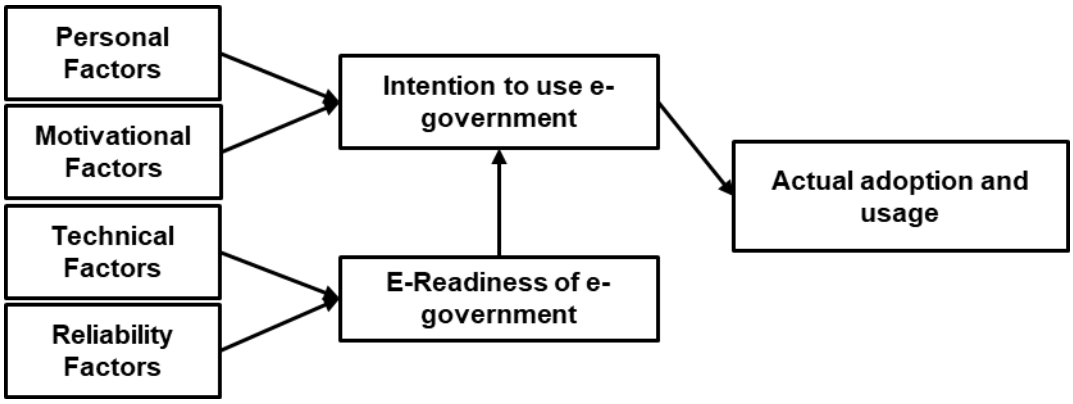


Table 1-10: EGAUM constructs towards adoption of e-government.

EGAUM Construct	Description
Personal factors	They refer to demographic factors such as the users' age, gender, education and computer literacy levels, users' location and income (Alghamdi & Beloff, 2014).
Motivational factors	
Perceived benefits	It refers to the degree to which e-government provides functional and non-functional benefits to its users (Alghamdi & Beloff, 2014).
Socio-Cultural	It is a combination of two influential aspects, the social aspect and the cultural aspect Alghamdi & Beloff, 2014).
Awareness	Activity related to making users conscious aware of and familiar with e-government, particularly users in remote areas Alghamdi & Beloff, 2014).
Functional quality of service	It refers to the evaluation of the functional aspects of a service that is provided by e-Government such as speed (Alghamdi & Beloff, 2014).
Previous experience	It refers to experiences that the user has had earlier using e-services (Alghamdi & Beloff, 2014).
Technical factors	
Perceived simplicity	It refers to the perception about that the e-Government service has the necessary aspects to make it easy to use (Alghamdi &

	Beloff, 2014).
Technical quality of services	It refers to the technical aspects that are visible to the users and can affect their intention to use the system: special needs, linkage errors, semantic errors (Alghamdi & Beloff, 2014).
Accessibility	It refers to the existing methods for reaching and accessing e-services (Alghamdi & Beloff, 2014).
Reliability factors	
Security and Privacy	Those are two significant factors that need to be of a high standard in any system (Alghamdi & Beloff, 2014).
Trustworthiness	It plays a vital role in helping users to overcome the perceived risk and uncertainty involved in using online services (Alghamdi & Beloff, 2014).
Regulations & Policies	It includes usage terms and conditions and policies related to payment, rights, data protection, and security and privacy (Alghamdi & Beloff, 2014).

Example of EGAUM in e-government field: Alghamdi & Beloff (2016) tested the developed framework (EGAUM). They found that all the proposed factors have degree of influence on the adoption and utilization level. However, perceived benefits, awareness, previous experience, and regulations & policies were found to be the significant factors that are most likely to influence the adoption of users from business sector.

1.3.9 Human-Organization-Technology (HOT) Fit framework

The Human, Organization and Technology Fit (HOT-Fit) framework is a socio-technical model that considers e-government systems from a human, organizational and technology perspective. The HOT-Fit model is the product of Information Success (IS) Delone and Mclean model and IT Organization Fit model (Rammea & Grobbelaar, 2017). The Table 1-11 is taken from Rammea & Grobbelaar (2017) work and it presents the variables of the model.

Table 1-11: e-government evaluation factors and net benefits measurements for HOT-Fit Framework

E-government evaluation factors	Dimensions	Measured E-government Aspects	Net benefits
Technology	System Quality	Data Accuracy, Database Contents, Ease of Use, Learning, Availability, Accessibility, Usefulness of System Features and Functions, Flexibility, Reliability, Technical Support, Security, Efficiency, Resource Utilization, Response Time, Turnaround time Importance,	Cost, Time, Communication, Avoid Personal Interaction, Control, Convenience, Personalization, Ease of information retrieval, Trust, Well informed-ness, Participate in decision-making, Productivity, Efficiency, Effectiveness, decision, Making quality, Positive outcomes, Transparency
	Information Quality	Importance, Relevance, Usefulness, Legibility, format, Accuracy, Conciseness, Completeness, Reliability, Timeliness, Data Entry methods	
	Service Quality	Quick, Responsiveness, Assurance, Empathy, Follow Up Service, Technical Support	
Human	System Use	Nature of Use (use for the Intended purpose, appropriate use, Type of information used,) Purpose of Use, Level of Use (general vs. Specific,) Recurring use, Reports Acceptance, Percentage used, Voluntaries of use, Motivation to Use, Attitude, Acceptance Satisfaction	
	User Satisfaction	Satisfaction with specific functions, Overall Satisfaction, Perceived Usefulness, Enjoyment, Software Satisfaction, Decision-making satisfaction Nature,	
Organizational	Structure	Nature, (type, size) Culture, Planning, Strategy, Management, Process, Autonomy, Communication, Leadership, Top Management Support, Champion, Mediator, Teamwork Financing	
	Environment	Financing Source, Government Politics, localization, Competition, Inter- organizational Relationship, Population served, External	

		Communication	

Source: (Rammea & Grobbelaar, 2017)

Example of HOT-Fit Framework in e-government field: Rammea & Grobbelaar (2017) employed HOT-Fit Framework to understand the level and status of e-government implementation in Lesotho (case of the Lesotho Company Registry System), their findings suggest that e-government implementation for the system is at the early transactional stage. And that organization and technology perspectives shown more challenges in the implementation of e-government when compared to the human factors.

1.3.10 Media Richness Theory

When seeking for information not only the source but the channel is important. Whereas theories described in previous subsections focused on the uptake of specific technologies (e-services), service delivery strategies of governments are, in fact, rooted in multichannel management and channel choice theories. Channel choice (CC) is a research branch strongly based on media and marketing theories such as Media Richness Theory (MRT). It studies citizens' and businesses choice of communication channels in public service encounters (Madsen & Kræmmergaard, 2016b; Pieterson, 2009).

Media richness theory states that different communication channels differ in their ability to facilitate communication. In the context of e-government, it implies that not all information and communication technologies are equally suited to meet the information requirements (Van De Wijngaert, 2010).

When selecting a communication medium, one important criterion is to reduce the equivocality, or misinterpretations, of a message. Depending on the task being performed face-to-face interaction can be selected over a phone call or an email, as during face-to-face interaction is more efficient in the immediate feedback provision, thus information transmitted would be more accurate.

Not only to reduce the equivocality of information is of interest for organizations, but they are also interested in reducing the uncertainty, the more information available the less uncertainty they must deal with. This is related to the amount of information that the organization required and it influences the channel choice, because not all channels are

capable of transmit in an efficient way the same amounts of information (Daft & Lengel, 1986).

The concepts of ‘uncertainty’ and ‘equivocality’ towards channel choice, in fact, have their roots in the work of Daft & Lengel (1986) when answering the question why organization process information and the concept of information richness itself. Information must reduce both, uncertainty, and equivocality, for the organization. Thus, the channels to transmit information are required to also help to reduce both.

Because communication media differ in the capacity to process information, Daft & Lengel (1986) ranked media in accordance with their richness, face-to-face is positioned as the richest media, because it can provide immediate feedback and information can be checked in real time and also it is able to provide cues. Telephone is in second place, the third place goes to personal documents such as letters or memos, and the lowest richness might be provided by impersonal written documents, and numeric documents.

Tu sums up, MRT states that the media varies in richness and depending on the richness different media are suited for different tasks, so to contribute towards reduction of uncertainty and equivocality in the information needed by organizations.

Example of MRT in e-government field: van den Boer et al. (2012) studied information seeking behavior in the government-to-business domain (G2B). They prove that it is important to consider source and channel choice together regarding information seeking behavior of businesses. And that besides having direct contact with governments, businesses make use of different sources to get governmental information while using various channels to contact those sources.

1.3.11 Models for Electronic Data Interchange Systems

Electronic Data Interchange systems can be classified into inter-organizational systems, they allow two or more organizations to exchange structured information by electronic means, the transmission occurs between computer applications of each organization involved (Swatman & Swatman, 1992). Within the field of e-government EDI models have been also used to study the electronically mediated relationship between businesses and governments. Particularly, two models can be mentioned: Benbasat, and Dexter’s EDI

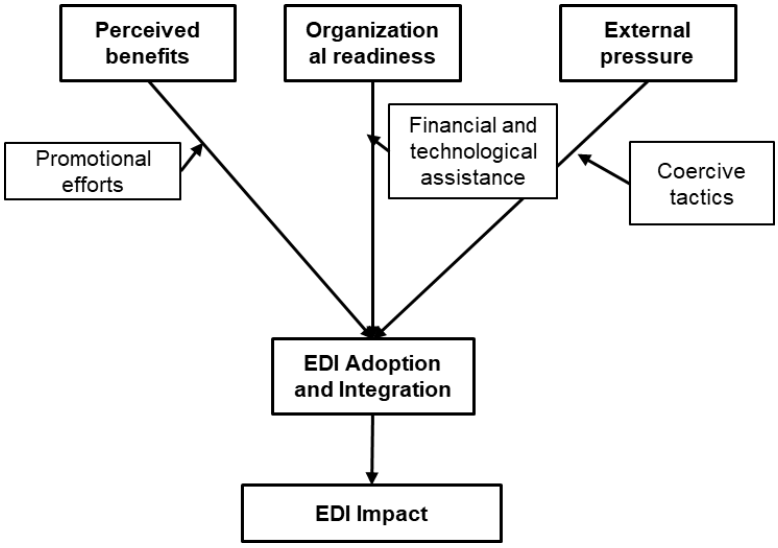
adoption and impact model (Iacovou et al., 1995), and Chwelos, Benbasat, and Dexter's EDI adoption model (Chwelos et al., 2001).

- **Iacovou, Benbasat, and Dexter's EDI adoption and impact model**

Because of the low penetration of EDI systems among small companies, Iacovou et al. (1995) investigate what influences EDI adoption in this group of firms, and they proposed and tested a framework of EDI adoption by small businesses.

The three main factors od the EDI adoption and impact model are: perceived EDI benefits, organizational readiness (availability of organizational resources), and external pressures to adopt (as small businesses, are susceptible to coercion by their larger partners). There are also three main aspects that should be considered to alter the effect of the three explanatory factors and facilitate a successful implementation of EDI: financial and technological assistance, promotion efforts, and coercive tactics (Iacovou et al., 1995).

Figure 1-13: Schematic of Iacovou, Benbasat, and Dexter's EDI adoption and impact model



Example of Iacovou, Benbasat, and Dexter's EDI adoption in e-government field: alongside with other technology adoption models, Alomar & de Visscher (2017) employed Iacovou et al. model to identify and analyze the factors affecting Belgium private companies' adoption of e-procurement. They found five main variables that explain e-

procurement adoption: size, attitude towards change, competitive pressure, trading partners' pressure and organizational readiness. In contrast, to Iacovou et al. model, they did not find significant relationship between the relative advantages and e-procurement adoption.

- **Chwelos, Benbasat, and Dexter's EDI adoption model**

Chwelos et al. (2001) developed a model towards the adoption of electronic data interchange (and other inter-organizational systems), similar to Iacovou et al. (1995), they proposed that readiness, perceived benefits, and external pressure are determinants predictors of intention to adopt EDI. With external pressure and readiness being significantly more important than the perceived benefits. They also state that those constructs can be categorized into three levels: technological, organizational, and interorganizational.

The perceived characteristics of technology based on DOI model, can be labeled in the technological perspective. They help to explain the technological part in the EDI adoption decision at individual-level. However, "*EDI adoption is almost always, and organizational-level decision executed in an inter-organizational context*" (Chwelos et al., 2001, p. 305).

Example of Chwelos, Benbasat, and Dexter's EDI adoption model in e-government field: Tung & Rieck (2005) examines factors influencing adoption of e-government services among business organizations in Singapore. Because they used Chwelos et al. model as a theoretical lens, for technological perspective, they employed Rogers' Diffusion of Innovation Theory, for organizational influences the literature on barriers to adoption were employed and, to capture inter-organizational factors, they relied on the literatures on network externalities and social influence theory. The result from the research shows that perceived benefits, external pressure, and social influence affect the firms' decision to adopt e-government services.

1.3.12 Other theories

Other theoretical lenses include SERVQUAL measurements, Lee et al. (2011) investigated if the willingness of a business to adopt e-Government depends on the perceived quality of government services through traditional service channels (offline channels), they found that thew willingness to adopt e-government increased when

business users perceived high quality service provision in offline service channels. Arendsen et al., (2006) employed transaction cost economics theory as a theoretical basis in the analysis of electronic data exchange, they found that small companies tend to outsource e-government related data exchange processes. Finally, amongst businesses studies, van den Boer et al. (2017) studied source and channel choices for businesses to interact with governments from information behavior field.

1.4 Relevant factors on the uptake of e-services by businesses

There is an extensive list of factors that might influence e-government services uptake by business organizations. Although, the dependent variables of previous studies towards uptake of e-services vary, they included intention to use, channel choice, satisfaction, confirmation of system adoption, intention to continue using, among others. Intention to use is the dependent variable more explored among the studies over usage of e-government services by businesses (Correa Ospina et al., 2021). Table 1-12 present a list of factors relevant for the uptake of e-government services by business' users found in previous empirical research.

Table 1-12: Main factors influencing e-government services uptake by businesses.

Dependent variable	Factors influencing dependent variable	Paper(s)
Intention to use	Perceived benefits	(Alghamdi & Beloff, 2016; Nguyen et al., 2020; Tung & Rieck, 2005)
	External pressure	(Tung & Rieck, 2005)
	Social influence	(Arendsen & Van De Wijngaert, 2011; Lian, 2015; Olaleye & Sanusi, 2017; Soong et al., 2020; Tung & Rieck, 2005)
	Organizational IT experience	(Arendsen et al., 2006; Arendsen & Van De Wijngaert, 2011)
	Operational performance	(Arendsen et al., 2006; Gunasekaran et al., 2009)

	Firm's size / Organizational size / Demographic characteristics	(Alomar & de Visscher, 2017; Arendsen et al., 2006; Arendsen & Van De Wijngaert, 2011; Nguyen et al., 2020)
	Organizational readiness	(Alomar & de Visscher, 2017; Arendsen, Van Engers, et al., 2008; Naggi & Agostini, 2011)
	Perceived usefulness	(S.-Y. Hung et al., 2012; Mohd Nawi et al., 2016; Sambasivan et al., 2010; Vejačka, 2018)
	Fear of change	(Gunasekaran et al., 2009)
	Facilitating conditions	(S.-Y. Hung et al., 2012; Nguyen et al., 2020; Sambasivan et al., 2010)
	Ease of use	(Sambasivan et al., 2010; Urciuoli et al., 2013)
	Web design (service quality)	(Nguyen et al., 2020; Sambasivan et al., 2010)
	Assurance of service (by service providers)	(Naggi & Agostini, 2011; Sambasivan et al., 2010)
	Responsiveness of service providers	(Gunasekaran et al., 2009; Mohd Nawi et al., 2016; Sambasivan et al., 2010)
	Business opportunities	(Kassim & Hussin, 2010)
	Perception of high-quality offline service provision	(Lee et al., 2011)
	Attitude towards change / IT	(Alomar & de Visscher, 2017; Arendsen et al., 2014; Arendsen & Van De Wijngaert, 2011)
	Interpersonal influence	(S.-Y. Hung et al., 2012; Olaleye & Sanusi, 2017)
	Perceived risk	(S.-Y. Hung et al., 2012; Lian, 2015)
	External influence	(S.-Y. Hung et al., 2012)

	Self-efficacy	(S.-Y. Hung et al., 2012; Kassim & Hussin, 2010)
	Lack of knowledge (theme and procedure)	(Gunasekaran et al., 2009; Haag et al., 2013)
	Management efforts	(Haag et al., 2013)
	Costs	(Gunasekaran et al., 2009; Urciuoli et al., 2013)
	Relative advantage	(Thi et al., 2014)
	IT infrastructure	(Gunasekaran et al., 2009; Thi et al., 2014)
	Compatibility	(Thi et al., 2014)
	Security	(Mohd Nawi et al., 2016; Thi et al., 2014)
	Complexity	(Shao et al., 2015)
	Government oversight	(Shao et al., 2015)
	Human resources	(Shao et al., 2015)
	Executive support	(Gunasekaran et al., 2009; Shao et al., 2015)
	Effort expectation	(Lian, 2015; Soong et al., 2020)
	Trust in e-government	(Lian, 2015; Vejačka, 2018)
	Awareness	(Alghamdi & Beloff, 2016)
	Previous experience	(Alghamdi & Beloff, 2016)
	Regulation and policies	(Alghamdi & Beloff, 2016; Bharosa et al., 2018)
	Trading partners' pressure	(Alomar & de Visscher, 2017; Naggi & Agostini, 2011)
	Competitive pressure	(Alomar & de Visscher, 2017)
	Performance risk	(Olaleye & Sanusi, 2017)

	Financial risk	(Olaleye & Sanusi, 2017)
	System quality	(Rammea & Grobbelaar, 2017)
	Amount of information about e-government	(Vejačka, 2018)
	Technical assistance from governments	(Bharosa et al., 2018)
	Perceived quality of services	(Rammea & Grobbelaar, 2017; Vejačka, 2018)
	Perceived security	(Vejačka, 2018)
	Performance expectancy	(Soong et al., 2020)
Intention to continue using	Perceived usefulness	(Pinem et al., 2018)
	Satisfaction	(Pinem et al., 2018; Rammea & Grobbelaar, 2017)
Satisfaction	Involvement of business in regulatory changes	(Bharosa et al., 2018; C. G. Reddick & Roy, 2013)
	Positive attitude by business towards government	(C. G. Reddick & Roy, 2013)
	Security of transactions	(Kindel et al., 2014)
	Ease of use	(Kindel et al., 2014)
	Cost of access/using	(Kindel et al., 2014)
	Ajzenenience	(Seo et al., 2018)
	Performance failure	(Seo et al., 2018)
	Operational effectiveness	(Santa et al., 2019)
	Quality of information	(Santa et al., 2019)
Confirmation of system adoption	Perceived administrative burden reduction	(Arendsen et al., 2014)
	Successful system implementation	(Arendsen et al., 2014)
	Ease of use	(Arendsen et al., 2014)

	Productivity	(Arendsen et al., 2014)
	Usefulness	(Ulman et al., 2012)
	Time-savings	(Naggi & Agostini, 2011; Ulman et al., 2012)
Channel choice** (internet)	Size	(Jansen et al., 2010; van den Boer et al., 2014)
	Age	(Jansen et al., 2010; van den Boer et al., 2014)
	Attitude	(Jansen et al., 2010)
	Digital skills	(Jansen et al., 2010)
	Source to get information	(van den Boer et al., 2012, 2016)
	Social influence	(van den Boer et al., 2014)
	Education	(van den Boer et al., 2014)
	Task (specificity)	(van den Boer et al., 2017, 2014)
	Exact situation	(van den Boer et al., 2016)
	Prior experience	(van den Boer et al., 2017)
	Perceived expertise of the government	(van den Boer et al., 2017)

Although in early 2000's the most explored factors were based on theoretical models such as TAM, UTAUT, DOI. In recent years research has evolved recognizing that public sector presents particular conditions and that models developed in other settings cannot be extrapolated directly into e-government field. For instance, when comparing e-government with e-commerce, van Velsen et al. (2009), they postulate that e-government context differs from e-commerce, because many governmental services are based on regulations that are often difficult to follow. Also, the group of users of e-government services are much more heterogeneous.

Models developed particularly in the field of e-government includes: from citizens' perspective, the Unified Model for e-Government Adoption (UMEGA), based on UTAUT,

has shown being able to explain the highest variance on behavioral intention to use e-government (Rana et al., 2015; Rana, Dwivedi, Williams, & Weerakkody, 2016; Dwivedi et al., 2017). From business perspective, the e-Government Adoption and Utilization Model (EGAUM) showed functional quality of service, perceived simplicity, previous experience, and regulations as significant factors towards the adoption and usage of e-government services (Alghamdi & Beloff, 2015).

Among factors influencing usage of online self-service applications, Jansen et al. (2010) analyze channel and source choice of entrepreneurs for obtaining governmental information. Their study goes beyond respondents' preferences and analyzes situational characteristics. Although they reported that the most preferred channel is the internet, businesses use different channels for different purposes in different situations. Apart from the direct contact with governments, businesses make use of intermediaries to get governmental information (van den Boer et al., 2012, 2016, 2017, 2014). Task specificity particularly influences both source and channel selection (van den Boer et al., 2017, 2014). In other words, businesses use a combination of channels and sources when seeking for information.

Research on channel choice is particularly located in the context of usage of self-service applications and it addresses some shortcomings of traditional IT acceptance/adoption theories because it considers that users have a choice, and that different channels can be used in a single encounter (Madsen et al., 2019). Among the shortcomings identified in IT acceptance/adoption theories, Schwarz & Schwarz (2009) state that research on IT acceptance has assumed that users have only one technology in mind and that they have no other acceptance perceptions towards any other comparable technologies. This situation was also identified in most of the e-government studies reviewed, the choice of the channel to perform a task is not considered, only the electronic channel (e-service) is studied. However, even in mandatory contexts, users get help or information requests through other channels (Madsen & Kræmmergaard, 2016a).

Regarding mandatory and voluntary settings, it is also important to notice that, even though most of the studies have taken place in voluntary settings, some researchers have evaluated traditional models in mandatory contexts (Brown et al., 2002; S. Y. Hung et al., 2011; Soong et al., 2020), they have found differences in the relationship between

variables, but still the factors are found relevant towards the dependent variable towards usage of given technology.

1.5 Mechanism towards explanation of the uptake of e-services by businesses

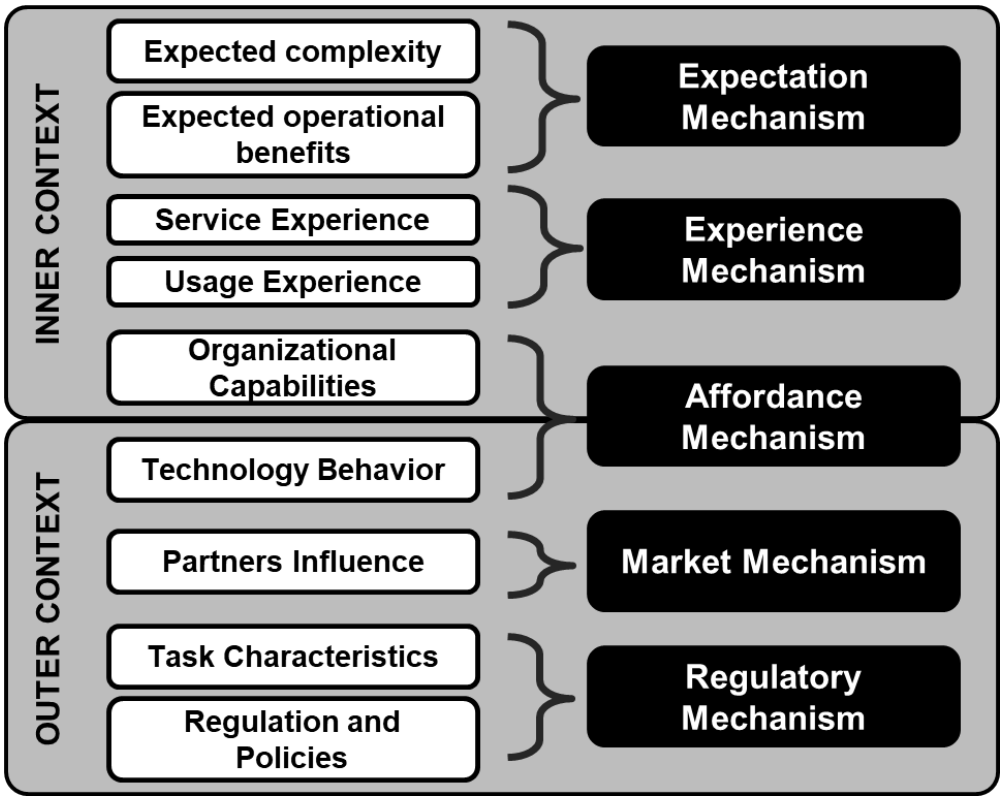
As noted in previous subsections, existing research uncoveres a plethora of factors influencing the adoption e-government services by businesses. As these factors can be seen as a manifestation of mechanisms (Saxena & Mcdonagh, 2017b).

From a critical realist perspective, the notion of mechanism is deeply related to causality. A mechanism is a causal structure that can trigger events, it has capacities for behavior (Bygstad & Munkvold, 2011). Under critical realist perspective, retroduction is a mode of inference that allows to postulate (and identify) mechanisms which are capable of producing given events (Sayer, 2010).

In coherence with critical realism, results form previous empirtical research (in a form of factors from literature) were used to hypothesize mechanisms that would explain e-government services usage by businesses. The hypothesized mechanisms are then used as a point of reference to compare and evaluate what was found in the empirical work carried out in this research.

The retroduction process at this point involved to group the relevant factors founded for e-government services usage by businesses and created categories that described the group. From the categories then mechanisms were postulated according to the context in which they might operate (inner or outer context of the organization). Figure 1-14 shows the categories that are the result of grouping factors and the hypothesized mechanisms, as well as the context in which they might be activated (See Appendix E for details).

Figure 1-14: Retroduction process and hypothesized mechanisms.



Five mechanisms were postulated. Two mechanisms were identified as operating in the inner context of the organization: expectation, and experience mechanism. Two mechanisms were identified in about the outer context of the organization: market and, regulatory mechanism. And, the fifth mechanism hypothesized, affordance mechanism, was found associated with both, the inner and the outer context of the organization. Each postulated mechanism can be described in terms of the factors it emerges from. Next subsections described in detail those mechanisms.

1.5.1 Expectation mechanism

According to expectation confirmation theory, expectation reflects anticipated behavior. The role of expectation has been widely explored in the IT adoption field. Users form expectations and perceptions towards technology (Davis, 1989; Lian, 2015; Shao et al., 2015) and its benefits (Arendsen et al., 2006; Chwelos et al., 2001; Tung & Rieck, 2005), and it could influence their intention to use e-government services, whether in a positive

or negative way. However, the context and the interaction with other mechanisms would shape the influence exerted over usage of e-government services.

Users form perceptions towards technology before using it (e-services in the context of e-government) such as the effort it would involve, how complex it is, the ease of use, how useful it is, benefits out of its usage, what are the costs of using it. Before the actual usage of technology these perceptions take the shape of expectations.

Weiss (1994) empirically demonstrates the influence of expectations on technology adoption. Users make the adoption decision when they do not have the full information about the technological innovation, but rather they hold expectations about future improvements, taking as a reference the current system in use.

1.5.2 Experience mechanism

Experience with the technology affects user attitudes towards the technology (Piehler et al., 2016). In the context of e-government, prior experience influences new channel choices to interact with governments (Teerling & Pieterson, 2011). For instance, satisfaction can only be evaluated after usage experience, it is generated when expectations can be met (Pinem et al., 2018) and it influences the continue usage of a given technology.

Experience mechanism can be activated at different moments. If the user is about to make a decision about adoption of a new technology, previous experience with similar innovation might influence the decision. On the other hand, the experience with the actual technology can influence the decision of continue using the technology, also it can shape the attitude towards the technology. Attitude has been identified as a strong predictor of behavior towards usage of information technology (Alomar & de Visscher, 2017; Arendsen et al., 2014; Arendsen & Van De Wijngaert, 2011). Experience has also an effect on trust (Olaleye & Sanusi, 2017).

There are different manifestations of experience as a mechanism that explain behavior towards usage of e-government services, especially in postadoption scenarios. However, it is a complex mechanism that interact with others, for instance, experience influences expectations towards the same systems or similar systems (Santa et al., 2019).

1.5.3 Affordance mechanism

The concept of affordance mechanism helps to explain how a given technology can support or restrict a set of specific usage with reference to a specific user (Paul M. Leonardi, 2011). The user can be an individual, a group, or an organization. Thus, in the organizational context, technology affordance does not refer merely to specific features of the technology but also to the possibilities and constraints of firm's capabilities to appropriate the technology artifact towards its business' objectives (Zammuto et al., 2007).

Certain affordances emerge from the designer of the technology who have some intended use in their mind. E-government services are developed by governmental agencies, the web design, their performance, their failures, security, among other technical aspects, can trigger events, such as decisions users make towards usage of e-services. However, not all affordances are realized due to firms' specific context. Firm's resources and capabilities relate to technical and organizational infrastructure that allow or constrain technology use. In this context, resources and capabilities include the availability of IT infrastructure, knowledge (IT and task), financial resources.

The realization of affordance also relates to the processes by which the firm gets ready for the implementation and use of e-government services. Affordance mechanism can be activated due to contextual conditions at both, inner and outer context of the organization, in the case of e-government, users have little or no influence in the technology itself as it is developed following regulations in place.

1.5.4 Market mechanism

Market is a mechanism mainly represented in the influence that partners exert on the firm behavior. Whether due to competitive pressure (to maintain their own competitive position), social influence (if the behavior is viewed more favorably by the public or by other organizations), or trading partners pressure (pressure exerted by associates) (Alomar & de Visscher, 2017; Chwelos et al., 2001; Tung & Rieck, 2005), firms can take an initiative in adopting e-government services when market mechanism is activated.

The structure of the market, the relationship of a firm with its competitors and the relationship of a firm with suppliers and customers can shape firm's behavior and decisions towards technology. Within the market, there are also intermediaries, they help

organizations to interact with governments regarding the channels used, e-government channels included.

1.5.5 Regulatory mechanism

Regulation has the power to seduce or enforce (Arendsen, Van Engers, et al., 2008). Usage of e-government services can be voluntary, or mandatory based on normativity. Government has the power to restrict decisions that firms can make based on the regulatory framework applicable. They provide the rules that enterprises must follow; it includes decisions towards usage of technology.

Regulation determines the rules for the task's businesses must perform (administrative burden), but also can limit the channel choices to perform those tasks. Task-technology fit (TTF) theory holds that IT is more likely to be used if IT matches the tasks that the user must perform (Goodhue & Thompson, 1995). van den Boer et al. (2017, 2014) found task characteristics as factors that influence channel choice. Businesses are responsible for different tasks (administrative burden) as part of their operation, the characteristics of those tasks influence which channels are used.

1.5.6 Mechanisms interaction

Critical realism acknowledges that mechanisms may interact with other mechanisms to produce causal effects. Sayer (2010) observes that the causal powers of mechanisms operate in the social relations and structures which they form. As uptake of e-government services can be seen as a process, rather than a single and static decision, different mechanisms are to be activated at different stages (before, during and even after usage of e-services).

From organization internal context, expectation and experience mechanisms might interact in the moment of using e-services. Individuals hold expectations that are confirmed or disconfirmed towards experiences, which in turn will shape new expectations. Affordance mechanism is also activated during the usage of e-government services as it is related to the possibilities of technology and the capabilities of the users. It would then interact with expectation and experience mechanisms.

On the other hand, although actors in the market (such as suppliers, customers, competitors) or government agencies (through regulation) have the power to influence firm's behavior, institutional infrastructure (affordances) determines how the firm can respond to those influences. Meaning that regulation, market, and affordance mechanism interact in the outer context exerting influence in the organization behavior.

It can be noticed that affordance mechanism can be activated at the inner, but also outer context of the organization. This is possible, since affordance is a product of designers' (e-government service provider and software firms) intentions and the capability of the users (businesses using the services)(Bansal & Shukla, 2021; Faraj & Azad, 2012).

1.6 Chapter summary

This chapter presented some of the key concepts associated to the field of study where is located this research such as e-government and e-government service. It also presented the e-government Colombian context, in which the research and fieldwork is carried on.

It also presented an overview of theoretical perspectives used in the study of uptake of e-government services by business organizations. A brief description of the theory or model is presented alongside with an example of studies in the field of e-government. Also, an extensive list of factors (68 unique factors) that would influence use or re-use of e-government services is presented, their influence varies depending on the context of the study (country, stakeholder, e-service, etc.).

The number of factors identified reflects the complex nature of the e-government services. At the same time, however, it is challenging for practitioners to pay attention to all of them, thus, this chapter also presented a proposal of mechanisms that underpin those factors. Those are used in further chapters to analyze the empirical data collected in this research.

2. Research methodology

This chapter presents the research methodology, which is influenced by the philosophy of critical realism. Section 2.1 outlines the ontological and epistemological approach based on critical realism and its suitability for this study. Section 2.2 outlines the theoretical perspective for data collection and analysis. Thereafter, section 2.3 describes the research framework (based on systems multimethodology) by explaining the methodological choices for the study and how they are integrated in this research. Finally, section 2.4 concludes the chapter.

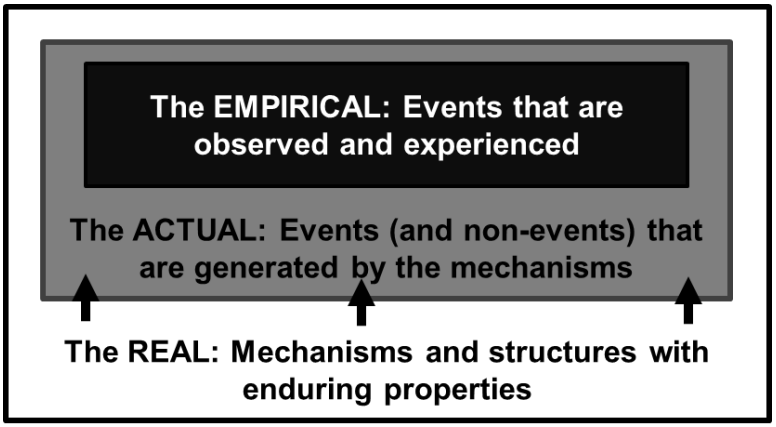
2.1 Ontological and epistemological approach

The philosophy of critical realism (CR) is associated with the work of Roy Bhaskar, Margaret Archer, Andrew Sayer, among others. It posits itself as an alternative to positivism, and interpretivism. Positivism is regarded as the philosophy of natural sciences. Under this view, knowledge is considered scientific if it is empirically verifiable or capable of being proved mathematically and logically, usually focused on making predictions and finding laws. From a positivistic perspective, the social world exists externally, and its properties can be measured using objective methods. On the other side, interpretivism emphasizes language and culture. From this perspective, reality is not exterior and objective, but socially constructed, people make sense of the world using language while interacting with others.

Bhaskar identified that ontology has been reduced to epistemology, what he called the *epistemic fallacy.* It means that statements about *being* have been translated into statements about our *knowledge* (Mingers et al., 2013). CR addresses some of the limitations of positivism and interpretivism by combining an ontological realism with epistemic relativism. Ontological realism means that CR assumes that reality is both intransitive (existing independently of humans 'knowledge about reality or the capacity to

gain cognitive access to reality) and stratified. Stratification is between mechanisms, the events that they generate, and events that are experienced (Figure 2-1), this stratification accounts for three domains: the real, the actual, and the empirical, respectively (Mingers et al., 2013).

Figure 2-1: CR's reality stratification



Source: (Mingers, 2006)

For CR, knowledge has intransitive dimension. As shown in Figure 2-1, the domain of the real encompasses the generative mechanisms, causal powers and structures that produce events. From a critical realist perspective, the notion of mechanism is strongly related to causality. A mechanism is a causal structure that can trigger events, it has capacities for behavior, it has causal powers (Bygstad & Munkvold, 2011). The domain of the actual is a subset of the domain of the real and it involves the events that occur because of the enactment of causal powers of structures.

The level of the empirical (a subset of the domain of the actual) consists of experiences, observations and measurements of the events generated (within the level of the actual). The underlying, intransitive structures and mechanisms of the real domain cannot be directly experienced nor measured by research. Epistemic relativism means then, that our knowledge of the world is partial, and it is shaped by context and historically situated: it is not objective, it is contingent and transient (Heeks & Wall, 2018).

A critical realist inquiry seeks for the explanations of events, but different from positivism CR does not look for laws, it seeks for causal powers, structures and mechanisms that

under certain conditions produce the event (Wynn & Williams, 2012). Thus, the goal is to identify the mechanisms that emerge from causal structures to generate the event of interest. However, the activation or non-activation of mechanisms is dependent on the contextual conditions (Wynn & Williams, 2012).

To explain a given event, the existence of mechanisms is hypothesized, if they existed and they were enacted the event could be produced. To do so, a critical realist researcher needs to move from the empirical domain to possible structures and mechanisms in the domain of the real (Mingers et al., 2013). This describes CR scientific methodology called *retroduction* by Bhaskar. Retroduction is a mode of inference in which events are explained by postulating (and identifying) mechanisms which are capable of producing them (Sayer, 2010). Those possible or hypothesized mechanisms do not prove that the mechanisms exist. There is a further stage within the methodology in which some of them could be eliminated and others could be supported providing the best explanation for the event (Mingers et al., 2013).

Heeks & Wall (2018) identified three methodological features or critical realism: iterative retroduction, pluralism, and reflexivity. As above-mentioned retroduction means moving from the domain of empirical to the real by postulating mechanisms that can produce given events, this is part of an iterative cycle while data is collected and analyzed. CR requires pluralism to improve the validity of the explanations of events. Triangulation can be obtained from different sources of data or through the usage of different methods. Finally, CR researchers are expected that they and their research participants be reflexive about the data at all stages of research.

CR research allows to support in-depth causal explanations for the outcomes of sociotechnical phenomena, in terms of both the actors' interpretations and the structures and mechanisms that interact to produce the outcomes in question. It means that causal mechanisms are attributable to human actors, as well as physical objects, and technological artifacts (Avgerou, 2013; Dobson, 2001; Wynn & Williams, 2012). Although events are the result of the enactment of the activation of mechanisms, it is possible that events do not occurs because of the counteracting effects of other mechanisms (Gambetta, 1998 cited by Wynn & Williams, 2012).

2.2 Processual approach and Socio-Technical Systems theory

A processual approach was adopted for this research, meaning that I studied a phenomenon that is dynamic and changes over time, it is not static. Uptake of technology by organizations is made along a process and it involves the interaction between human agency and technology within a particular context.

2.2.1 Processual approach

- **Process definition**

van de Ven (1992) identified three ways in which the term *process* is used in the literature: (1) process as a logic that explain a causal relationship in a variance theory (a relationship between independent and dependent variables), in this case the process usually remains unobserved, but it is used to explain a sequence of influences from an independent variable on a dependent variable; (2) process as a category of concepts or variables, that refers to actions of individuals or organizations such as work flows, and decision making (they can be seen as work process or business processes). Those concepts denote actions, nevertheless, in these usages, those constructs are operationalized and measured; and (3) a sequence of events that describes how things change over time, this definition takes an historical developmental perspective and focuses on events, activities, and stages.

For this research the definition of process adopted is the one provided by Pettigrew (1997) influenced by the definitions given above: a process as a sequence of individual and collective events, actions, and activities unfolding over time in context. In this conception, as events unfold, they are captured an analyzed from an historical and developmental perspective.

- **Processual Analysis**

Van de Ven & Poole (1995) present process theory as an explanation of how and why an organizational entity changes and develops. Pettigrew (1997) states about processual analysis that it implies description, analysis, and explanation about what, why and how of some sequence of individual and collective action. These views are consistent with the

aim of this research which is related to description and explanation of the uptake of e-government inter-organizational services by micro-businesses.

For Pettigrew (1997) there are three aspects involved in a processual analysis: (1) there is a search for patterns, (2) there is a quest to find the underlying mechanisms that shape the patterns, and (3) inductive pattern recognition has to concur with deduction. But the researcher must keep in mind that processual analysis is not only about pattern recognition, but the analysis conducted is linked to the outcomes of the process under investigation.

Process research is characterized by cycles of deduction and induction, deductive drivers come from the assessments of the strengths and weaknesses of existing theory. Deductive structure is a prelude to a process of inductive reasoning and pattern recognition, a cycle of deduction and induction, among other activities, includes: the core question of the study, related themes and questions, preliminary data collection, early pattern recognition, disconfirmation and verification, further data collection, additional pattern recognition across more case examples, comparative analysis (Pettigrew, 1997).

2.2.2 Socio-technical systems theory

As mentioned earlier, this research was addressed from a process view, variance theories were not found appropriate as theoretical lenses. Instead, socio-technical system (STS) theory was felt appropriate as a heuristic device for data collection and analysis, because this study was looking at a phenomenon related to technology and organizations. It implies technological artifacts as well as the people who use those artifacts within a given social context. Also, IS field (where this thesis is located) goes beyond the technological system and merely the social system, it studies the phenomena that emerge from the interaction of both systems (Baskerville & Myers, 2002). Also, e-government phenomena by definition is socio-technical: organizational change, skills, and technology together are the key to success (Grönlund & Horan, 2004).

In addition, this research does not adopt a technological deterministic view nor social deterministic view, but the interaction between technology and social processes as independent subsystems. Thus, STS is particularly appropriated in the case of uptake of inter-organizational e-government services, due to the interaction between the organization and technology.

The STS theory provides a view of an organization as a socio technical system consisting of two subsystems – the technical subsystem (TS) and the social subsystem (SS). While the social subsystem is concerned with people, relationships, reward systems and authority structures; the technical subsystem includes processes, tasks and technology needed to transform input to outputs (Bostrom & Heinen, 1977).

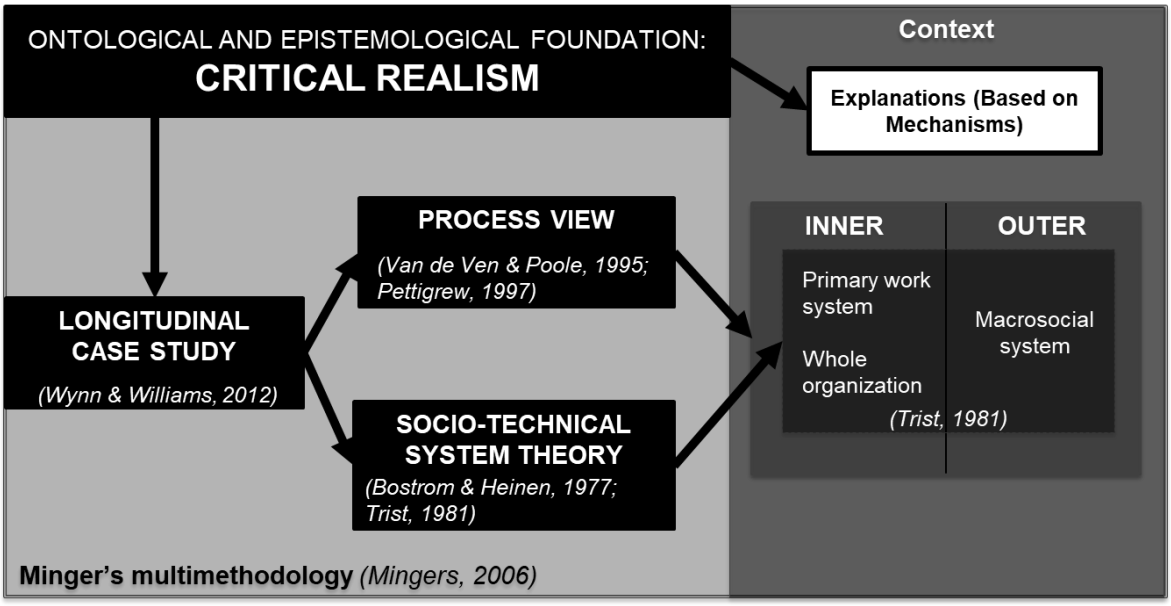
The STS fundamentally focusses on the fit and interdependency between the TS and SS and looks for their joint optimization rather than the optimization of the technical sub-system and the adaption of the social sub-system around it (Cherns, 1987). Consideration of the social and the technical as separate entities allows the researcher to identify how the social and the technical interact to become the sociotechnical and what implications this has for the process of organizing.

For this research STS provides convenience in terms of the context and the units of analysis for the case study involved not only technology or the organization but both, the social and technical subsystems. STS also provides a frame for the coding process during data analysis.

2.2.3 Integrating process perspective and socio-technical systems theory

For data collection and analysis, the STS perspective and process approach are integrated. For Pettigrew, although process is the stream of analysis, context is the terrain where it flows, thus, inner, and outer context of the organization need to be considered when studying processes. Similarly, three levels of analysis within STS are proposed by Trist (1981): primary work-system, the whole organization system and, macro-social systems. In this research two levels are considered: internal and external (see Figure 2-2).

Figure 2-2: Research design



Source: Author

2.3 Research framework

This sections presents the formal stages of a CR-informed research project based on Mingers (2006).

2.3.1 Systems multimethodology

As presented by Mingers (2006), multimethodology, as its simplest refers to the use of more than one method or methodology when studying some real-world problem. In coherence with CR paradigm, Mingers (2001) argues that all research situations can be seen as inherently complex and multidimensional, and would thus benefit from a wide range of research methods. The world has material aspects that can be measured or counted, but it also has social aspects that must be shared and understood, and indeed personal and individual aspects that must be experienced and expressed. This calls for the judicious and knowledgeable combination of a variety of research and intervention methods (Mingers, 2006).

The multimethodology proposed by Mingers (2006) provides a flexible framework in which real-world problem can be approached from different dimensions and methods through

one of the following combinations, namely: methodology combination, it implies the use of two or more methodologies within an intervention; methodology enhancement, involves the use of a single main methodology, but its improvement when importing methods from others; single-paradigm multimethodology, referred to the combination of several methodologies all from the same paradigm; and multi-paradigm multimethodology, similar to the previous combination but using methods from different paradigms.

Multimethodology has three arguments in favor: first, real-world situations are not one-dimensional, which means that different research methods can address different aspects of the same situation; second, research is carried out through phases, that may require different types of activities and the use of different methods; finally, the combination of different methods, even when performing similar functions, can provide a "triangulation" of the situation, providing confidence in the results (Mingers, 2006).

The multimethodology uses the three worlds postulated by Habermas (1984, 1987 cited by Mingers, 2006) they are: the material world, which exists without human intervention, it is an objective world independent from the observer; the social world, is intersubjective, human beings participate in it as members of a social system in which rules, norms and resources are formed; and the personal world, the world of one's thoughts, emotions, experiences, values and beliefs.

Additionally, multimethodology leads the investigation through different stages once the problem is identified, namely: (1) appreciation, which deals with the description and explanation of the situation identified through the lenses of concepts and theories; (2) analysis, which seeks the postulation of hypothetical mechanisms, that if they existed, would produce the phenomena; (3) assessment, where the alternatives are evaluated and the correct generative mechanisms are identified to develop an appropriate theoretical base (stages two and three account for critical realism’s retroduction); and (4) action, this stage aims to bring changes, if necessary or desired towards phenomenon studied.

- **Critical realist case study**

Case studies are suitable for the form “how” and “why” in research questions, when the researcher has little or no control over events and the phenomenon investigated is contemporary (Yin, 2003). This research met these criteria, it attempts to answer a “how”

question, the researcher has not control over events and, incorporation of e-government services into businesses operation is a contemporary phenomenon, critical realist case study is the main strategy for the research (Wynn & Williams, 2012).

Multiple case studies provide external validity through replication, either towards getting similar results or contrasting results and thus get a rich theoretical development (Yin, 2003). There are two embedded units of analysis, the technology, and the organization, since the aim of this research is to explain how businesses incorporate and use e-government services overtime.

Since the research question is related to a process and it implies time, referred to events that can take place at different moments, a longitudinal study is proposed. Longitudinal research allows to: (a) detect changes over time, (b) explore the processes associated with change or stability and, (c) understand the perspective of the person experiencing that change (Vogl et al., 2018).

Longitudinal studies are valuable in CR paradigm, due to understand changes over time is decisive to detect the properties of structures and contextual influences that activate mechanisms that would cause events (Wynn & Williams, 2012). In addition, Langley et al. (2013) state that “longitudinal data (whether obtained with archival, historical, or real time field observations) are necessary to observe how processes unfold over time”. In this research time is captured through a combination of retrospective and real time data.

Being a longitudinal study means that it is possible to observe changes in activities and events over time. The deadline that organizations had to start issuing electronic invoices set a limited timeframe for the longitudinal study. This research could have been extended after the e-invoicing system was operational, however, data collection stopped after both organizations expressed that their operation was "stable" using e-invoicing systems.

In section 2.3.1 the research strategy of case study was described. In this section the practical aspects for this research are presented. It includes the design for the multiple case study under critical realist philosophy, the context in which the research was conducted, and the cases selected.

Two organizations (cases) participated in this research. Having two cases allowed to perform comparisons and to identify mechanisms for the events that unfolded during the

uptake of e-invoicing (e-government inter-organizational service) in the organizations. The criteria for case selection are presented in Table 2-1. Because of the socio-technical nature of the uptake of technology in organizations, two units of analysis were selected: the organization and the technology (e-invoicing service).

Table 2-1: Case selection criteria

Criteria	Explanation
A case may meet all the conditions for testing theory or may represent a significant contribution to theory building (Yin, 2003).	Businesses participating in the research must have been starting the process or at some stage of implementing and using electronic invoicing.
The subjects themselves must have direct experience with the phenomenon being studied and being able to express their feelings about the topic of study (Schwarz et al., 2014).	
It is desirable that the researcher combines historical data with current data collected in real time (Langley, 1999).	
Conditions to favor comparisons between cases.	• Same size (microbusiness) • Same geographic location

Table 2-2 presents how the principles for conducting a critical realist case study were applied to this research (Wynn & Williams, 2012).

Table 2-2: Methodological principles of CR

CR Principle	It involves	In this research
Explication of events	Identification of events of the underlying phenomena.	Using interviews and from the participants own experience, events occurring within the uptake process of e-government inter-organizational service are identified.
Explication of structure and Context	Identification of components of social and physical structure, contextual environment, along with relationships among them.	Within the analysis of the process, not only activities are described, but actors participating on them, as well as contextual conditions that might trigger the event.
Retroduction	Postulation of a set of hypothetical mechanisms that may have interacted to generate events.	From the literature review a list of mechanisms were hypothesized, using a retroductive approach. These mechanisms were linked to the identified events. Retroduction was also used to hypothesize mechanisms from empirical data collected.

Empirical Corroboration	Ensuring that proposed mechanisms have causal power and that they have better explanatory power than alternatives.	For each case, interviews were coded following 'Abductive' approach. This allowed to compare the hypothesized mechanisms from academic literature to the ones that emerge from the empirical data collected and then select those that offer a best explanation for the event.
Triangulation	Multiple approaches to support causal analysis.	The research employed different sources of data: interviews, observations, and documentation across two organizations. It served as a comparative case study.

Source: Author based on Wynn & Williams (2012)

- **Methods for data collection and analysis**

As the case study responds to a longitudinal design, fieldwork data collection took place between **November 2019 and February 2022**. Interview was the main method for data collection. It was structured within three cycles; each cycle attempts to address a specific set of topics regarding the uptake process of electronic invoicing.

Regarding data analysis, there were two moments, the first moment was mainly descriptive, the process as it happened or was happening was identified. The method of visual mapping was enriched with a customer journey approach, then events were identified. The second moment focused on explanation which leads towards the postulation of mechanisms that would explain the events observed, next subsections present the details about methods of data collection and analysis.

- **Interviews**

To conduct the interviews, the guidelines of Myers & Newman (2007) for qualitative interviews in IS research were followed. Those guidelines involved taking a dramaturgical approach, as follows:

Table 2-3: Interview's guidelines

Element	Description	In this research
The drama	The interview itself	
The stage	Location in which the interview takes place. It includes furniture, dress, equipment.	Location: - Interviewee's office - Café

	Regardless of the venue, the interviewee must be aware of the formal interview.	Equipment: - Recording device - Notebook - Pen
The actors	- Interviewer - Interviewees	- Researcher - Accountants - Managers - Other
The audience	- Interviewer - Interviewees - Those interested in the research (thesis, papers, publications).	- Researcher - Accountants - Managers - Public sector (Entity in charge of taxes). - Academic community - Other
The script	It includes an opening, an introduction, the key questions, and a closure. However, the script should be open and flexible.	See Appendix D
The entry	It is related to minimizing social dissonance and make the interviewee feel comfortable.	First interview: warm greeting, thanks in advance for the time, and explanation about the research. After the first interview: warm greeting, thanks in advance for the time, and reminder of what was mentioned in previous interview(s).
The exit	It refers to the end of the interview and possible preparing for the next encounter, whether the same actors or different.	After finishing the interview, some warm chat was made over key points mentioned during the interview. Also, the interviewee was asked to help with the contact of other people of interest to be interviewed (snowball sampling).
The performance	It refers to putting in action the previous elements. It is directly related to the quality of the data.	

A first cycle of interviews was conducted. The main goal was to characterize the organizations and to identify what were they doing or what had they done towards the uptake of e-invoicing, the purpose was to collect information about what happened or was happening before the implementation of e-invoicing. At this stage, two company A customers were also interviewed with regards to their e-invoicing uptake process (these interviews were conducted during visits to company A).

A second cycle of interviews was carried out. It focused on the stage of implementation of e-invoicing, it dealt mainly with experience of the organization with the configuration of the software, the legal procedure to start issuing electronic invoices, and organizational aspects.

Finally, a third cycle of data collection was conducted towards the experience using e-invoicing during the regular operation of the organization.

- **'Abductive' grounded theory methodology**

The analysis of the interviews follows an 'abductive' grounded theory approach inspired by Hoddy (2019). He employed open and axial coding to identify CR mechanisms. While open coding breaks the data into small pieces to different meanings, axial coding reassembles it by identifying regularities, trends, patterns, and in the end mechanisms. This research employed a set of coding methods that were found more suitable based on this research main objective and question, coding methods were selected from Saldaña's work (2013).

Hoddy's (2019) approach, used an 'abductive' variant of grounded theory, although, early grounded theorists were advised not to conduct literature reviews previous of data collection, contemporary grounded theory admits the researcher to handle 'preconceived analytical categories' and draw on 'pre-existing theoretical knowledge, hunches and hypotheses as necessary "points of departure" and building blocks for the development of more abstract theory' (Oliver, 2011, p. 10 in Hoddy, 2019). In this sense, the review of the literature allowed us to identify the mechanisms that offered a basis towards the explanation of the phenomenon being studied.

This research also employed a comparative method between literature and empirical data. Empirical data was coded using attribute, descriptive, process, and causation coding methods (Saldaña, 2013), in Table 2-4 coding methods are described, The software used was *QDA Miner Lite*. From the list of causation codes, mechanisms are postulated, then they are compared to mechanisms postulated from academic literature to select those that best explain the events that happened during the uptake of an e-government inter-organizational service (e-invoicing). The mechanisms selected needed to fulfill some criteria: they must be able to explain more than one event and also have empirical evidence, in accordance with critical realism.

Table 2-4: Coding strategies for data analysis

Coding method	**Description**
Attribute coding	It is the notation; it provides basic description of the data and not what is embedded in it. Examples of data represented in the codes include participants characteristics, fieldwork settings, data format, etc.
Descriptive coding	Descriptive coding summarizes in a word or short phrase the basic topic of a fragment of qualitative data.
Process coding	Process coding captures actions, activities performed by the actors mentioned in the interviews. It uses gerunds and it shows dynamics of time.
Transition coding – looking for events: Based on previous codes, data collected was reviewed towards identification of events, and they were coded as well.	
Causation coding	Causation coding attempts to uncover what participants believe about events and their causes.

The process for data analysis was as follows: the first stage involved close inspection of empirical data; and subsequent stages involve moving across the domains of stratified reality (critical realist ontology) in order to identify the mechanisms that might explain the events observed during the uptake process of e-government inter-organizational services. Interviews were coded using the coding methods mentioned earlier.

Each interview of each case was coded first using attribute coding, some elements were identified in order to get data classified based on aspects of inner and outer context of the organizations; whether the interviewees talk about aspects occurring before, during or after implementation and usage of e-invoicing; social and technical aspects mentioned in

the interviews and within observations were coded; actors mentioned by the participants; and communication channels to interact with the actors. Each fragment (paragraphs and sentences) of transcripts was coded within the codes presented in Table 2-5 (for the description of the codes see appendix F). The purpose of using attribute coding was to get essential information and context for the subsequent analysis and interpretation.

Table 2-5: Summary of attribute coding

Code category	**Attribute code**
Context	Inner
	Outer
Stage	Before
	During
	After
Socio-technical aspects	Social
	Technical
Actors	Manager
	Accountant
	Person, who issues invoices
	Person, who process invoices
	Software provider
	Governmental agency
	e-invoicing provider
	Digital certificate provider
	Customers
	Suppliers/Providers
	Experts/colleagues
Channels	Calls
	Physical visits
	Chat
	E-mail
	Websites
	Remote access computer software

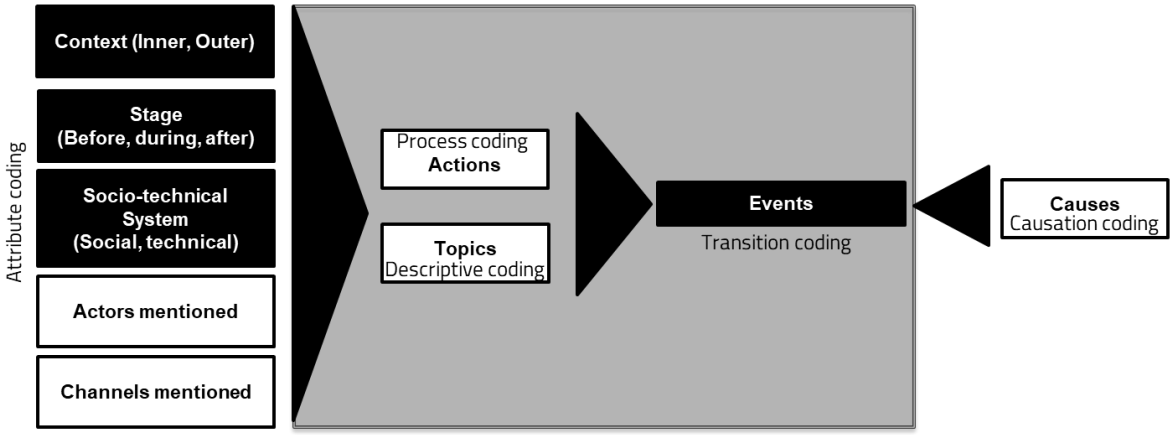
The next step into data analysis involved a new codification activity, this time using descriptive coding (identification of a topic) and process coding (a word or phrase which captures action) (Saldaña, 2013). Using this coding strategy paragraphs and sentences were considered. Codes obtained from this cycle are shown in appendix F. While descriptive coding leads to an index of the data's content, process coding captures action and dynamics of time. In addition, process coding is in coherence with Pettigrew (1997), who posits that exposing processes requires a process vocabulary. Which in turn was also useful for the aim of this research towards the study of the uptake process of e-government inter-organizational services. Descriptive and process codes, alongside with some attribute coding were the input to describe businesses journey towards uptake of e-invoicing, represented in the enterprises journey diagram.

The next step during data analysis involved a transition coding cycle, it was based on codes from previous cycles, attributes, topics, and actions. But this time, data was reviewed towards the identification of events, things that happened. Thus, the combination of actions and topics allow to identify events of interest that occur during uptake process of e-invoicing.

The last moment of coding data employed causation coding; the main purpose was to find explanation for events previously identified. Causation Coding attempts to uncover what participants believe about events and their causes (Saldaña, 2013). Then, causation codes were the main input towards retroduction process to hypothesize mechanisms that would explain the occurrence of events.

As mentioned before, the software used was *QDA Miner Lite.* Figure 2-3 represents the entire coding process: context, stage, and socio-technical codes are based on methodological choices, actor and channels came from the empirical data collected, as well as actions and topics. A central part of coding process was the identification of events, and the causes of those, as this is part of the aim of this research. Figure 2-4 shows an example of the coding process, using real fragments from data collected.

Figure 2-3: Coding process

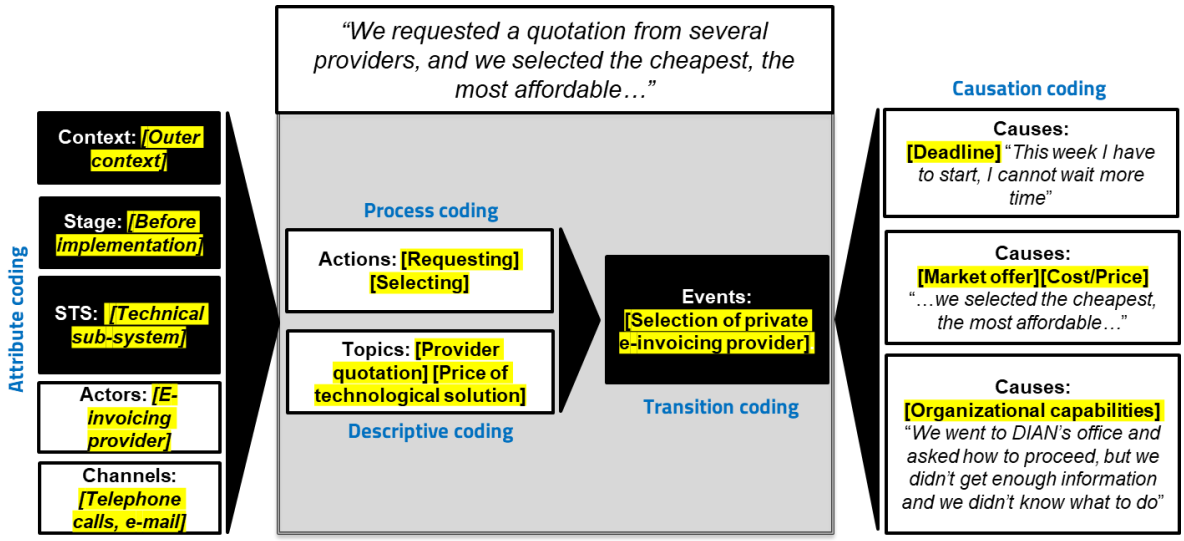


Source: Author

As it can be noticed in Figure 2-4, the fragment "*We requested a quotation from several providers, and we selected the cheapest, the most affordable*" was coded using the code system defined for data analysis (presented in Figure 2-3). Thus, in regard to attribute coding, the fragment refers to the "*outer context"* of the organization, as it implies the interaction with providers. The interviewee is referring to things happening "*before implementation"* of e-invoicing, and to a task they performed, thus it is code into the "*technical subsystem"* (based on the socio-technical theory). The actor identified in the fragment is the "*e-invoicing provider"* and the company employed "*telephone calls and email"* to interact with the providers.

The actions identified were "*requesting*" and "*selecting*" and they were then identified as process codes. "*Provider quotation*" and "*price of technological solution*" were found suitable for descriptive coding. The event of interest then suggested by the fragment is the "*selection of a private e-invoicing provider*" (This is named as transition code in this work). Finally within the same fragment or other fragments, possible causes that might explain the event were linked (see Figure 2-4), the "*deadline"* for implementation, the "*price*" of the IT solution and their knowledge and general "*capability*" to fulfill with the implementation of e-invoicing influence the decision of selecting a private e-invoicing provider.

Figure 2-4: Coding process example



Source: Author

- **Events identification**

As it can be noticed in the example (Figure 2-4), process coding and descriptive coding allowed the identification of events in coherence with critical realism. Thus, topics can be identified through all the transcriptions, however, the actions towards the uptake of e-government services are much more limited.

As a reminder, in critical realism events can only be identified, observed or experienced in the empirical world and to some extend actual world, thus they can be identified through users' narratives. Events are related to actions, and they are shaped by the context in which they occur. Process coding focuses on identifying actions that are performed along a process. When analyzed together with topics identified through descriptive coding, events can be found. And this was the approach followed in this research for events identification, a combination of process and descriptive codes during each stage (before, during and after implementation of e-invoicing).

- **Visual mapping / customer journey**

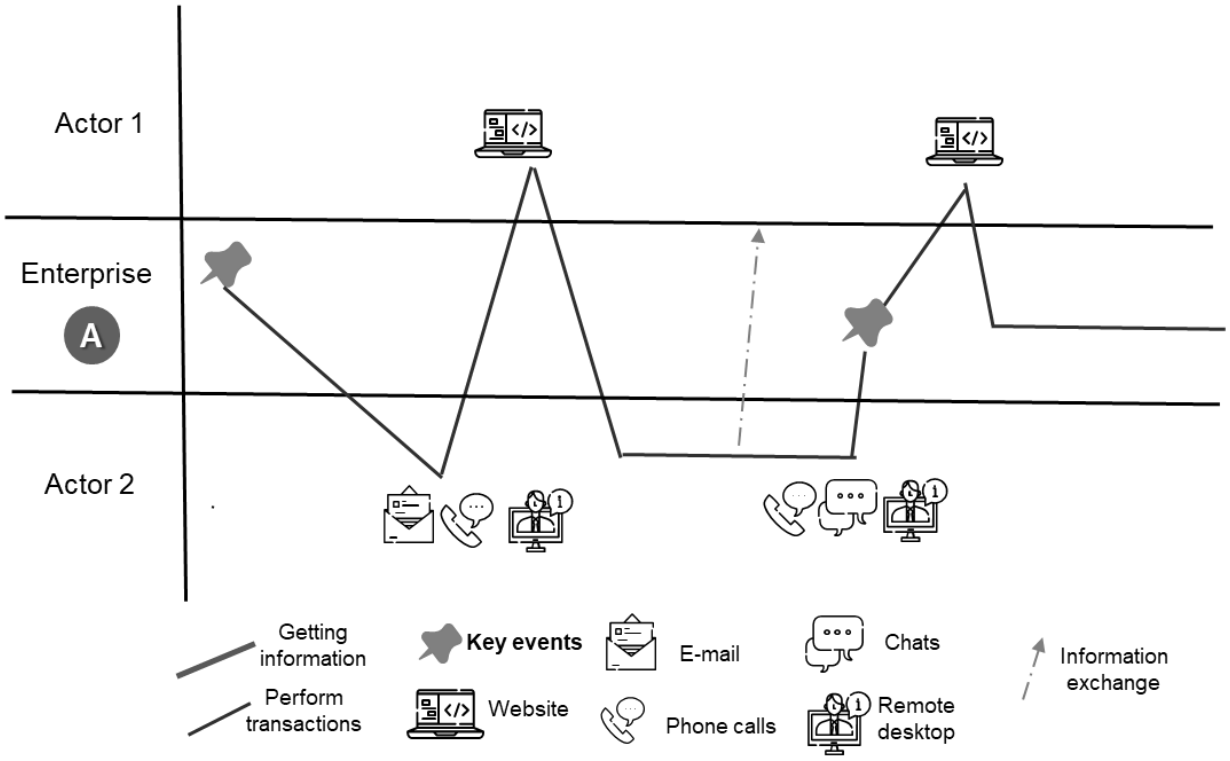
Visual graphical representations allow to observe dimensions, precedence, parallel processes, and movement in time. Visual mapping strategy represents process data in the form of visuals to then derives patterns from the visual (Langley, 1999).

Customer journey mapping method was chosen to enrich visual mapping due to the users' perspective taken in this work. Customer journeys are described not only to take the viewpoint of the customer, but also to reach insight into their experiences, thus the service process can be analyzed "as is" (Følstad & Kvale, 2018).

The journey that organizations experienced towards the uptake of e-invoicing service is represented in a graphic. The inputs for the graphic came from attribute coding with regards to actors and channels, and process coding, as the actions performed by the organizations shows the movement in time of each organization towards the uptake of e-invoicing. Within the graphic also the moment in which an event occurred are marked.

An example of the enterprise journey diagram is presented in Figure 2-5, there are lanes for each actor identified for the stage and the ones, the company interact with, channels used for the interaction are represented in form of icons, lines also have a meaning, they can represent an interaction to get information, to perform transaction, or the exchange of information. For each enterprise and each stage of data collection (before, during, and after implementation) an enterprise journey diagram was built.

Figure 2-5: Enterprise journey diagram



2.3.2 Research validity

To ensure research quality, this research relies on Creswell & Miller (2000). Validity, then is defined as how accurately the final account represents participants' reality, it means the validity of inferences drawn from data (Creswell & Miller, 2000).

Creswell & Miller (2000) propose two perspectives for the choice of validity procedures: the lens researchers choose to validate their studies and researcher's paradigm assumptions. They also identified nine different types of validity procedures: triangulation, disconfirming evidence, researcher reflexivity, member checking, prolonging engagement in the field, collaboration, the audit trail, thick / rich descriptions, and peer debriefing. Table 2-6 presents their proposed framework to select validity procedures.

Table 2-6: Validity procedures within qualitative lens and paradigm assumptions

Paradigm assumption	Positivist or systemic paradigm	Constructivist paradigm	Critical paradigm

Lens			
Lens of the researcher	Triangulation	Disconfirming evidence	Researcher reflexivity*
Lens study participants	Member checking*	Prolonged engagement in the field	Collaboration
Lens of people external to the study	The audit trail	Thick rich description	Peer debriefing*

Source: (Creswell & Miller, 2000) *selected procedures for this research.

Therefore, based on Creswell & Miller (2000) framework, this study relied on *four procedures to ensure validity:

- ✓ **Researcher reflexivity**: The researcher reflected on the aspects that might shape interpretation of the data, such as beliefs, assumptions, biases. To reach a degree of confidence on results, the researcher also returns to the data repeatedly to see if explanations and interpretations makes sense. In this study, data were reviewed at least twice in each cycle to ensure coding represents what was expressed by participants.
- ✓ **Member checking**: It consists of taking data and interpretations back to the participants in the study so that they can confirm the credibility of the information. Although, collaborations are suggested as more suitable for critical paradigm, for this research, involvement of participants in the study itself as co-researcher was not possible, they agreed to participate in the interviews and let the researcher to observe organizational situations. For this research, at the beginning of each interview (except the first one), there was a moment to talk about previous data collected and check how accurate and realistic was the researcher interpretation, participants could react to the information presented and make comments to be incorporated in the analysis.
- ✓ **Peer debriefing**: It involves the review of the data and research process by someone familiar with the research phenomenon. This validity procedure was employed partially, and specially towards research process. During the entire study, PhD supervisor provided feedback and ideas for the research. The ongoing study was also presented in the seminars organized by the research group in Systems and ICT in Organizations (GISTIC, by its acronym in Spanish), because

of those seminars also feedback was provided at different stage of research. Finally, the research (at different stages) was presented in academic events, also feedback about methodological aspects were received during an academic visit to Trinity College Dublin and during meetings with a e-government researcher from the IT University of Copenhagen. All the feedback received help to adjust the research process and add credibility to the research itself.

2.3.3 Integrating methodologies

This sub-section presents the match between the elements of the methodological design of this research. Table 2-7 summarizes key points of the methodological choices such as the stage of CR research, the Pettigrew's processual approach, the case study design, and methods for data collections an analysis. This sub-section also shows the different phases of the research (see Figure 2-6).

Table 2-7: Multimethodology in the study

Stage of CR research	**Involves**	**Matching Pettigrew processual approach with CR**	**CR case study**	**Methods**
Appreciation	Initial exploration of the literature: ● concepts and theories ● empirical studies Initial exploration of the situation as experienced by the people involved.	Core question of the study. Related themes and questions. Preliminary data collection	Case selection Identification of events	Literature review Interviews / Coding Visual mapping
Analysis	Explanation in terms of possible hypothetical mechanisms or structures that, if they existed, would produce the phenomena.	Early pattern recognition. Early writing	Retroduction Explanation of events	Abductive' approach for coding (Descriptive,

Assessment	Assessment of possible mechanisms to reach an explanation of the phenomena. It includes interpretation of the results and inference to other situations.	Disconfirmation and verification. Elaborated themes and questions. Further data collection. Additional pattern recognition across more case examples. Comparative analysis	Empirical corroboration Explication of Context and Structure	process and causation coding) Retroduction Comparative method
Action	Bring changes to the situation under study, if needed or desirable.			

Regarding the process itself, this research started with the identification of a research problem. The research problem guided a systematic literature review. A key outcome from the literature review is the postulation of a set of mechanisms that might underlie the uptake process of e-government services by businesses. The hypothesized mechanisms are the main input to try to explain the events identified from the empirical data collected.

The empirical part of this research was divided into three cycles or moments, each cycle follows the stages of Minger's multimethodology for a research under critical realist perspective (Mingers, 2006). Thus, the phases of appreciation, analysis, and assessment were conducted for each moment of data collection. The data collection moments correspond to three points of reference regarding uptake of inter-organizational e-government service, these are: before implementation, during implementation, and after implementation.

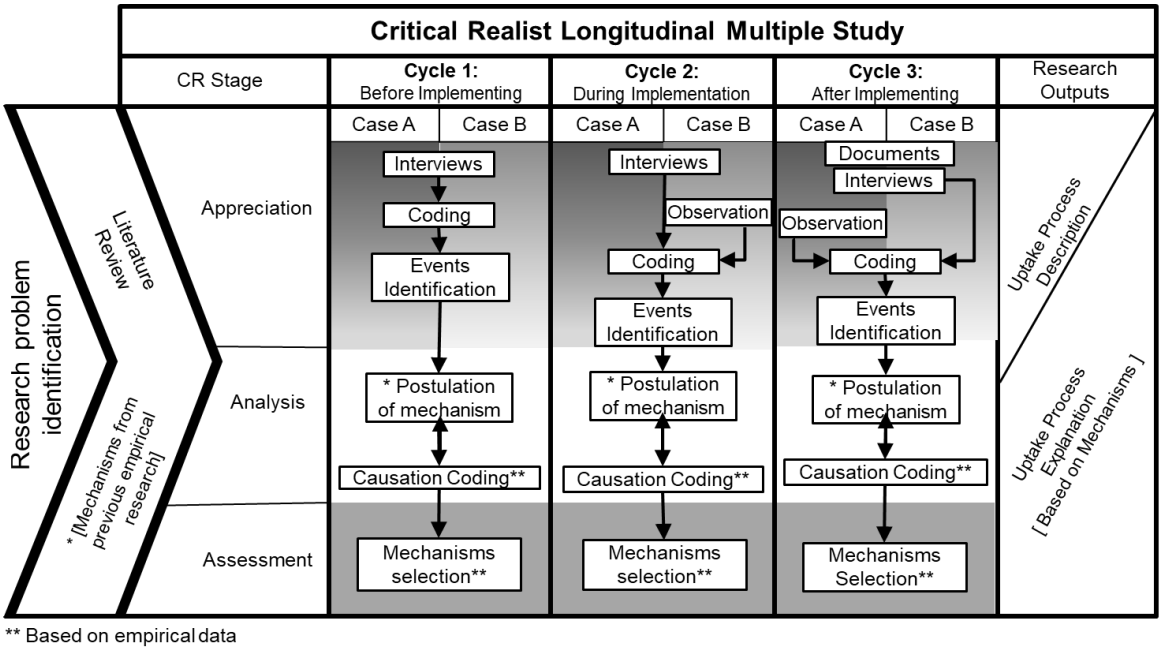
Following multimethodology implied that for each one of those the three moments, data was collected by the means of interviews, observations (when possible) and documents (when available). The empirical data was analyzed (Saldaña, 2013) and the situation of the companies at those moments (before, during and after implementation of e-invoicing) were described. In addition, events of interest were identified those events were related or matched with the postulated mechanisms from the literature review, based on a list of criteria items previously defined (see Appendix G).

Parallelly, empirical data was coded one more time, this time using causation coding. A list of causes codes was obtained, based on those, new mechanisms were postulated and matched to the events previously identified using a list of criteria items (see Appendix G). Once events were matched with the mechanisms postulated from the literature and the ones postulated from empirical data, they were compared so to select those mechanisms that offer the best explanation. The criteria used for this consist of selecting the mechanism that explains more than one event and that there is empirical evidence to support the link between the event and the mechanism.

It is important to note that critical realist paradigm, process perspective, case study strategy and socio-technical systems theory (represented in the unit analysis of the case study) guide all the time the research process. To conduct research framed by critical realism and methodological choices previously mentioned the contextual conditions in which the process is happening is at utmost importance, thus, the conditions in which the mechanisms are activated or not are also taken into account to offer the explanation toward the uptake process of the inter-organizational e-government service studied in this research (e-invoicing).

After concluding the three cycles, two research outputs can be mentioned. First, based on the stages of appreciation and analysis (of each cycle) the uptake process description was obtained, and based on the whole research process an explanation of the uptake process can be offered in terms of mechanisms.

Figure 2-6: Research process



Because of the description of the process was initially obtained in terms of the narrative of the participants (although divided into three moments: before, during, and after implementation). The data collected was analyzed through the lenses of information systems lifecycle, so to express the process in terms of stages that best describe each moment that the organizations went through. It means that for the purpose of the research stages were named in terms of before, during and after implementation, as it takes implementation as a point of reference, but after the data was collected and analyzed, the stages can be named more accurately. Figure 2-6 represents the research process as it has been just described.

2.4 Chapter summary

This chapter presented the philosophical and methodological choices for the research. Ontological and epistemological perspectives of CR were assumed and based on them methodological decisions were made. Multimethodology from Mingers (2006) served as a framework to guide the stages of a CR research.

Due to the processual view taken in this research, which also implies to explain why of businesses actions. “Abductive approach”, allows to take into account previous research and also empirical data. Coding in combination with two levels of analysis (inner and outer

context of the organization, and social and technical aspects) are used for the identification of mechanisms that would explain events of interest, such as decisions made during the process.

3. Case study description

This chapter introduces the context and the case study that forms the foundation of this research. In sections 3.1 and 3.2 an overview of the background and context of the case study is presented. It is about Colombian e-government context in general and usage of e-services by businesses.

Section 3.3 presents the case study focusing on two organizations, they are classified as micro-businesses under Colombian regulation. The selection of these organizations is based on its relevance to the research problem and the potential insights it can offer.

It is also important to note that a specific inter-organizational service (e-invoicing) has been selected for the research. It will be presented in section 3.4, the process of data collection is described in section 3.5 and section 3.6 presents a summary of the chapter.

3.1 E-government and e-services in Colombia

In Colombia, the e-government program starts at national level in 2000 as a presidential directive with the aim to provide information, services, and procurement online. By 2002, a new presidential directive stated that every governmental agency must create a system that allows citizens to access information (Directiva Presidencial N° 10 Del 2002, 2002). Between 2003 and 2007, e-government in Colombia is mentioned in several laws, decrees, and official documents and it is consolidated as a public policy.

By 2008, the objective of the e-government strategy called "*Gobierno en Línea (GEL)*" (In Spanish) was the construction of an efficient, transparent, and participative State with better services for citizens and businesses. The strategy was included in different decrees and documents of the National Council of Economic and Social Policy, and it was composed by five phases (Table 3-1). Also, some manuals were created to provide public entities with common guidelines towards the implementation of the e-government program.

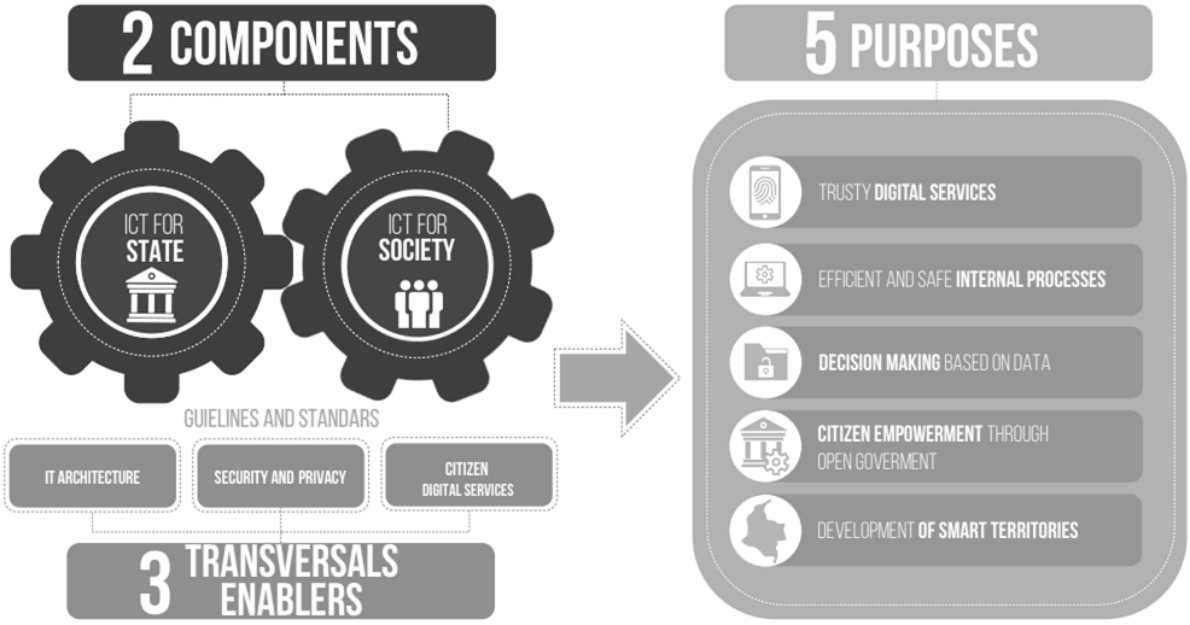
Table 3-1: Colombian e-government program by 2008

Stage	Description
Information	Public entities enable websites to provide basic information and search.
Interaction	Communication between public servants and citizens or business through electronic means.
Transaction	Citizens and business can access to services through electronic means.
Transformation	e-services are offered according to citizens and business necessities, thus cooperation between public entities is needed.
Democracy	ICT allows citizens to participate in Government decision making and construction of public policies.

Source: (Decreto 1151 de 2008, 2008)

After a process of evolution, e-government Colombian policy was named "*Gobierno Digital*" ("Digital Government") and it is composed by two main components (ICT for State and ICT for Society) and three transversal enablers (information security, enterprise architecture, citizen digital services) (Decreto 1008 de 2018, 2018). Their focus changed from the nature of the activity (e.g., get information, perform a transaction, etc.) to the area that is impacted by the usage of ICT (e.g., government or society). The elements involved in the current policy seek the achievement of five purposes: (1) better services, (2) efficient government operation, (3) decision making based on data, (4) citizen empowerment based on open government and (5) smart territories (Figure 3-1).

Figure 3-1: Colombian Digital Government program by 2018

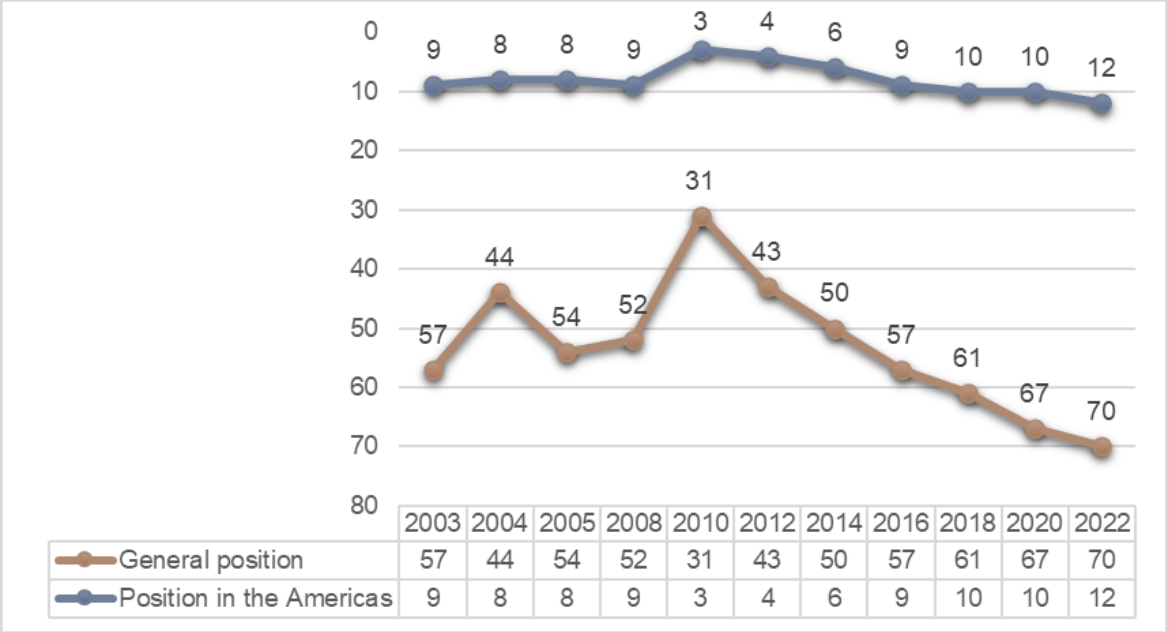


Source: Translation from Ministerio de Tecnologías de Información y las Comunicaciones (2018a)

In general terms, Colombia has done a huge effort to progress in the implementation of electronic government, since the measurement of the Electronic Government Development Index (EGDI) is made by United Nations. However, for some years Colombia has been dropping in the general ranking, suggesting that even though efforts are being made, other countries are going ahead with their programs (Figure 3-2) (United Nations, 2022).

Within the same ranking (EGDI, it is also interesting to note that by 2010, Colombia appears as a leading country in e-government in the region (position 3), suggesting that regulations related to possible sanctions to public servants that were issued to enforce compliance with the e-government program (Circular No. 058 / 2009) might had had an impact in the advances reported for 2010.

Figure 3-2: Colombia position UN E-GOV survey

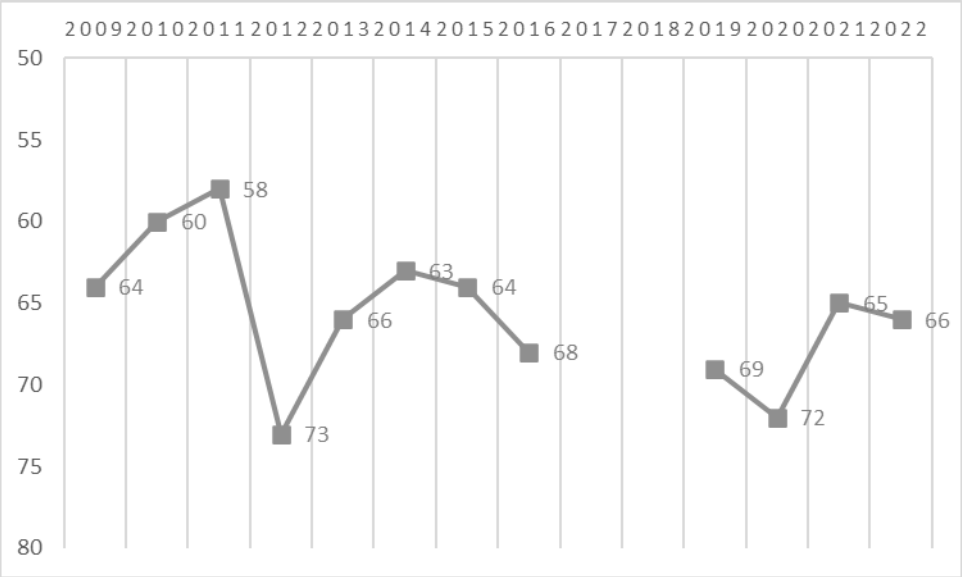


	2003	2004	2005	2008	2010	2012	2014	2016	2018	2020	2022
General position	57	44	54	52	31	43	50	57	61	67	70
Position in the Americas	9	8	8	9	3	4	6	9	10	10	12

Source: Author based on (United Nations, 2022)

On the other hand, in the Networked Readiness Index (NRI) calculated by the World Economic Forum, specifically in the pillar of governmental use of ICT, for the year 2016 Colombia was fourth in region, being exceeded only by United States, Canada and Uruguay (World Economic Forum, 2016). Figure 3-3 (no data available for 2017 and 2018) shows the position that Colombia has occupied in this index. Although there is not a clear pattern, Colombia measurements are close to the average score for the region.

[6]**Figure 3-3**: Colombia position in NRI ranking.



Source: Author based on (World Economic Forum, 2022)

Colombian government have been consistently promoting the usage of ICT in Micro, Small, and Medium Enterprises (MSMEs) as a mechanism to impact positively their productivity, while expanding the size of their demand and survival rates (CCIT & Fedesarrollo, 2013), these type of programs also influences the NRI measurement. Governmental programs for this purpose include "*Mipyme vive digital*"[7], "*Empresario Digital*"[8] and, as of 2018, "*Centros de Transformación Digital Empresarial*"[9], they seek increase access, use and appropriation of the Internet in Colombian MSMEs.

The main purpose of those programs is contributing to competitiveness and productivity, by applying ICT in MSMEs' processes and operation, thus, contributing to reduce the digital divide between companies. "*Mipyme vive digital*" was mainly focused on projects related to IT infrastructure. "*Empresario digital*" is focused on IT training, and "*Centros de Transformación Digital*" in the alignment of ICT with the business' goals.

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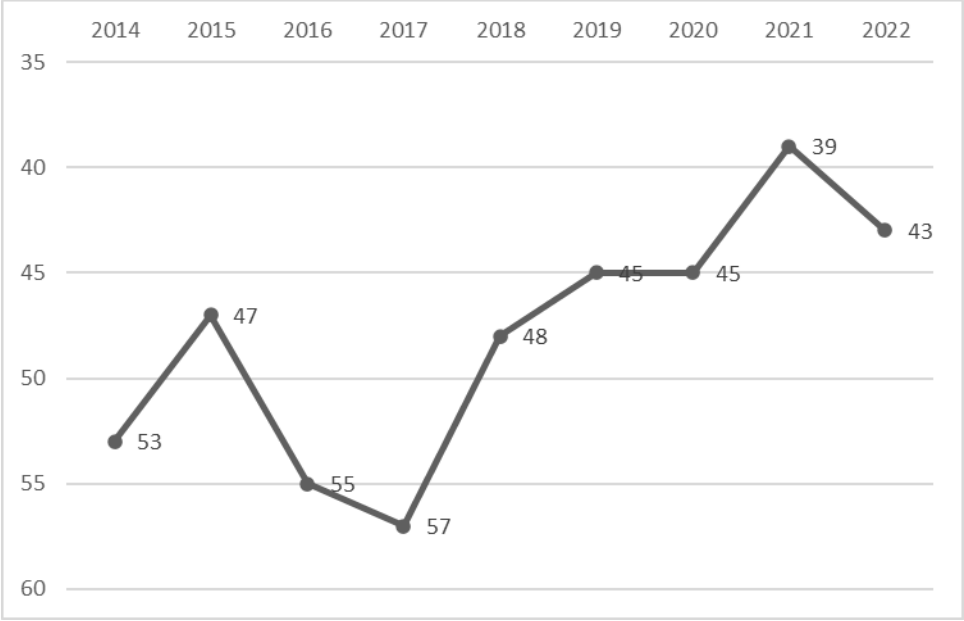
[6] No data available for 2017-2018
[7] https://www.mintic.gov.co/portal/604/w3-propertyvalue-7235.html (Retrieved in September 2018)
[8] https://www.mintic.gov.co/portal/604/w3-article-72736.html (Retrieved in September 2018)
[9] http://www.centrosdetransformaciondigital.gov.co/695/w3-channel.html (Retrieved in November 2018)

As of 2018, 75% of MSMEs have internet access, 8% sells through the internet and 26% buy through the internet, 36% have presence on the web and 38% use social media (Ministerio de Tecnologías de Información y las Comunicaciones, 2018b). The Internet also allows business access to electronic services offered by public institutions to comply faster and easier with the procedures/paperwork for which they are responsible as part of their operation (Jansen et al., 2010).

Figure 3-4 shows Colombia position within the Raking calculated by Waseda University. Colombia shows a positive trend based on the aspects evaluated by Waseda raking. An interest fact in the Waseda International digital government rankings for 2021, it is that Colombia and France were tied for 30th position with regards to online service component (Waseda University, 2021).

Figure 3-4: Colombia position Waseda University Ranking

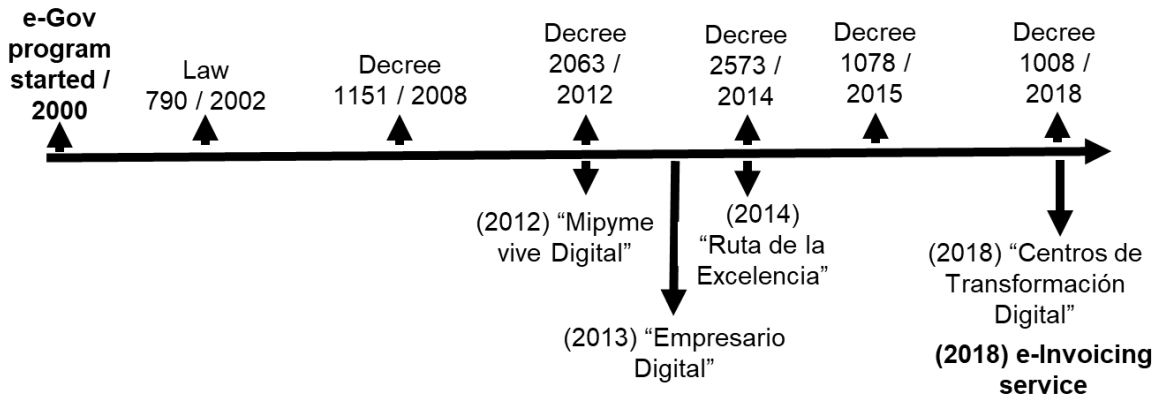


Source: Author based on (Waseda University, 2021)

Finally, Figure 3-5 shows key moments in the evolution of e-government in Colombia since the program officially started in 2000 (See Appendix A). Different laws and decrees have incorporated e-government topics such as open government, e-services, IT management, security, among other topics. And different programs towards enterprises

have been carried on. The last update for e-government program was done in 2018. During the same year, new regulation about e-invoicing for the country was released.

Figure 3-5: Key moments of e-government in Colombia[10]



3.2 Usage of e-government services by micro-businesses: Colombia

As of 2015, the usage of e-government services by Colombian businesses was around 37.4%, and there was a significant gap between usage by large and small enterprises (Dirección de Gobierno en Línea, 2015). Table 3-2 and Figure 3-6 shows data from the most recent study about usage of ICT by micro-business to perform tasks in public entities.

Table 3-2: Usage of e-government services by Colombian micro-businesses

Activity (*)	**Office**	**Call**	**Internet**	**Intermediaries**
Getting general information (36.7%*)	28.20%	19.70%	67.60%	
Follow up public programs	29.80%	17.90%	60.10%	

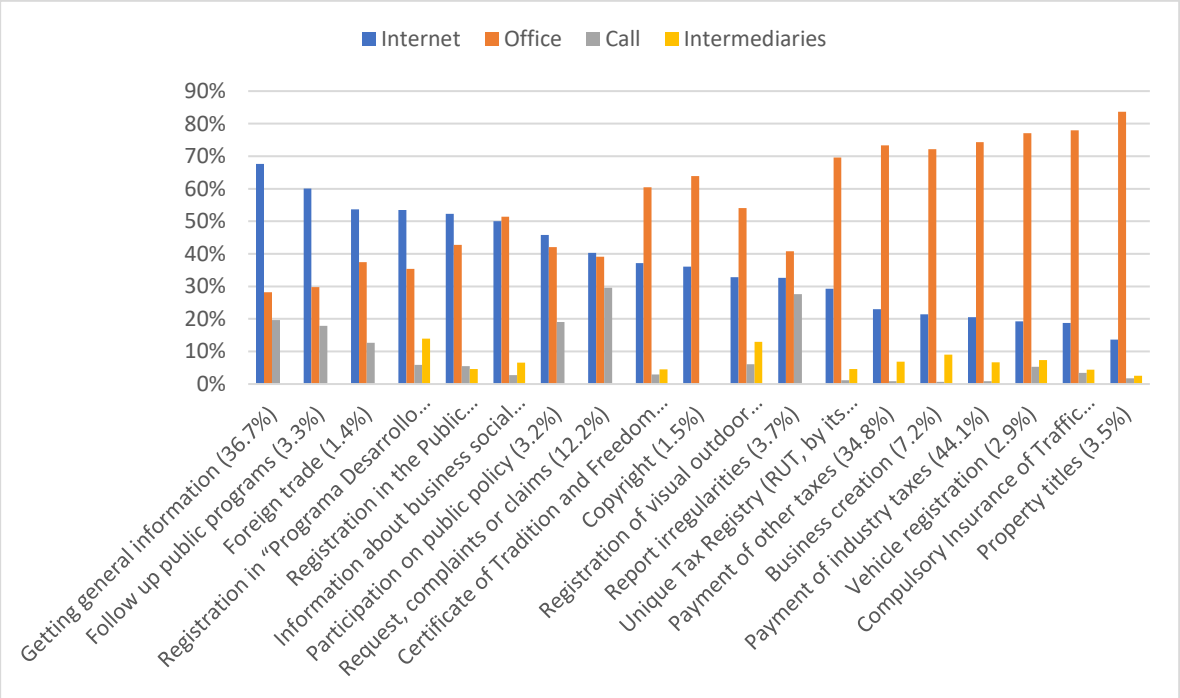
[10] Appendix A presents a list of Colombian regulation associate with e-government and e-invoicing

(3.3%*)				
Foreign trade (1.4%*)	37.50%	12.70%	53.70%	0%
Enrollment in "*Programa Desarrollo Proveedores (PDP)*" (3.1%*)	35.40%	5.90%	53.50%	14.00%
Enrollment in the Public Employment Service (4.3%*)	42.80%	5.50%	52.30%	4.60%
Information about business social networks (4.2%*)	51.40%	2.70%	50%	6.60%
Participation on public policy (3.2%*)	42.10%	19.10%	45.80%	
Request, complaints, or claims (12.2%*)	39.10%	29.60%	40.30%	
Certificate of Tradition and Freedom of Properties (8%*)	60.50%	2.90%	37.20%	4.50%
Copyright (1.5%*)	63.90%	0.00%	36.10%	0.00%
Registration of visual outdoor advertising (9%*)	54.10%	6.10%	32.80%	13%
Report irregularities (3.7%*)	40.80%	27.60%	32.60%	
Unique Tax Registry (RUT, by its acronym in Spanish) (41.2%*)	69.60%	1.20%	29.30%	4.60%
Payment of other taxes (34.8%*)	73.30%	0.90%	23.00%	6.90%
Business creation (7.2%*)	72.20%	0.70%	21.40%	9.00%
Payment of industry taxes (44.1%*)	74.30%	0.90%	20.50%	6.70%

Vehicle registration (2.9%*)	77.10%	5.30%	19.30%	7.40%
Compulsory Insurance of Traffic Accidents (SOAT, by its acronym in Spanish) (7.6%*)	78.00%	3.40%	18.80%	4.40%
Property titles (3.5%*)	83.70%	1.80%	13.70%	2.50%

Source: (Ministerio de Tecnologías de Información y las Comunicaciones, 2017) *Percentage of business that required perform the activity.

Figure 3-6: Usage of e-government services by Colombian micro businesses



Source: Based on Table 3-2 (Usage of e-government services by Colombian micro businesses)

From the Table 3-2 and Figure 3-6, it is possible to identify that the usage of electronic services is higher if the task is referred to get information or an incidental action, but when the task is based on regulations such as those related to taxes, vehicle registration or insurances, physical point (office) or face to face contact is the preferred channel to do

the paperwork. This is consistent with the e-government features provided by van Velsen et al. (2009), they postulate that e-government context differs from e-commerce, because many governmental services are based on regulations that are often difficult to follow and that could explain why users prefer face to face contact. Usage of e-government services by micro businesses in Colombia shows the necessity to pay attention the tasks related to transactional e-government services.

In regards with inter-organizational e-government services, Colombian Government started a large project towards the massification of electronic invoicing (e-invoicing) across the country. It was expected that by 2020 all businesses will be using it. Although, by November 2017, only 3% of the enterprises across the country had implemented an e-invoicing system and none of them belongs to the group of small companies (SERES, 2017), as of 2021, almost 80% of businesses were already using e-invoicing (SERES, 2021).

3.3 Case study: Organizations

As shown in Table 3-3, the cases selected correspond to the category of micro-businesses, under Colombian regulation. It means that they have less than 10 employees. Micro businesses are the most businesses in the economy; thus, they are a significant group of users of governmental services. Small businesses also face different challenges when implementing technology. In regards to usage of e-government services, in Colombian context, there is a significant gap between large and small companies (Dirección de Gobierno en Línea, 2015).

Table 3-3: Cases

Case	**Economic sector**	**# Employees**
Case A	Services (Accountability)	1 Manager 1 Secretary 4 Accountants
Case B	Services (Food)	1 Director 1 Accountant 5 - 30 Temporary collaborators (seasonal)

- **Case A**

Company “A” is located in the city of Armenia, Quindio, Colombia. It offers services to companies, and eventually individuals. Its operation consists of accounting services and tax consultancies. In other words, the company is responsible for some or all their customers’ accounts. Employees at the company record all transactions (costs, incomes, etc). and produce financial statements and other reports as per required by their clients. Company A portfolio includes accounting, tax management, and advice with respect to taxes and tax procedures. Some clients opt to keep their own accounting records, but they pay for guidance with regards taxes and tax procedures. However, most of the clients send their financial documents, so the company acts as a bookkeeper.

Company A is classified in the category of micro-business with 5 employees. The owner is the manager as well, and all the five employees report to him. Except from the secretary, all employees are accountants, and they get assigned several clients (other organizations) to deal with their requests. To perform their job, employees need the documents that support the incomes, costs, and expenses, etc. of the customers (other businesses). These documents are usually paper-based, and the client can choose whether to send a physical copy of the paper or a scanned (virtual) copy. Invoices are the main document accountants need to do their job.

The secretary oversees the main issues of the office itself, such as the payroll, social security, issuing invoices, among other functions. Invoices are usually issued monthly to their clients (at the end of each month).

The company is not divided by departments or areas, however, all required by the organization is addressed by the manager or assigned to any employees. There is not an IT area or person in charge. Each person in the organization has a computer, they use office software package such word processors and spreadsheets. They also use a specialized accountability software called “*Contapyme*”. This software allows them to keep their own records but their clients’ records as well. “*Contapyme*” is organized by modules or packages that users can buy separately. And they pay annually to get support from the software provider. When there are problems with computers, Company A relies on a “*trusted person*” from outside of the organization to fix any problem (technical problem). Company A usually employs electronic channels to perform paperwork such as payments. Finally, they keep paper-based invoices stored physically in a room.

- **Case B**

Company B is a non-profit organization, yet they run a business to get money for their social goals. It was founded in 2001 by the university parish of Pentecost, an archdiocesan parish. It is located at a University in the Colombian coffee region; however, it has an independent legal status from the University and the Church. It has its own board of directors. It is a legally constituted company with a legal representative and with all the legal and administrative functions that an ordinary company has.

As a non-profit organization, is goal is to promote and develop actions for the benefit of students, especially regarding food for low-income students who cannot return home for lunch or do not have how to buy a good quality lunch. The organization gets resources to finance lunches, but students make a small payment per lunch to contribute, 1000 Colombian pesos (around 0,22 Euro or 0,25 dollar[11]) to get access to the food program. During 2019, the organization was providing food for about 641 students daily.

Company B has two permanent employees, the director, and an accountant. However, depending on the size of its operation at different moments, many more people are required, but they are hired on a temporal basis some months a year (usually during the academic semester). This personnel includes people who cook the food for students or help in catering events, sometimes also involves people helping in administrative tasks.

Company B has several coffee shops located inside the university, at different venues in the campus. They also hire people to perform the commercial activity at the coffee shops, and apart from donations, the company obtains economic resources from this commercial activity. However, during holiday months (4 months per year) the coffee shops remain closed, meaning that there are no employees during this time.

Although there are some areas established: kitchen, coffee shops, administrative area, there is no role for people in charge of IT functions. In fact, the main accountant is the one that oversees technological matters such as acquisitions, outsourcing agreements, calls for support, etc.

[11] Exchange rate on January 3, 2022

Company B uses office software package such word processors and spreadsheets. They also use software to keep the records of their sales, inventories, accountability, issue invoices, and process incoming invoices. Company B owns a server to keep the data and to install the software. The software is call "*Contapyme*". "*Contapyme*" is organized by modules or packages that users can buy separately. Company B pay for and uses several modules of the software.

3.4 Case study: Inter-organizational service [e-invoicing]

The inter-organizational e-government service studied in this research was electronic invoicing. Although regulation towards e-invoicing in Colombia has existed since 1995, it was in 2016 that regulation towards making mandatory its usage was released (Law 1819, art. 308). By 2019, companies of all sizes were included in the normativity that makes mandatory its usage, and the strategy for massification of e-invoicing in the country was released setting deadlines for different economic sectors (Resolution 0020 Mandatory Schedule 2019-2020), at the same time the technological platform to facilitate massification was implemented, it includes the technology needed to exchange information, but also free of charge platform that can be used for anyone to issue e-invoices for "free".

The companies that are responsible for VAT are the ones obligated to issue electronic invoices (regardless of their size). They have to report in "real time" the invoices data to the governmental agency. To fulfill with this obligation, companies have three possible options (see Table 3-4).

Table 3-4: Options to implement e-invoicing.

Option	**Description**
Free of charge e-invoicing platform ("*Facturación gratuita DIAN*")	It is a computer system developed by the governmental agency to favor the implementation by micro and small enterprises. However, it is open for anyone to use. Additional requirements: Users need to get a digital certificate to sign electronically the invoices. However, the company can ask for free digital signature certificate to the governmental agency if they have problems to acquire one.

Authorized e-invoicing provider	E-invoicing also can be implemented by getting the service from a private provider. Additional requirements: It involves agreements and payments to the provider. And the provider needs a valid authorization issued by the governmental agency.
Own software of the company	The same organization obligated to issue e-invoices can develop their own software to issue e-invoices and exchange the data. Additional requirements: The software must fulfill with the technical requirements of the document and for exchanging the data with the public entity. The software must be approved by the governmental agency.

E-invoicing is built in XML UBL 2.0 format, it means universal business language version 2.0 format. It also needs a digital signature to issue valid invoices. The XML document is readable by computers, so this document is transmitted to the governmental agency, if everything is correct, the software receives an automatic confirmation from the governmental agency, then the invoice is delivered to the customer (see Figure 3-7 and Figure 3-8). Without the confirmation, it is not possible to deliver the document to the customer. The xml file is sent to the customer, but also a graphic representation (document readable by humans on PDF). The same applies for debit and credit memos.

Figure 3-7: Flow for the exchange of information (e-invoicing) via private provider

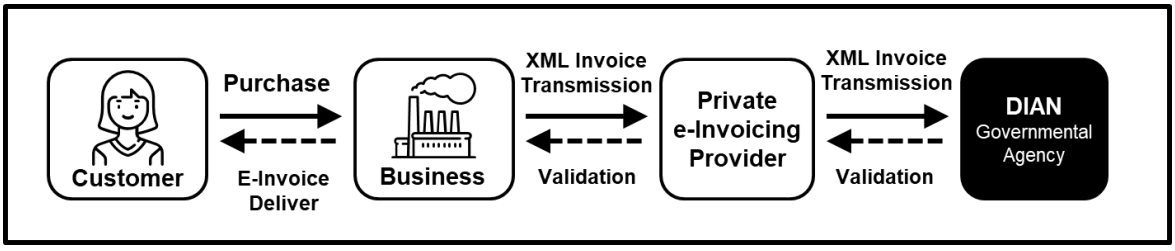
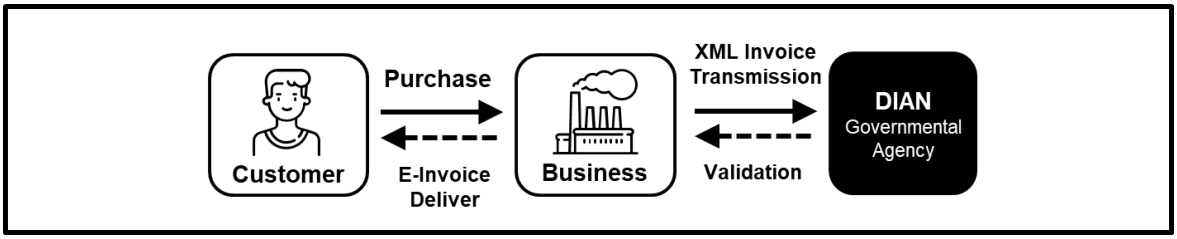


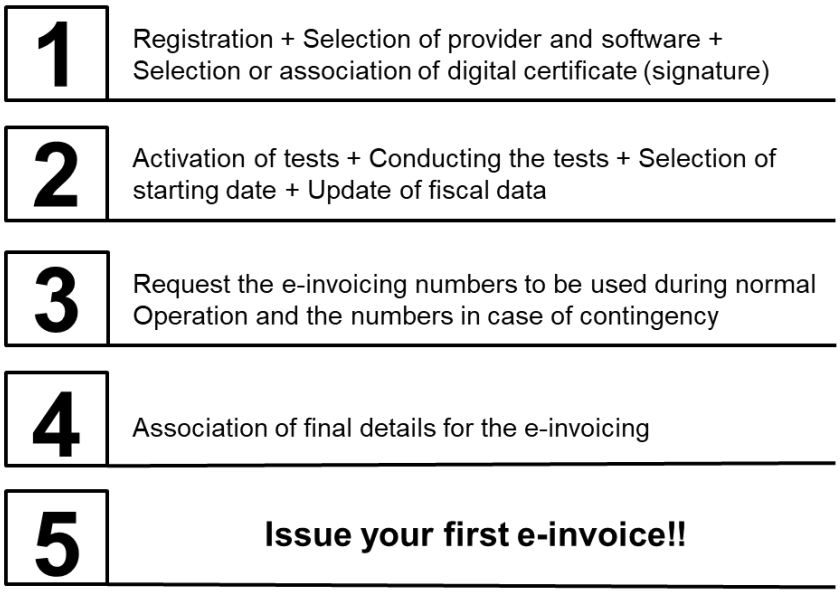
Figure 3-8: Flow for the exchange of information directly with the public agency



For an electronic invoice to be valid needs to meet some criteria, apart from the same elements required in a paper-based invoice, it includes: (a) to be expressly denominated as an invoice; (b) surname and name, or company name and tax identification of the seller or of the person rendering the service; (c) surname and name, or company name and tax identification of the purchaser of the goods or services; (d) discrimination of the VAT paid; (e) to bear a number that corresponds to a consecutive numbering system of sales invoices; (f) date of issue; (g) specific or generic description of the items sold or services rendered; (h) total value of the operation; and (i) the name or company name and tax identification of the printer of the invoice (the e-invoicing provider for electronic invoices); e-invoices need to be digitally signed, have a QR code that allows to access to e-invoice information, and unique number that identifies the e-invoice (CUFE, Spanish acronym).

Regardless of the option selected to get e-invoicing implemented requires going through some steps described by the governmental agency (DIAN) (see Figure 3-9). Additional configuration within the organization might be needed or additional configuration depending on the arrangements with the private e-invoicing provider.

Figure 3-9: Steps to start issuing e-invoices (Supply perspective)



Source: Translated from (DIAN, 2018)

3.5 Data collection process

As presented in chapter 2, methods for data collection mainly involved interviews. A total of 17 interviews were conducted between the two organizations. Two interviews were conducted at the entity in charge of taxes and customs, which is the entity responsible for the e-invoicing project. Three sessions of observations were held at the organizations. And documentation about the e-invoicing project and the solutions implemented by the organizations was consulted.

As mentioned previously, apart from the two companies that are part of the case study, an interview with personnel from the governmental agency in charge of taxes and customs was also conducted. The main purpose was to get information about the e-invoicing initiative, regulation, the free e-invoicing service, and advance of e-invoicing massification. After the interview, access to the free e-invoicing service as a test user was granted, so the free of charge solution was explored.

The interview guidelines used in this research can be found in Appendix D.

Table 3-5: Data collection

Source	Stage	Method	Quantity	Interviewee	Duration / Pages
Case A	**Before Implementation**	Semi-structured interview	2	Accountant 1A	92min
		Semi-structured interview	1	Accountant 2A	17min
	During Implementation	Semi-structured interview	1	Accountant 1A	41min
		Semi-structured interview	1	Secretary 1A	22min
	After Implementation	Semi-structured interview	1	Accountant 1A	66min
		Semi-structured	1	Customer A1 (Assistant	30min

		interview		accountant)	
		Semi-structured interview	2	Customer A2 (Assistant accountant)	40min
		Semi-structured interview	1	Owner / Manager 1A	15min
		Observation	2	-	300min
		Documents	1	[PDF] Official offer from e-invoicing provider	15 pages
			1	[Slides] Presentation from e-invoicing provider	48 pages
Case B	**Before Implementation**	Semi-structured interview	1	Accountant 1B	70min
	During Implementation	Semi-structured interview	2	Accountant 1B	90min
		Casual conversation about e-invoicing during observation	1	Manager 1B	15min
		Observation	1	-	240min
	After Implementation (During Sars-Cov-2 pandemic)	Semi-structured interview	2	Accountant 1B	97min
		Semi-structured interview	1	Manager 1B	37min
		Documents	1	Offer from e-invoicing provider	
		Web document	1	User's manual	Wiki
DIAN (Government agency)	**During massification of e-invoicing in the country**	Semi-structured interview	1	Manager of e-invoicing project (DIAN 1)	30min

	(Colombia)	Semi-structured interview	1	Professional support e-invoicing project (DIAN 2)	60min
		Exchange of emails	5	Professional support e-invoicing project (DIAN 3)	Email interaction
		Official regulation	7	Decrees Resolutions	-
		User's Manual free e-invoicing service	1	-	-
		Information published at web site		Web site	
		Multimedia resources as part of the diffusion strategy	-	YouTube videos, Facebook lives	

3.6 Summary

This chapter presented an examination of the selected case study. The purpose of this chapter was to provide a comprehensive understanding of the case study's background, context, and key aspects, so to provide a base for interpreting the findings under these conditions.

4. Findings of applying the research framework

Chapter 4 provides the details of the application of research methodology in practice. The multiple critical realist case study is presented, alongside the stages for a CR informed research. Empirical data were collected at three different moments: before, during and after the incorporation of electronic invoicing into businesses operation. Thus, research is reported in the same way through sections 4.1, 4.2, and 4.3.

4.1 [Before implementation] Starting the journey towards electronic invoicing.

This subsection presents the results from the first cycle of data collection. It focuses on what the organizations deal with before the implementation of e-invoicing. As a reminder, at this stage of the research (before implementation of e-invoicing) all the phases from appreciation to analysis (see chapter 2) were conducted.

4.1.1 Interplay between appreciation and analysis

Based on Minger's multimethodology (Mingers, 2006), the appreciation at this stage of the research involved the initial exploration of the literature. Theoretical perspectives and findings from empirical related studies were analyzed. At the same time, findings reported on previous research were addressed using a retroductive approach to hypothesize a set on mechanisms that might be involved in the uptake of e-government services by businesses (Chapter 1). This section reports the results from the first cycle of interviews, it was focused on what companies experienced before implementation of e-invoicing (it means before the configuration and customization of the software that supports e-invoicing and electronic exchange of data between the company and the governmental agency). Key activities at this stage involved adoption decision and acquisition of a

software solution towards the exchange of data with governmental agency in charge of taxes.

- **Case "A" Journey – Before Implementation**

In 2019, Case A migrated towards a new tax regulation called "*Regimen de tributación simple*" ("simple taxation regime" would be a translation into English). This decision, plus the release of a new information system to manage invoices electronically (made by the public entity in charge of customs and taxes), obligated company A to do the necessary to start issuing invoices electronically. Many questions emerged, leading the company into an information seeking process to understand what needed to be done. They read official documentation; it was provided by colleagues of the owner/manager of the company (A). At the beginning they did not look for the official documents at the website of the government agency since they received the documents from colleagues. Apart from reading the regulation, they visited the physical office of the public agency responsible for the electronic invoicing national initiative (but local office) to get information, and they attended in-person conferences about the topic (organized by the governmental agency).

With the information obtained, Company A decided to adopt e-invoicing to comply with the regulation in place. Then, they registered at the governmental website as a company that would issue invoices electronically. They had three options to implement electronic invoicing: (a) using a free of charge e-invoicing service provided by government, (b) developing their own software under the technical requirements to exchange information with the governmental agency, and (c) acquiring a service from a private provider authorized by the governmental entity.

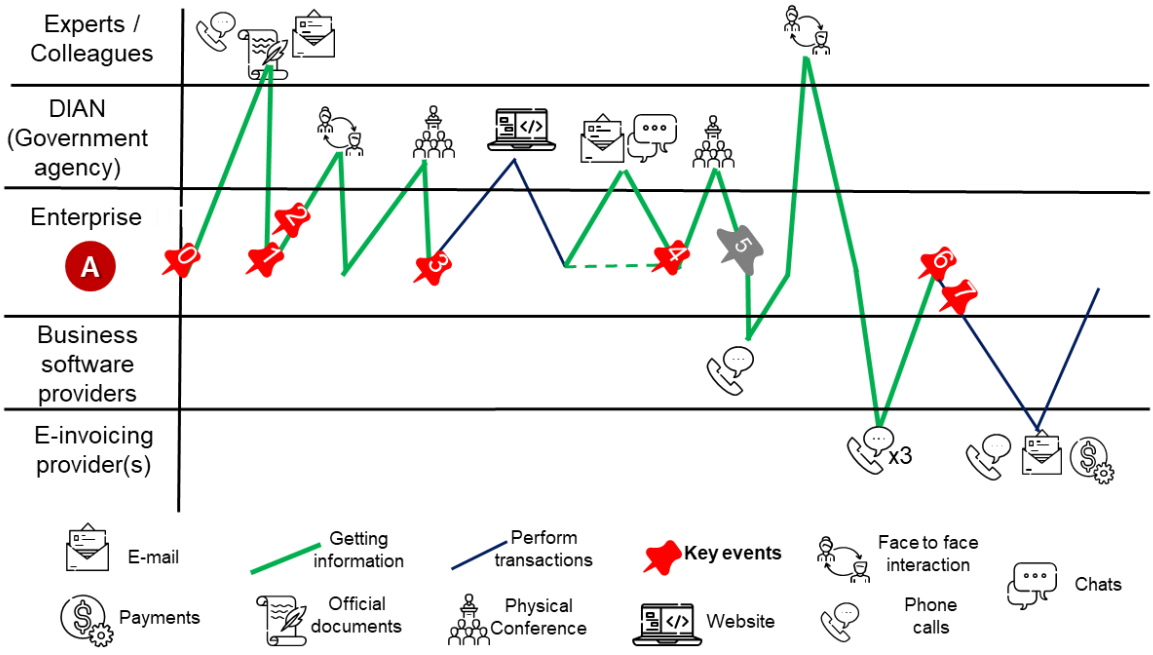
They considered to use the free e-invoicing service provided by the governmental agency. However, some questions about the process to use the free of charge e-service were sent to the public agency by email and chat, but there was no clear response; personnel from the public entity suggested to read the normativity, as expressed by an interviewee *"… we text by chat channel and they took too long to reply, and when they replied they referred us to the normativity"* (Accountant 2A). Thus, the perception of the company was that, in fact, the personnel from the public entity did not know how the organization should have proceeded. An accountant interviewed from the "case A" said that after reading the available documentation "*there were still plenty of uncertainty, we started looking for in-*

person support, we were advised to call to a special line, but they never answered, so we went to the office of the public entity, but they did not know either" (Accountant 1A).

After summiting their doubts to the public agency, Company "A" waited for some days, but got no response, however they attended another conference in the topic of electronic invoicing, but there was no new and useful information. Running out of time, because of the deadline. They decided to give up on using the free invoicing service and started looking for a private provider. At this point, the actor they went for information was their company software provider, the one that provides the accountability software for the enterprise operation ("*Contapyme*" software provider). After getting information about the price and conditions for the service, they went for more information from their network of colleagues, looking for other options. Based on the advice they received, they called to at least three companies that offered e-invoicing service. Eventually, they selected one of the providers. The main criteria for the selection were based on the costs and the one chosen offered all they needed at what they considered affordable price. An interviewee mentioned that "*the e-invoicing provider was recommended, we got quotations from different providers and the one we chose was cheaper, more affordable. Basically, that is why we chose this one*" (Accountant 1A). Then, they started the process to get the service implemented. What was next is related to the acceptance of the contract, payment of the fee, and provision of the documents requested by the e-invoicing provider.

Figure 4-1 shows how company A started the journey towards getting electronic invoicing incorporated in its operation. The figure represents the actors involved as well as the interaction of the company A with those actors through time. It shows which channels were used to interact with them such as e-mail, chat, telephone calls, physical visits, websites, etc. It also represents some additional information (payments, documents consulted, and events identified). The events identified during this cycle of data collections are numbered from 0 to 7 in Figure 4-1. They will be described in the next subsection.

Figure 4-1: Case A: Starting the journey towards electronic invoicing



- **Case "B" Journey – Before Implementation**

After the entity in charge of taxes and customs released a new regulatory framework and it stablished deadlines for the implementation of electronic invoicing and exchange of invoices data in real time in 2019, company B started looking for information about it. The accountant of company B read official documents published in the entity's website, she attended a conference and explored how to access to the free invoicing service. She asked questions during the conference, they promised to answer via email, however, no responses arrived.

Based on the deadline for the implementation of e-invoicing, several months in advance, Company B decided it was the moment to adopt e-invoicing service and started to explore how to do so within the transactional website of the governmental agency. They were interested in using the free of charge e-invoicing platform, but it was not easy to understand what had to be done. The accountant decided to visit the physical local office of the government agency (in charge for e-invoicing initiative), but information received was unclear and incomplete. The accountant interviewed expressed: *"… when I asked about the free of charge e-invoicing platform and the digital certificate, they told me that*

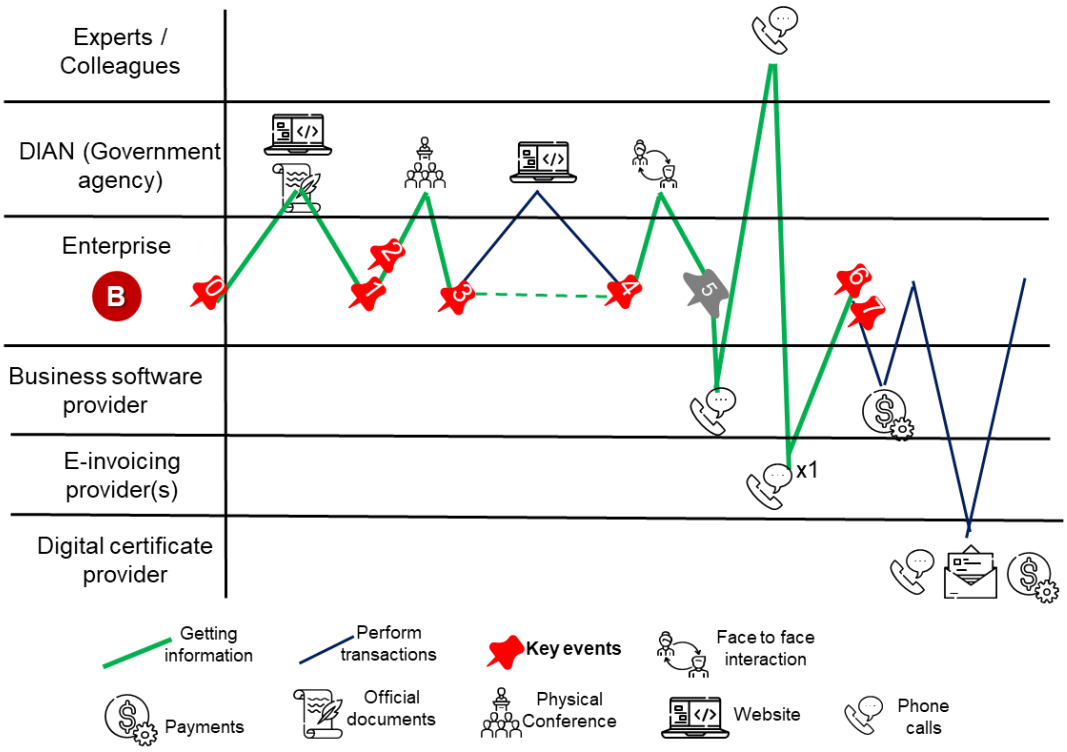
they were not well informed yet about the process to access to the free e-service that in other occasion I should come back to them "(Accountant 1B).

Because of the uncertainty about the implementation of the e-invoicing by themselves, company B gave up on the free of charge e-invoicing service. The accountant contacted its software provider ("*contapyme*" software provider). The one that already provides the software used to issue invoices by computer in order to explore the possibility to migrate towards electronic invoicing. At the same time, company B consider a private e-invoicing provider recommended by a colleague. However, when comparing costs and benefits, the software provider was chosen to implement electronic invoicing. What was next is related to the acceptance of the contract, payment of the fee, and provision of the documents requested by the software provider and the payment and documents requested by the digital certificate provider.

In order to implement electronic invoicing, the company had to buy a digital certificate to electronically sign the invoices. This product was not included in the agreement with the software provider, but the software provided advised Company B on how to get the digital certificate.

Figure 4-2 shows how company B started the journey towards getting electronic invoicing incorporated in its operation. The figure represents the actors involved as well as the interaction of the company B with those actors, it shows which channels were used to communicate, such as e-mail, chat, telephone calls, physical visits, websites. It also represents some additional information (payments, documents consulted, and events identified). The events identified during this cycle of data collections are numbered from 0 to 7 in Figure 4-2, they will be described in the next subsection.

Figure 4-2: Case B: Starting the journey towards electronic invoicing.



- **Identification of events across cases**

Table 4-1 shows the events identified for each case at this stage, before implementing electronic invoicing systems. Seven events and one non-event were identified, and in both cases (A and B) they refer to the same situation. Non-event is described as an event that, even though was expected to happen it did not happen.

Table 4-1: Events - Before implementation of e-invoicing

Case A events	Case B events	Description
(0) The search for information about legal framework started.		It refers to the activity of looking actively for information related to e-invoicing regulation.
(1) e-invoicing adoption decision		It refers to the moment where the decision to adopt e-invoicing was officially/formally made. it implies its acceptance. Key activity that evidences that decision was made was the search for an e-invoicing provider in addition to continue searching for information.
(2) Information seeking about providers and technical aspects		It refers to the activity of looking actively for information related to e-invoicing providers and

	technical requirements.
(3) Decision to try to access to the free of charge e-invoicing platform	It refers to the interest showed towards the usage of the free of charge e-invoicing service and the actions made towards getting access to it.
(4) Dissatisfaction with the public agency information provision service	Discontent with the quality and availability of the information provided by the public entity.
(5) No selection of free e-invoicing service	**Non-event.** Decision to adopt and use the free of charge e-invoicing platform offered by Colombian governmental agency in charge of taxes and customs was not made. And it was expected to happen as the free e-invoicing system was created to help small businesses to incorporate electronic invoicing with no extra-costs. In other words, they decided not to use the free e-invoicing service. It is identified as a non-event, since due to the size and monthly volume of invoices issued, both companies were part of the objective users of the free e-invoicing service. They had also showed interest on using it.
(6) Selection of private e-invoicing provider	Decision made towards the selection of the e-invoicing provider among the options available.
(7) e-invoicing service acquisition	It involves the paperwork and payment for the e-invoicing service.

4.1.2 Interplay between analysis and assessment

- **Retroduction among cases: postulated mechanisms from empirical data**

For this stage (before implementation), the Table 4-2 presents the list codes (as a result of coding process from the interviews) used in the retroduction process. Causation coding was the input for the retroduction process.

Table 4-2: Retroduction among cases – Before implementation

Before implementation of e-invoicing			**Hypothesized mechanism**
	Causation coding	**Categories**	
Outer context	Regulation	Regulatory framework	Regulatory mechanism
	Deadline		
	E-invoicing provider offer	Providers offer	Market mechanism
	Support from provider		
	External advice	External	

	Customer pressure	influence	
	Price / Cost of e-service	Market price	
	Compatibility	e-service possibilities offered	
	Software integration		
	Trialability		
	Technology features		
	Quality of system		
	Lack of information available	Information available and useful	**Administrative literacy (AL) mechanism***
	Misinformation		
	Lack of diffusion		
	Poor guidance		
	Information difficult to find		
	Information difficult to understand or ambiguous		
	Unclear information		
Inner context	Lack of skills	Organizational capabilities	Affordance mechanism
	Concerns	Organizational expectation	Expectation mechanism
	Risk avoidance		
	e-invoicing impact		
	Dissatisfaction	Dissatisfaction	Experience mechanism
	Volume of invoices	Operation	

- **Administrative literacy mechanism***

Administrative literacy refers to "*the ability to navigate bureaucracy, which includes having a good idea of how society's institutions work, the terminology involved and hence being better able to know where to go to find the forms, procedures, contact information etc. necessary, and indeed understand the information once found and being able to act upon it*" (Grönlund et al., 2007, p. 217). In this research it is argued that it can be considered as

a mechanism towards adoption and usage of e-government services as it has the power to influence given behaviors such as decisions. Döring (2021) states that administrative literacy refers to the capacity to obtain, process, and understand information and services from public organizations, in this way users might make appropriate decisions.

From empirical data, it was found that the lack of information available, poor guidance from the institution, and lack of skills from the users caused the abandon of the idea of using the free of charge e-invoicing platform. And it influenced the decision made towards getting the service from a private provider. Although documents with the regulation were available, they weren't enough to solve the questions that users had, neither was the guidance from the public employee at the local office of the governmental entity.

In fact, the non-event identified towards the usage of the free of charge e-service might have occurred due to the lack of enactment of the administrative literacy mechanism in the context at that moment. And, at the same time, it caused the event related to the selection of the private e-invoicing provider (the provider can be seen as an intermediary).

- **Evaluation of mechanisms (from literature) towards identified events.**

From the review on previous empirical research five mechanisms were hypothesized (process of retroduction followed to postulate those mechanism can be consulted in Appendix E and the description of the mechanisms can be found in the chapter 1). Table 4-3 matches the events identified in this stage with the possible mechanisms that would generate the events, the criteria to match events vs mechanism is described in the Appendix G.

Table 4-3: Events vs. hypothesized mechanisms (from literature) – Before implementation

Mechanism postulated / **Events**	**Expectation**	**Experience**	**Affordance**	**Market**	**Regulatory**
Information seeking about legal framework **(0)**				**X**	**X**
e-invoicing adoption decision **(1)**					**X**
Information seeking about providers and technical aspects **(2)**				**X**	**X**

Decision to try the free e-invoicing service **(3)**	**X**		**X**	**X**	
Dissatisfaction with the public agency information provision service **(4)**	**X**	**X**			
No selection of free of charge e-invoicing service **(5)**		**X**	**X**	**X**	
Selection of private e-invoicing provider **(6)**	**X**		**X**	**X**	
e-invoicing service acquisition **(7)**				**X**	**X**

The events 0, 1 and 2 involve information seeking about regulatory framework, adoption decision and search for technical information, respectively. Those might have been triggered because of the regulation in place. Governments have the power to persuade or enforce their constituents towards certain behaviors such as the use of technology (Arendsen, van Engers, et al., 2008). At the same time, regulation establishes what tasks companies must perform (administrative burden / red tape). But regulation is not usually detailed enough, and questions arises from users. In this context, particularly business users, leading them into an intense process of search for information to solve their doubts. The purpose behind the search for information is to get the necessary knowledge that guides them into the implementation of the regulatory framework.

On the other side, considering that, in Colombia, regulation towards the usage of electronic invoicing has existed for many years, but its adoption (in the cases studied) had never been considered before, regulatory mechanism might have caused both, the search for information and the decision to adopt e-invoicing service, due to its enforcing nature.

Expectation and market mechanisms provoked on both organizations interest towards the free of charge e-invoicing service offered by the public agency. As the organizations were looking for providers, they found that there was a free of charge platform which resulted convenient for them because of their size and volume of invoices issued monthly. Although they tried to get access to the free of charge e-invoicing platform, their expectations were not realized as they did not find enough information available nor useful help from the local office.

No selection of the free of charge e-invoicing platform can be seen as a non-event, it means that it was expected that the microbusinesses studied had decided to implement the free e-invoicing service, but instead they gave up on it. The free of charge e-invoicing

platform was designed and developed with the main aim of favor the adoption and use on e-invoicing by micro and small enterprises. However, the event did not happen, both companies gave up on its usage, previous experiences with other technological platforms from the same entity might have affected the decision. In addition, market mechanism could have influenced the decision to give up on it as private providers kept trying to persuade companies with their services and offers.

With regards to the choice for the e-invoicing provider, market mechanism might have exerted power in the decision. The market mechanism involves not only the supply side represented by the persuasion from e-invoicing providers, but also from customer side, as they might soon could start demanding their invoices to be issued in electronic form. In other words, trading partners exert pressure (Alomar & de Visscher, 2017; Chwelos et al., 2001; Tung & Rieck, 2005) on the company.

In addition, because there was not only one provider to consider, but many, there are also other mechanisms activated that influence the decision. Expectation and affordance mechanisms are postulated. Expectations reflects anticipated behavior. Users form perceptions towards technology, positive or negative, and it affects decisions, both companies expected that the provider help them to fulfill with the obligation of electronic invoicing. In addition, affordance mechanism would explain the judgment about the possibilities from the technology for the organization, based on its current organizational and technical capabilities.

Finally, market and regulatory mechanisms dictated the dynamics for the trading relationship between the e-invoicing provider, the government, and the organizations.

- **Evaluation of mechanisms (from empirical data) towards identified events.**

Table 4-4: Postulation of mechanism (from empirical data) towards identified events.

Mechanism postulated / **Events**	**Expectation**	**Experience**	**Affordance**	**Market**	**Regulatory**	**Administrative Literacy**
Information seeking about legal framework **(0)**					O	O
e-invoicing adoption decision **(1)**					O	

Information seeking about providers and technical aspects **(2)**					O	O
Decision to try the free e-invoicing service **(3)**	O			O		
Dissatisfaction with the public agency information provision service **(4)**		O				
No selection of free e-invoicing service **(5)**	O			O		O
Selection of private e-invoicing provider **(6)**	O		O	O		O
e-invoicing service acquisition **(7)**				O	O	

Based on the empirical data some mechanisms were postulated and analyzed towards the identified events. Empirical data supports the existence of a regulatory, market, expectation, experience, and affordance mechanism, but one additional mechanism was postulated from empirical data, it can be named as “Administrative literacy mechanism”. It is postulated as a mechanism towards uptake of e-government services by businesses since it can be activated under some contextual settings and thus it would have the power to influence users’ decisions during e-service uptake process.

Empirical data also supports that regulatory mechanism explain the events of information seeking and adoption decision, as well as the paperwork to acquire the e-invoicing service. Both companies express that regulation was the reason to search for information but also to make de decision toward electronic invoicing. Similarly, market mechanism influences the decision towards the selection of the e-invoicing provider. Technology characteristics and expectations formed towards e-invoicing service were determinants in the provider selection. Regarding the administrative literacy mechanism, it could not be activated due to the contextual conditions related to the lack of information available and poor guidance from the governmental entity, however the lack of enactment of this mechanism might explain different events during the stage.

At this stage, expectation played an important role in the decision towards the e-invoicing service selection. And experience with similar red tape at the same governmental entity as well, Accountant 1B said “…*they told me that the e-invoicing platform was completely different from the current platform where the income tax returns are filled, and where the electronic signature is used. Then, there might not be any problems. However, I do not*

know how it will perform, I do not know, because the current website is always down, it does not work well with the electronic signature, there are many errors, something is always missing, etc. I do not know how informatic systems work but when many people is trying to access it stops working too".

- **Evaluation of mechanisms**

Table 4-5 shows the match between events, mechanisms postulated from the academic literature and the ones that emerged from empirical data (in short, coincidences between Table 4-3 and Table 4-4). It can be noticed an overall good level of coincidence. There is an additional column with regards to the new mechanism identified (administrative literacy).

Table 4-5: Assessment of mechanisms before implementation

Mechanism postulated / **Events**	**Expectation**	**Experience**	**Affordance**	**Market**	**Regulatory**	**Administrative Literacy**
Information seeking about legal framework **(0)**					■	O
e-invoicing adoption decision **(1)**					■	
Information seeking about providers and technical aspects **(2)**					■	O
Decision to try the free e-invoicing service **(3)**	■			■		
Dissatisfaction with the public agency information provision service **(4)**		■				
No selection of free e-invoicing service **(5)**				■		O
Selection of private e-invoicing provider **(6)**	■		■	■		O
e-invoicing service acquisition **(7)**				■	■	

Conventions	■	Coincidence (Theoretical and empirical corroboration)	O	Mechanism with empirical evidence

Four mechanisms underlying the process towards uptake of e-government interorganizational services before its actual implementation: expectation, market, regulatory, and administrative literacy mechanism. These mechanisms are selected since each one participates in the explanation of more than one event, and they are supported by the empirical data collected.

During this phase, affordance mechanism was manifested by the judgement about the possibilities of the software towards the tasks they must perform, however it was mainly in form of expectations being formed based on the market offer as users could not try the technology and the information obtained was not enough. Thus, expectation mechanism was supported by empirical data more than affordance at this stage. Also, market and regulatory mechanisms were activated, and they exerted pressure on the organizations influencing their decisions. Finally, administrative literacy mechanism could not be fully activated due to external conditions, such as lack of knowledge at the local office of the entity, but it helps to explain the occurrence of some events such as the decision of paying to an intermediary.

- **Contextual conditions during the stage.**

Regulation related to the possibility to implement electronic invoicing in Colombia has existed for many years (since around 1995). Usage of electronic invoicing until 2019 was voluntary. However, between 2016 and 2018, Colombian government and particularly, the agency in charge of taxes and customs started a project towards the massification of e-invoicing. The main strategy in place was related to the enforcement of uptake of electronic e-invoicing.

Some other conditions from the context can be mentioned: users perceived a poor guidance and a poor-quality information about towards e-government services. Which in turn, might have prevented the activation of administrative literacy mechanism. Table 4-6 shows some examples of differences between what was told by the entity in charge of e-invoicing (DIAN) in the interviews performed and what was expressed by the people in the organizations that were participating in the implementation process. This table then presents evidence of contextual conditions that prevented the enactment of administrative literacy mechanism.

Table 4-6: Example of poor-quality information about free of charge e-invoicing service

Topic	Information provided by personnel at the governmental entity.	Interviewee
Who can use the free of charge e-invoicing service?	"Any business can use the free e-invoicing service, no matter the size; micro, small, medium or large business" (DIAN 1)	"We registered, but they told us that the DIAN would send us a notification telling us if they accepted us or not, because we had to meet certain conditions in order to be accepted to access to the DIAN's free of charge platform, not everybody could. They had to be small and medium companies, to have a certain number of employees, well... I don't remember at this moment what the conditions were, but we fulfilled them, but they never answered us." (Accountant 1A). "…they said that the free service was for very small companies that did not have the economic capacity, at this point I am so small we only operate 8 months in the year, so what is small?" (Accountant 1B)
Features of e-invoicing service.	"Unlimited e-invoices can be issued, also debit memos and credit memos… The same type of documents can be received. It can be used from any device, mobile devices included, but internet connection is required Customers and products data have to be entered, they will be saved, as well as electronic documents generated, however, the responsibility for the storage and conservation of the	"The other thing with the free of charge DIAN platform is that it does not interface directly with my software and **does not save information**" (Accountant 1B).

	documents belongs to the person or company itself".	
How can a company access to the free of charge e-invoicing platform?	"The person or company interested in using the free e-invoicing service only must (1) enter the website, (2) register its data, (3) select the free of charge e-invoicing service, (4) link or request the digital signature certificate, then, (5) perform some tests to become familiar with the software and that's it"	"The first thing was that… when I started to search for information, they did not give us enough information on how we could access this free service, and the second thing is that when they said that it was possible, that we can access, letters should be written so the request would be approved. … I sent questions to access to the free of charge e-invoicing platform, but they did not reply" (Accountant 1B)

In summary, companies did not get accurate information about who could access to the e-service, nor what were the characteristics of the e-service, nor the process to follow, which in turn also prevent the activation of affordance mechanism.

Finally, time pressure also was part of the contextual setting in which companies were operating, as there was a deadline in place to start issuing electronic invoices.

4.2 [During implementation] Implementing electronic invoicing.

4.2.1 Interplay between appreciation and analysis

The appreciation phase at this stage of the uptake process (during implementation of inter-organizational service) involved a new cycle of data collection also made through interviews. They focused on what companies experienced during implementation of e-invoicing, it means during the configuration and customization of the software that supports e-invoicing and electronic exchange of data between the company and the governmental agency.

- **Case A Journey - During implementation**

Once company "A" paid the fee to get e-invoicing service, they started to interact with the e-invoicing provider frequently, and it was the provider the one who perform the

necessary steps to get implemented the e-service. Company A communicate with the provider through e-mail, telephone and through internet. Using remote desktop software, the e-invoicing provider was able to perform certain configuration tasks such as registration of software, digital signature, etc. at the website of the governmental agency on behalf on Company A.

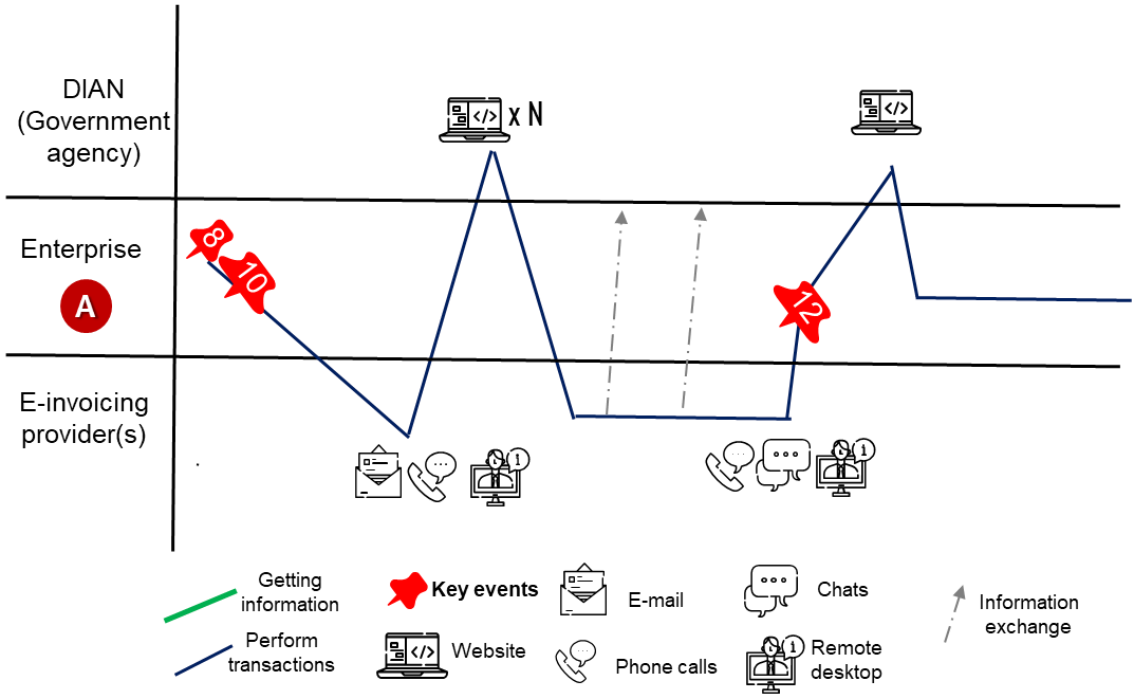
Some functional and technical tests were needed during the implementation (also mandated by the government). When successfully passed, the company would be allowed to formally start issuing electronic invoices. However, company A did not participate on those tests, nor even the functional ones, everything was performed by the provider in order to fulfill with the official requirement. Although the purpose of the tests is that companies could experience, learn and get familiar with e-invoices, company A did not participate of those.

On the one hand, Company A had to update the invoice numbers authorized and other legal documents, these tasks were also performed with the e-invoicing provider assistance. *"…for the request for the invoice's numbers, we got help from them, we used 'TeamViewer' software for it*" (Accountant 1A).

Because Company A did not participate in the tests, they received some training from the provider (remotely) at the moment the company was already issuing legal invoices (telephone, chat, and remote desktop were the channels used for training). "*The day we started to issue e-invoices we had to call them to get guidance*" (Accountant 1A). For the next weeks, Company A called the e-invoicing provider a lot to solve doubts or get guidance.

Figure 4-3 shows company A journey while implementing the electronic invoicing system and starting operation using it. Similarly, to previous section, some events are marked in the figure, those will be explained in the next section.

Figure 4-3: Case A: Journey during e-invoicing implementation



Regarding the e-invoicing service implemented, it is a web application that they use separately of their accountability software. The had to create customers and the services/products they offer before issuing invoices. Electronic documents are stored while the company is a customer of the e-invoicing provider, however, it is company A responsibility to keep the records for at least 10 years according to the law. They can get support from Monday to Friday during working hours.

- **Case B Journey - During implementation**

Company B continue working towards the uptake of e-invoicing, they wanted to do the registration and the configuration at the government agency website, and specially they wanted to perform the tests required before officially start issuing e-invoices. Company B was willing to actively participate on those tasks; Although the accountant in charge was trying to do the tasks by herself, it was not possible to complete the tasks, due to doubts during the process. For instance, the type of information that should have been filled out at the government agency web platform. Company B was very confused, and they were doing significant effort and spending time getting unsuccessful results. Company B then changed its attitude towards the implementation and leave the e-invoicing provider to

continue with the process. However, they still did want to participate. Email and calls (mainly call) were the channels used.

After the technical configuration required was completed, Company B received information about how to perform the tests. They accessed to a web portal for issuing electronic documents (a demo version). Company B found out that customers and product's data should be entered, which was a bit disappointed as company B was expecting to get the e-invoicing service integrated with the current accountability software, so they would not need to enter the data of customers and products again.

> "*I did not know that for me to be able to start testing I had to fill out the same as the free of charge DIAN software (free of charge e-invoicing platform), what a surprise! I did not know I would have to start registering suppliers, clients, create them, if I was supposed to have bought it precisely to avoid that. Seems like at least for the demo, for the tests, I supposedly must do it, then I am creating products and services and things to be able to make the blessed test. That was the surprise of this week" (*Accountant 1B).

Company B also looked for help as it was not easy to create an e-invoice. At the same time Company B also complained to the e-invoicing provider, because of for the tests, the accountant had to create products and customers and she wanted to know how the e-invoicing was going to work with their current data. It happened that the provider had an agreement with a third company to develop and support the feature related to electronic e-invoicing and data exchange. And that However, information for testing was not correct or incomplete. As company B should not perform the tests on that website. In short, that website was meant for companies that was going to used e-invoicing apart from their accountability software.

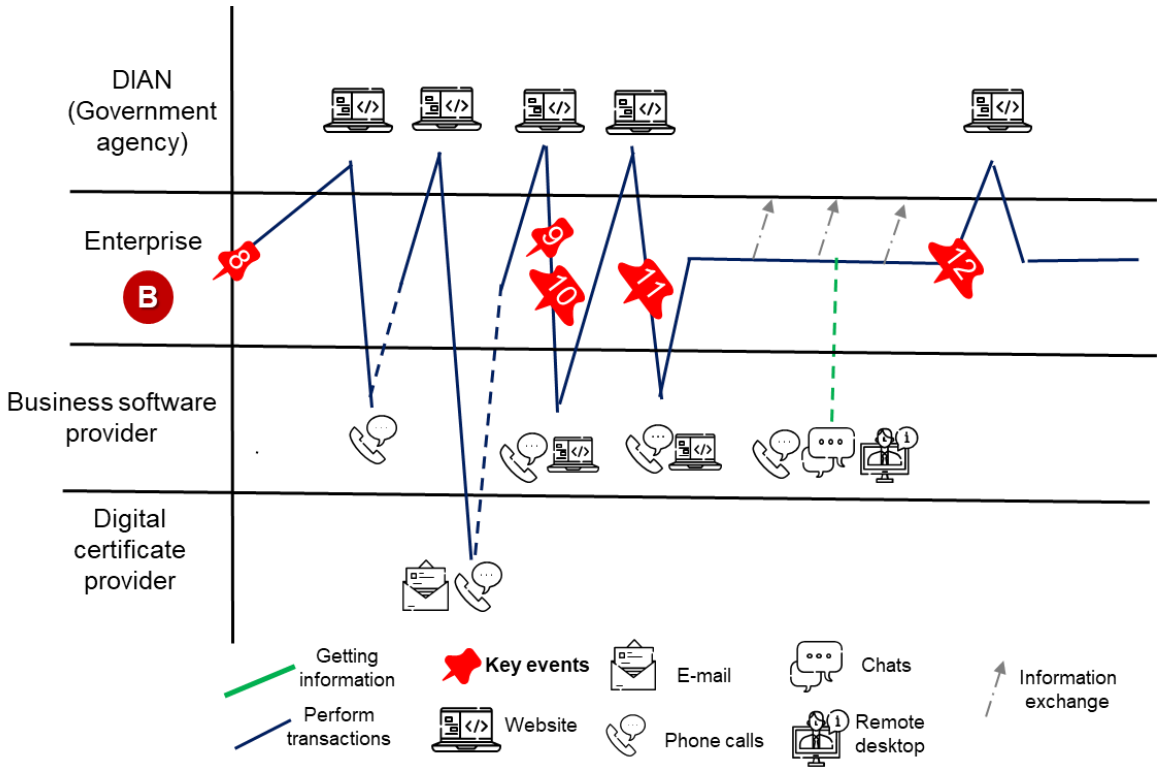
The software provider explained that they do not need to access that web platform, that tests and official invoices will be create through the same software they already used. Once the configuration (update of the system) was done by the software provider, Company B participated in the tests that the government agency asked for before authorizing the company to issue invoices electronically, during this activity company B was accompanied by their software provider. And the main accountant and the person in charge of issuing invoices participated to the test and at the same time, this activity

accounts as a training. Emails, chats, and remote desktop were the channels used for virtual training.

When they got official authorization and were technically ready to issue electronic invoices, company B again received support via remote desktop access (from their software provider) to do it correctly as they did not feel confident already that the procedure was correct and the electronic invoice valid, this acted as a training as well.

Figure 4-4 shows company B while implementing the electronic invoicing system and starting operation using it.

Figure 4-4: Case B: Journey during e-invoicing implementation



- **Identification of events across cases**

Table 4-7 shows the main events identified for each case at this stage, while implementing electronic invoicing system.

Table 4-7: Events - During implementation of e-invoicing

Case A events	Case B events	Description
E-invoicing implementation starts **(8)**		Implementation activities involved,

		registration to issue e-invoices, registration of the software, and digital signature, tests, initial load of data, and even user training.
	Unsuccessful/incomplete registration of the software and digital signature to issue e-invoicing made (made by the organization itself) **(9)**	Particularly, Company B, was involved in the technical implementation activities, however, they could not complete the registration by themselves, nor after asking question to the business software provider and the digital certificate provider as technical vocabulary were found in the forms, and they did not have enough knowledge to complete them.
Change on participation role towards e-invoicing uptake (from active to passive) **(10)**	Change on participation role towards e-invoicing uptake (from individual to collaborative) **(10)**	It represents a change in the attitude and activity of the organization towards the uptake of electronic invoicing. Because of the agreement made with a private provider, both companies gave responsibility to their e-invoicing provider.
	User training **(11)**	Training towards issuing e-invoices using the new technology, and instruction to check that information was sent to the governmental agency.
Paperwork to start issuing legal e-invoices **(12)**		It refers to get the obtention of official authorization document to issue electronic invoices as well as the numbers that can be used for electronic invoices.

4.2.2 Interplay between analysis and assessment

- **Retroduction among cases: postulated mechanisms from empirical data**

For this stage (during implementation), the Table 4-8 presents the list codes (as a result of coding process from the interviews) used in the retroduction process. Causation coding was the input for the retroduction process.

Table 4-8: Retroduction among cases – During implementation

During implementation of e-invoicing			**Hypothesized mechanism**
	Causation codes	**Category**	
Outer context	Bureaucracy burden	Regulation	Regulatory mechanism

	Time pressure		
	Usability	Technology features	Affordance mechanism (external technology)
	Trialability		
	Technology features		
	Complexity		
	Software integration		
	Poor guidance	Support	Intermediation mechanism
	Support from provider		
	Agreement signed (e-invoicing provider)	Agreements	
	Trust in the provider	Trust	
Inner context	Lack of knowledge	Organizational capabilities	Affordance mechanism (organizational capabilities)
	Lack of skills		
	IT infrastructure		
	User training		
	Prior experience	Previous experience	Experience mechanism

- **Intermediation mechanism**

As intermediaries can contribute to bypassing the red tape, it means that companies can be relieve of their bureaucratic tasks and they also bridge expert knowledge (Löbel et al., 2016), intermediation is postulated as a mechanism because it has the power to generate given events at the organizations. The possibilities that the organizations get when they make an agreement with the e-invoicing provider might have caused the change in the active role they were showing towards getting e-invoicing implemented.

Arendsen et al., (2006) found that especially small companies tend to outsource e-government related data exchange processes. In fact, intermediaries can contribute to the adoption of e-government services (Weerakkody et al., 2013), they are perceived as specialists and they interact more effectively and efficiently with administration and their

clients. As a mechanism, intermediation has the power influence business decisions, as businesses transfer responsibilities to intermediaries, they make things on behalf of the organizations and help them with the administrative tasks (Arendsen & Ter Hedde, 2009), they also provide advice, thus, organizations can choose their level of engagement, in this case, in the implementation of e-government services.

- **Evaluation of mechanisms (from literature) towards identified events.**

From the five mechanisms hypothesized based on the literature review, four mechanisms were found likely to explain the events identified at this stage (Table 4-9). The criteria followed for this is described in the Appendix G.

Table 4-9: Hypothesized mechanisms (from literature) vs events – During implementation

Mechanism postulated / **Events**	**Expectation**	**Experience**	**Affordance**	**Market**	**Regulatory**
E-invoicing implementation starts **(8)**			**X**	**X**	**X**
Unsuccessful/incomplete registration of the software and digital signature to issue e-invoicing made (made by the organization itself) **(9)**.		**X**	**X**		
Change on participation role towards e-invoicing uptake **(10)**		**X**	**X**	**X**	
User training **(11)**			**X**		
Paperwork to start issuing legal e-invoices **(12)**		**X**			**X**

Experience, affordance (organizational capabilities and external technology), market, and regulatory mechanism might operate during this stage (during implementation). However, some events might have happened because of the lack of enactment of some mechanisms. Experience mechanism might have not been activated in all the events, as it would be activated when the organization is facing a situation similar to a past situation and implementing e-invoicing was a completely new task, but they had experience issuing invoices. On the other hand, restrictions or constrains from technology, plus the lack of

specialized knowledge or skills (affordance mechanism) might have produced the change in the participation of the organizations towards the implementation of e-invoicing service.

In addition, they selected and paid to a third company (type of intermediary) to get implemented the e-invoicing service and to get guidance on how perform the necessary steps to start issuing electronic invoices. It relates with the activation of the market mechanism. e-Invoicing provider could perform administrative and technical tasks on behalf of the organization, leading them to switch from an active role and active participation to a more passive and collaborative role during implementation stage. Instead of doing the process by themselves they asked for help but participating to complete tasks.

- **Evaluation of mechanisms (from empirical data) towards identified events.**

Table 4-10 shows the results of the match between the identified events in this stage and the mechanisms that might explain them. It includes the administrative literacy mechanism postulated based on the empirical data from the previous stage. And the criteria employed is described in Appendix G (Table G-2).

Table 4-10: Postulation of mechanism (from empirical data) towards identified events.

Mechanism postulated / **Events**	**Expectation**	**Experience**	**Affordance**	**Market**	**Regulatory**	**Administrative literacy**	**Intermediation**
E-invoicing implementation starts **(8)**			O				O
Unsuccessful/incomplete registration of the software and digital signature to issue e-invoicing made (made by the organization itself) **(9)**.		O	O			O	
Change on participation role towards e-invoicing uptake **(10)**		O	O				O
User training **(11)**			O				O
Paperwork to start issuing legal e-invoices **(12)**					O	O	

Empirical data support the mechanisms previously postulated (the ones that emerged from the literature). However, an additional mechanism is identified, intermediation mechanism, in this research it is postulated as a key mechanism for this stage (during implementation of e-invoicing), and it would best explain the change from active to passive or collaborative participation in the uptake process of e-invoicing, the implementation process itself and the successful fulfillment of requirements to start issuing electronic invoices.

Because of the relationship established with the e-invoicing provider at the moment of the acceptance of the offer and after making the payment for the service, organizations might have relaxed as they transfer risks and responsibilities to a third part and now, they have a partner to ask help.

Administrative literacy (AL) mechanism was postulated from the analysis of the previous stage (before implementation of e-invoicing service). It was then taken into account to analyze if the same mechanism can also explain events during implementation. As it can be noticed in Table 4-10, Administrative literacy might be able to explain success or failure in performing the administrative tasks towards getting implemented e-invoicing.

Regulatory mechanism was manifested through bureaucracy burden, all the paperwork that was required to start using electronic invoicing. And, experience and affordance mechanisms interact during the stage, although some events might be explained due to the lack of enactment of experience mechanism such as the unsuccessful registration when company B tried to perform it by itself. On the other hand, affordances were showed from the interaction of the employees of the companies with different e-services during implementation stage, not only e-invoicing service.

- **Evaluation of mechanisms**

Table 4-11 shows the match between events, mechanisms postulated from the academic literature and the ones that emerged from empirical data (in short, coincidences between Table 4-9 and Table 4-10). It can be noticed an overall good level of coincidence. There are two additional columns with regards to the new mechanisms identified (administrative literacy and intermediation mechanism).

Table 4-11: Assessment of mechanisms during implementation

Mechanism postulated / **Events**	**Expectation**	**Experience**	**Affordance**	**Market**	**Regulatory**	**Administrative literacy**	**Intermediation**
E-invoicing implementation starts **(8)**			■				O
Unsuccessful/incomplete registration of the software and digital signature to issue e-invoicing made (made by the organization itself) **(9)**		■	■			O	
Change on participation role towards e-invoicing uptake **(10)**		■	■				O
User training **(11)**			■				O
Paperwork to start issuing legal e-invoices **(12)**					■	O	

Conventions	■	Coincidence (Theoretical and empirical corroboration)	O	Mechanism with empirical evidence

The criteria to select the mechanisms that best explain the events identified at this stage were those mechanisms with empirical evidence that explain more than one event, it means that, **experience, affordance, and intermediation mechanism underlie the implementation of e-invoicing service**. Nevertheless, based on the empirical evidence, the enactment of intermediation mechanism constrained the fully enactment of affordance mechanism, due to the limited interaction with technology (e-invoicing) during implementation. However, at the same time lack of experience in processes like this one they were facing (implementation of inter-organizational services) favored both, intermediation, and affordance mechanism to be activated, thus helping to explain the events associated with this phase of uptake process.

Administrative literacy still plays a role in the explanation of events during implementation, as paperwork needed to be performed before starting to issue electronic

invoices. However, it is partially constrained because of the enactment of the intermediation mechanism.

- **Contextual conditions during the stage**

During the implementation phase, both organizations were not alone, as they had already and agreement with a private e-invoicing provider for their service towards issuing e-invoices and transmitting the data to the governmental agency, but also for the required support. It means that providers made some activities on behalf of the organizations (A and B) and provided guidance when needed.

During this stage the deadline for the implementation of e-invoicing were even closer, thus putting some pressure on the organizations to avoid possible fines from the governmental agency.

4.3 [After implementation] Using electronic invoicing.

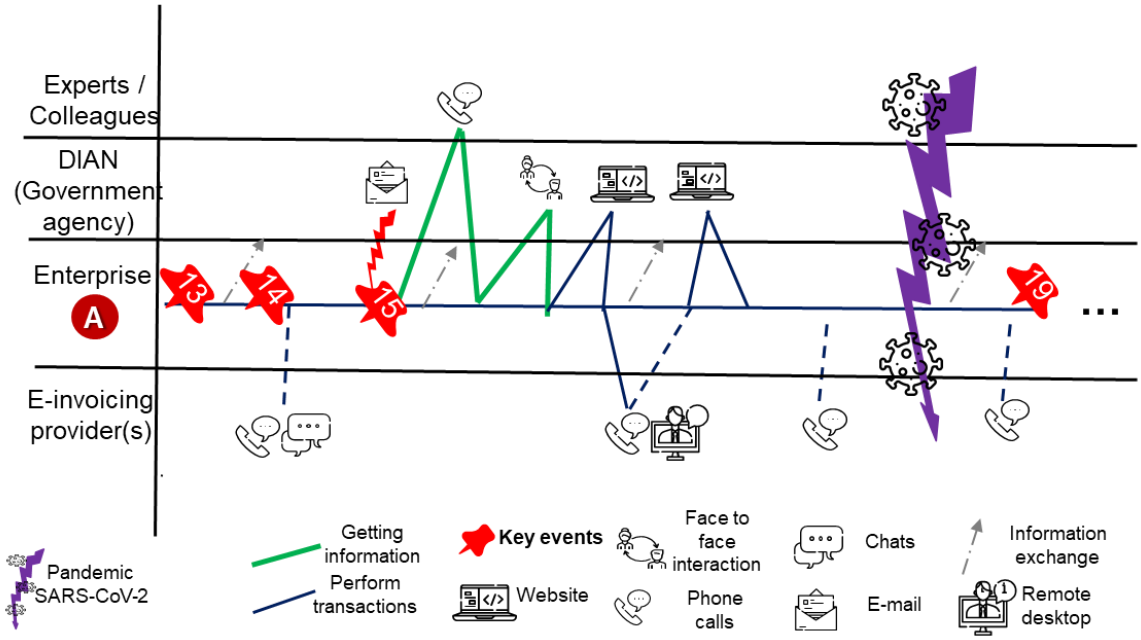
4.3.1 Interplay between appreciation and analysis

The appreciation phase at this stage of the uptake process (after implementation of inter-organizational service) involved a new cycle of data collection also made through interviews and observation. They focused on what companies were experiencing while using the inter-organizational service (e-invoicing). In other words, this stage took place after the go-live of the e-invoicing system.

- **Case “A” Journey – After Implementation**

Figure 4-5 shows company A after implementing the electronic e-invoicing service and operating with it. Similarly, to previous sections, some events are marked in the figure, those will be explained in the next subsection.

Figure 4-5: Case A: Journey after Implementation



After implementation, Case A started to issue electronic invoices and as expected, it implied that they started to change work practices on how to create and send the e-invoices. For instance, they realize they need to get or update customers electronic mails, so they could send the invoices.

During the first month after implementation, company A had to call and text to the e-invoicing provider in order to get some help in light of doubts, it was like they were trained while they were already officially operating, issuing legal e-invoices. After first month, the calls made to the e-invoicing provider asking for help diminished. The person in charge of issuing invoices learnt how to do it, and in fact, she found that the process with the e-service were more efficient than issuing paper-based invoices. "*It can be done quickly, it takes less time, it is super easy*" (Secretary 1A).

After four months of being issuing e-invoices they received an e-mail from the government agency, it was a reminder to register and make the process towards electronic invoicing. They did not pay enough attention as they were already issuing electronic invoices, in fact they thought it was a general email, a reminder for everyone. However, the manager communicated with his network of colleagues, and they shared information about changes in the e-invoicing technical and operational aspects. Basically, at the beginning the invoice was being delivered first to the customer and then reported to the government

entity, but they changed this procedure and at that point, the invoice must be first reported to the government agency and then delivered to the customer. There was a deadline for users' that were already operating with electronic invoicing to migrate towards the new system, however, they were not aware of that change.

With this information they went to the local office of the governmental agency to get more information and asked what they had to do and asked about the validity of previous invoices they had issued, because it was a serious concern. The good news, there were no problems with previous invoices, however, they need to do the adjustments to migrate to the new system immediately.

Then they called the e-invoicing provider to get assistance in the migration process, which involved a registration in another web site and the configuration to report the data to the public entity. The change was purely technical. Thus, the person in charge of creating and sending invoices could continue issuing invoices in the way she had already learnt to do them, in the same service she was already using. At the moment, occasionally she calls the e-invoicing provider to get help.

During this process of changing work practices, although Company A were generating invoices electronically, they continue print them to storage, and also, they keep delivering invoices in person to many clients. However, some efforts are being made to get customer's emails and make them to accept electronic invoices.

In March 2020, the pandemic due to novel coronavirus (Sars-CoV-2) was declared. Because of country restrictions, the company was affected as their clients were badly affected as well. Employees went to work from home, however, thanks to electronic invoicing, invoices were delivered by e-mail and no face-to-face contact to deliver the invoices was required. During 2020, they also paid to the same e-invoicing provider to renew the usage of e-service. In fact, in short term, they are not considering changing their current e-invoicing provider.

Because of the nature of the company, they act as bookkeeper for other companies and as consultant. Once the e-invoicing were implemented (within company A), they started advising their clients to get the electronic e-invoicing service from the same provider, so company B might be able to assist them more efficiently. However, the implementation of e-invoicing on their clients did not necessarily impact the way they do their job. As

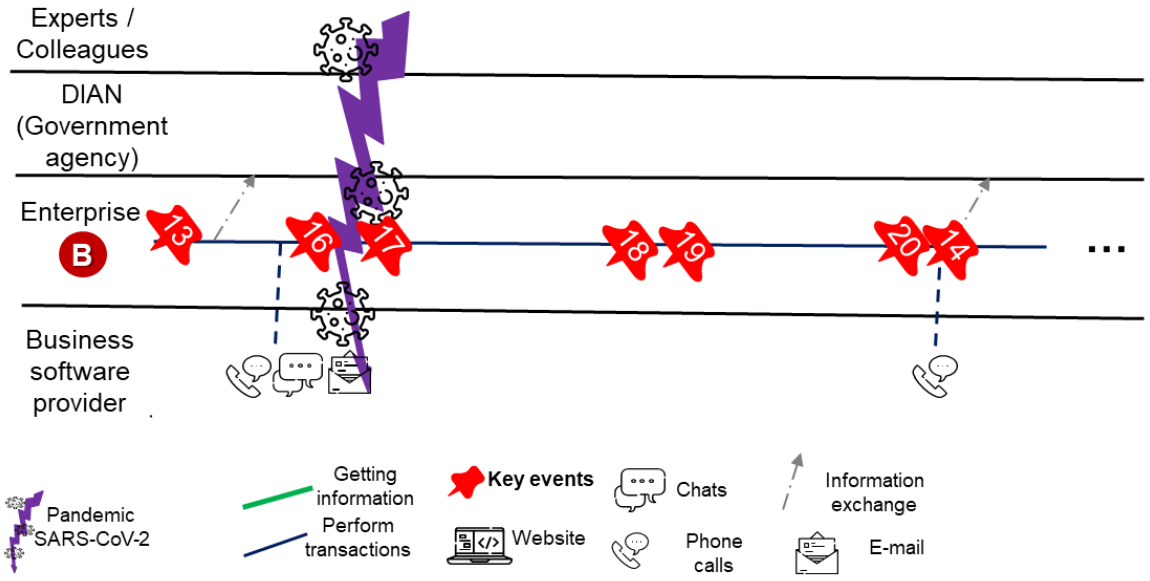
everyone is using an independent system not integrated with the accountability software, the data is still manually transferred for the generation of the financial statements. Regarding the interviews held with two clients of Company B, both were willing to follow the company B advice and get an agreement with the same provider.

- **Case "B" Journey – After Implementation**

Company B started issuing electronic invoices at the end of February 2020, they used telephone calls, chats, and email to ask for help to its business software provider, as electronic invoices were being issued from the accountability software interface. However, a month later (March 2020) the pandemic due to novel coronavirus Sars-CoV-2 was declared, and as a consequence of restrictions in economic activities, as well as quarantines for the population, the company had to stop most of their activities, there were no students to feed, nor people buying in the sales points at the University, nor events to offer catering services. Thus, for months there was not a single e-invoice issued. As time went by, and restrictions in the country were extended once and again and again, they had to suspend or cancel contracts with most of their employees. At the same time, they regretted the costs they incurred with the e-invoicing service and that after one year they could hardly operate "*It was a waste of money, we paid both e-invoicing service and digital signature.*" (Accountant 1B). In accountant's opinion, she should have insisted with the free e-invoicing service offered by the governmental entity, however she acknowledges that her opinion is based in the context of the pandemic, but that also her opinion might have been different under different circumstances, for example without the pandemic, the integration between their current software and the e-invoicing service have allow the organization to operate more efficiently.

Figure 4-6 shows company B after implementing the electronic e-invoicing service and operating with it. Similarly, to previous sections, some events are marked in the figure, those will be explained in the next subsection.

Figure 4-6: Case B: Journey after implementation



Additionally, at this point (after implementation of e-invoicing) the accountant expressed that she would have implemented the free e-invoicing service offered by the public entity (DIAN) if information offered would have been more accurate and inquiries would have been attended on time. After almost a year of having implemented e-invoicing service, she expresses that there are much more information available and practical tutorials to guide businesses in the process. However, back then there was not enough useful information available, nor on the internet, nor at the local office of the public entity. In her opinion, switching to free e-invoicing service is an option to be considered if restrictions would have remained in place for longer.

Regarding the person who issues the invoices, she did not have major problems with the new e-invoices as invoices are issued from the same software than before. Because most of the employees were suspended, the main accountant of the company oversaw almost all the activities to fulfill with the bureaucratic burden of the company. This situation affected the routinization of the operation using electronic e-invoices. With regards to the e-invoicing functionality Company B expressed to experience delay at the moment of issuing invoices, it can be noticed under the labels “to be sent”, “to be delivered”. If after waiting for some time the state does not change, they ask the provider for support. Nonetheless, in terms of operation they had not experienced significant changes, nor positive nor negative (it is important to notice that the volume of invoices is critically affected by the restrictions as a consequence of the pandemic). Because they usually

delivered invoices by email. There was not significant change. Regarding support for e-invoicing, phone calls were the main communication channel with the provider.

At the time of the last interview (February 14th, 2022), Company B was restarting their operation, they continue with the same e-invoicing provider and desist from the idea of switching to the free of charge e-invoicing platform offered by the public entity. Company B was hoping to recover their level of operation and in this case, the integration of e-invoicing with the current accountability software was still convenient "*We don't know how is going to be the operation this year, maybe it is good, we decided to keep the same private provider. Although we haven't issued any invoices this year yet, but the academic semester is still about to start*" (Accountant 1B).

- **Identification of events across cases**

Table 4-12 shows the events identified for each case at this stage, after implementing electronic invoicing system. Eight events were identified, both cases experience different events, except for the e-invoicing usage starting and the renewal of the agreement with the private e-invoicing provider.

Table 4-12: Events - After implementation of e-invoicing

Case A events	Case B events	Description
E-invoicing usage starts **(13)**		It refers to the moment in which official invoices started to be issued by the organization
Adaptation of working practices **(14)**		It refers to the moment in which the organizations started to issue electronic invoices and the conscious reflection about the implications for the business operation.
Upgrade of e-invoicing service **(15)**		Organization A had to upgrade the e-invoicing service so to fulfill with the requirements of the governmental entity, but they did not know.
	Delay on adaptation of working practices **(16)**	The organization was expecting to fully use e-invoicing service, however, due to external conditions (pandemic), the organization stop its operation and they stopped issuing invoices. It also caused that most of the employees lost (at least temporally) their jobs.
	Company operation interrupted **(17)**	
	Regret implementation of e-invoicing with private provider **(18)**	Feeling of disappointment because of the costs of private e-invoicing solution while the company was not operating. And the feeling that free e-invoicing solution could have been a good option.
E-Invoicing service renewal **(19)**		It corresponds to the first renewal of e-invoicing services, as both companies made agreements with private e-invoicing provider.
	Company operation	After almost a year and a half, company B

	reestablished **(20)**	restarted its operation.

4.3.2 Interplay between analysis and assessment

- **Retroduction among cases: postulated mechanism from empirical data**

For this stage (after implementation), the Table 4-13 presents the list codes (as a result of coding process from the interviews) used in the retroduction process. Causation coding was the input for the retroduction process.

Table 4-13: Retroduction among cases – After implementation

During implementation of e-invoicing			**Hypothesized mechanism**
	Causation codes	**Categories**	
Outer context	Easy to use	Technology features	Affordance mechanism
	Usefulness		
	Technology features		
	Software integration		
	Instantly reporting to public agency		
	Compliance	Regulation	Regulatory mechanism
	Change on regulatory framework		
	Support from provider	Provider agreement	Market mechanism
	Price / cost of e-service		
	Pandemic	Changes in the economic context	
	Economic restrictions		
	Lack of sales		
	Loss of clients		
	Loss of jobs		
Inner context	Less errors	Operational impact	Experience mechanism
	Saving time		
	Invoices deliver easily		
	E-invoicing benefits		
	Process integration		

	User training		
	Adaptation	Routinization	Appropriation mechanism
	Willingness to change working practices		
	Lessons learned		
	User engagement		
	Unwillingness to change the system	No intention to return previous systems	

- **Appropriation mechanism**

Appropriation is a new mechanism postulated from the analysis of empirical data collected after the implementation of e-invoicing in both companies. Regarding appropriation, this work draws in the definition given by Janneck (2009). It is defined as the process of adapting technology by users or groups of users to integrate it into their lives, practices, and (work) routines. de Vaujany (2008) define appropriation as the practices through which an artefact is made locally useful for a given purpose. As a mechanism, appropriation might explain the adaptation to the use of e-invoicing and engagement with its usage. Additional definitions for the appropriation concept are presented in Table 4-14.

Table 4-14: IT Appropriation definitions

Author(s)	Definition
(Wertsch, 1998 in Gonzalez Rubio, 2013, pp. 33)	*"Taking something that belongs to others and making it one's own"*
(Carroll et al., 2002, p. 2)	*"It is the way in which technology or technological artefacts are adopted, shaped and then used"*
(Carroll et al., 2003, p. 39)	*"Appropriation occurs where the users take possession of its capabilities in order to satisfy their needs"*
(Overdijk & Van Diggelen, 2006, p. 90)	*"The notion of technology appropriation implies a process of social construction in which the actions and thoughts of the user are shaped by the technology, while the meaning and effects of the technology are shaped through the*

	users' actions"
(de Vaujany, 2008, p. 7)	*"It can be defined as the practices through which an artefact is made locally useful for a given purpose by an actor"*
(Janneck, 2009, p. 153)	Process of adapting technology by users or groups of users to integrate it into their lives, practices, and (work) routines.
(Gonzalez Rubio, 2013, p. 54)	*"A process of social construction that allows an individual, a user group or an organization to make the technology their own"*

There are elements in common in the definitions given for appropriation concept, one of them is that it seems to occur in the after the usage of the new system, it is related with the continued usage of the technology and the adaptation of working practices. Appropriation as a mechanism has the power to explain events in relation with the continued usage (routinization) and in general the adaptation of the organization to the new system.

- **Evaluation of mechanisms (from literature) towards identified events.**

From the five mechanisms hypothesized based on the literature review, four mechanisms were found likely to explain the events identified at this stage (Table 4-15). The criteria followed for this is described in the appendix G (table G-1).

Table 4-15: Hypothesized mechanisms (from literature) vs events – After implementation

Mechanism postulated / **Events**	**Expectation**	**Experience**	**Affordance**	**Market**	**Regulatory**
E-invoicing usage starts **(13)**			**X**		**X**
Adaptation of working practices **(14)**		**X**	**X**		
Upgrade of e-invoicing service **(15)**		**X**		**X**	**X**

Delay on adaptation of working practices **(16)**			X	X	
Company operation interrupted **(17)**				X	X
Regret implementation of e-invoicing with private provider **(18)**		X	X	X	
E-Invoicing service renewal (with e-invoicing provider) **(19)**		X		X	X
Company operation reestablished **(20)**			X	X	

After matching events with the mechanisms from the literature, it can be noticed that the mechanism of affordance helps to explain the adjustment in working practices. Affordance mechanism at this stage operate through the e-invoicing service that now the organization can use and the possibilities it offers. The process of learning and migration involved the interaction with the new system. For company A the migration went from paper-based invoices to electronic invoices, company B went from computer-based invoices to electronic invoices. The interaction with the system allows to get an idea about the actual possibilities and restrictions of the new technology and to accumulate experience towards the routinization of the new form to issue invoices.

In the case of Company A, it also involved the adaptation to work with their client's e-invoices for the purpose of bookkeeping. On the other hand, specifically company A faced an upgrade in the e-invoicing system and experience, market and regulatory mechanism interacted in this event. For company B there was no need to upgrade the system as they started issuing invoices after the change in the regulatory framework and the technical requirements were met from the beginning.

Regulatory and market mechanisms might explain the events of pausing operation and the delay in adaptation of working practices, of course, under contextual conditions related with the ongoing pandemic.

- **Evaluation of mechanisms (from empirical data) towards identified events.**

Table 4-16 shows the results of the match between the identified events in this stage (after implementation of e-invoicing) and the mechanisms that might explain them. It includes the administrative literacy, intermediation and appropriation mechanisms postulated based on the empirical data from previous and current stage. And the criteria employed to do the match is described in Appendix G (table G-2).

Table 4-16: Postulation of mechanism (from empirical data) towards identified events.

Mechanism postulated / Events	Expectation	Experience	Affordance	Market	Regulatory	Administrative literacy	Intermediation	Appropriation
E-invoicing usage starts **(13)**			O		O		O	
Adaptation of working practices **(14)**		O	O					O
Upgrade of e-invoicing service **(15)**		O	O		O		O	
Delay on adaptation of working practices **(16)**				O				
Company operation interrupted **(17)**				O				
Regret implementation of e-invoicing with private provider **(18)**		O	O	O		O		
E-Invoicing service renewal (with e-invoicing provider) **(19)**		O		O	O		O	O
Company operation reestablished **(20)**				O				

From the interviews, it was found that four of the mechanisms postulated from literature are enough to explain the events observed after implementation of e-invoicing. They can be explained in terms of affordance, experience, market, and regulatory mechanisms.

Based on empirical data, experience, affordance, and market mechanisms accounts for explanation of most of the events at this stage (after implementation). Experience also plays a role in the long term and, market and regulatory mechanism keep the pressure towards the way of operation, and government is responsible for the upgrades of the system, which are events that directly affect organizations.

Intermediation mechanism will be present for as long as the companies keep a relationship with the private e-invoicing provider. Appropriation mechanism seems to explain the actual incorporation of e-invoicing into the company operation, not only by explaining the adaptation process, but also keeping the system (no changing the provider and not interested in going back to the previous system).

- **Evaluation of mechanisms**

Table 4-17 shows the match between events, mechanisms postulated from the academic literature and the ones that emerged from empirical data (in short, coincidences between Table 4-15 and Table 4-16). It can be noticed an overall good level of coincidence. There are three additional columns with regards to the new mechanisms identified (administrative literacy, intermediation, and appropriation mechanism).

Table 4-17: Assessment of mechanisms after implementation

Mechanism postulated / **Events**	**Expectation**	**Experience**	**Affordance**	**Market**	**Regulatory**	**Administrative literacy**	**Intermediation**	**Appropriation**
E-invoicing usage starts **(13)**			■		■		O	
Adaptation of working practices **(14)**		■	■					O
Upgrade of e-invoicing service **(15)**		■			■		O	
Delay on adaptation of working practices **(16)**				■				
Company operation interrupted **(17)**				■				
Regret implementation of e-invoicing with private provider **(18)**		■	■	■		O		
E-Invoicing service renewal (with e-invoicing provider) **(19)**		■					O	O
Company operation reestablished **(20)**			■	■				

Conventions	■	Coincidence (Theoretical and empirical corroboration)	O	Mechanism with empirical evidence

Like previous stages, the selected mechanism corresponds to those with empirical evidence and that help to explain more than one event. For this stage (after implementation), **experience, affordance, market, and regulatory mechanism interact to cause the identified events, but also intermediation and appropriation mechanism**.

The events at this stage relate to the routinization of usage of e-invoicing service and maintenance, empirical evidence suggest that activation of appropriation mechanism can explain the routinization, the adaptation of working practices. Support from provider is a key manifestation of intermediation mechanism, but in the context of the pandemic, restrictions of economy (market mechanism) played a role and affect the adaptation of working practices, especially in Company B, delaying the routinization as well. Affordance mechanism also plays a role as training continue while officially issuing e-invoices and the interaction between the organization and the technology is stablished in long term, also in relationship with upgrades of the e-service.

During usage, affordance mechanism also helps to explain events related to adaptation of working practices. The interaction of users and technology through time helps to the routinization of the new way to issue invoices. The outcomes of that interaction shape the adjustments of previous routines in the organizations. Employees also discover the possibilities of the technology to improve their performance, and they also learn how to solve common problems by themselves.

Finally, regulatory mechanism can be activated at any moment causing unexpected events inside the organization, for instance, Company A had to update the e-service used and also the registration initially made as a consequence of an update in the regulatory framework. Regulatory mechanism also ensures the continued usage of e-invoicing service.

- **Contextual conditions during the stage**

The pandemic and the restrictions in place had an adverse effect in the routinization of the usage of e-invoicing service. The events identified at this stage were surrounded by the following contextual conditions.

- ✓ Update in the regulation about technical aspects of e-invoicing (from validation after e-invoice delivered to the customer to validation before the e-invoice is delivered to the customer)
- ✓ Restrictions in economic activities because of the Sars-Cov-2 pandemic.
- ✓ New and practical information about implementation of e-invoicing published on the Internet, not only coming from the government itself, but citizens and accountants (e.g., Published on YouTube).
- ✓ Experience obtained from the participation in the uptake process in other organizations. The accountants interviewed helped other organizations in the uptake process of e-invoicing, considering the experience with their own organization, and at the same time gaining more experience that allows them to evaluate their own adoption and implementation process.
- ✓ Finally, Company A influenced the adoption and acquisition made by some of its customers. This is an example of how market mechanism is acts. One of its customers expressed: "*The idea is to follow the advice of the accountant and to acquire the service from the same provider they selected*" (Customer company A). The customer organization also said "*…the truth is that we never took the time to look for the free of charge e-invoicing service*" (Customer company A).

4.4 Chapter summary

Through this chapter the results of applying the methodological framework were presented. As this research follows a process perspective, events unfolding before, during and after implementation of e-invoicing (in context) were identified (Pettigrew, 1997). The data collected covered the period from the moment the organizations realized they had to use e-invoicing until a period of fully operation with the e-invoicing service.

Mingers (2006) multimethodology was followed for each period (before, during and after implementation of e-invoicing). The phases of appreciation, analysis and assessment were conducted, it means that each period of time was described, and events identified, then mechanisms that would explain those events were postulated and finally, based on empirical evidence the mechanisms that offered the best explanation were selected for the explanatory framework presented in the next chapter.

Different actors were identified during the process, they might have the power to influence, persuade or enforce adoption and use of e-invoicing service as shown in figure 5-2 (company A) and figure 5-3 (company B).

Within this context, three groups of users were identified with different powers: people perceive as experts might have the power to influence decisions and actions within an organization towards the e-invoicing service. Due to the nature of the e-service, experts can influence managers or accountants. The second group of users have the power to persuade whether internal members within the organization or within a commercial relationship, as it is the case of private providers trying to get clients to sell the service of electronic e-invoicing. The third group of actors have the power to enforce (it includes government agencies and customers), while government might enforce the owner of the business, customers might exert pressure on the people that issue invoices towards issuing electronic documents.

Particularly in case A, due to the business's operation (accountability services), company A might also influence customers towards the adoption of e-invoicing service, as they provide advice and guidance to them. On the other side, company B, might be able to persuade its suppliers. Figure 4-7 and Figure 4-8 represent the actors and power relationships identified in each organization studied.

Figure 4-7: Case A - Actors interaction towards uptake of e-services

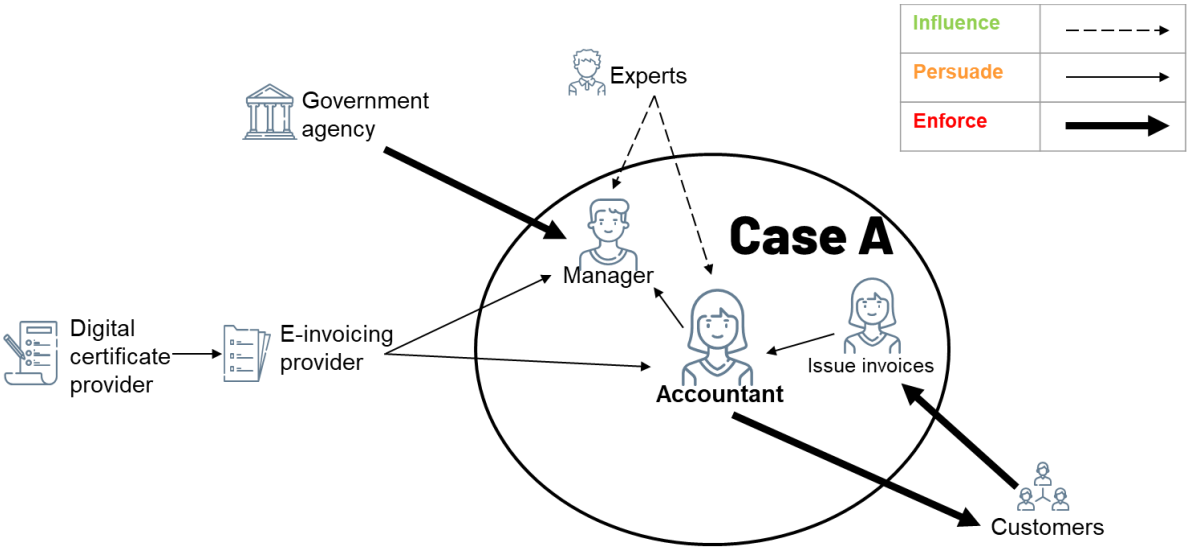
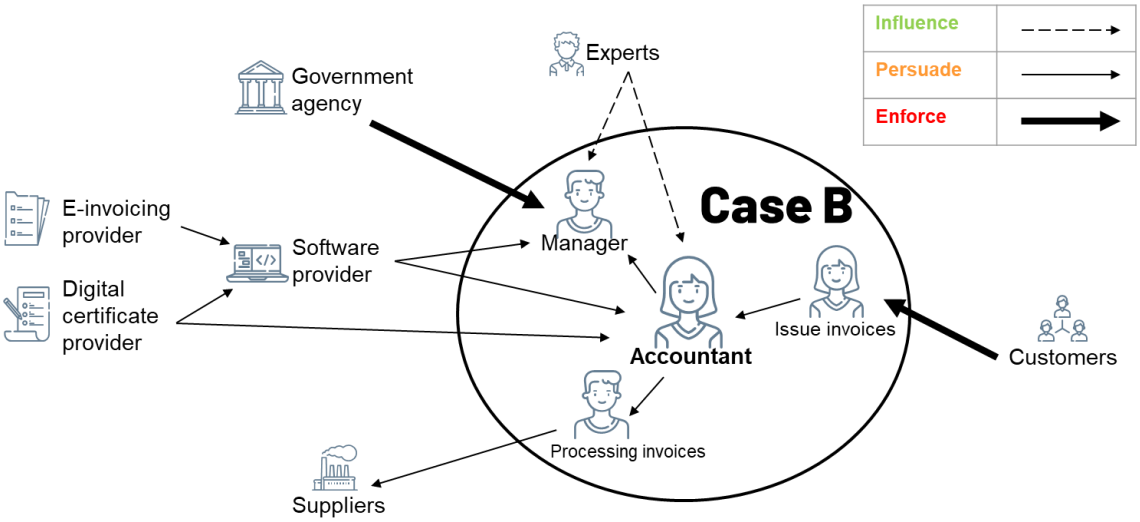


Figure 4-8: Case B - Actors interaction towards uptake of e-services



5. Towards an understanding and explanation of inter-organizational e-services uptake

This chapter presents the development of an explanatory framework to answer the study research question: **How do micro-businesses incorporate inter-organizational e-government services into their operation and what are the underlying mechanisms that explain their uptake[12] process?**

Based on the data collected and analyzed, events and underlying mechanisms were identified, alongside with stages. Thus, a level of reasonable certainty was reached, and it allows to present the following theoretical framework. The theoretical framework presented in this chapter goes beyond the description of a process, it explains how and why of the uptake process of inter-organizational e-government service of e-invoicing.

Because of the design of the research considered 3 cycles of data collection segmented in time as before implementation, during implementation and after implementation of e-invoicing, there are two points that should be noticed: an implementation should have been performed and the three cycles of data collection can be associated with IS life cycle pre-implementation, implementation and post-implementation (Huang & Yasuda, 2014). Therefore, phased based IS life cycle models were reviewed to perform a comparison between the empirical findings and the theory available. The phased-view of ERP implementation developed by Bajwa et al. (2004) has similarities with the process followed by the companies participating in this study.

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[12] As a reminder, in this document, uptake of e-government services refers to the process of adopting (decision towards usage), implementing and using e-services.

The phases of awareness, in which the need of IT solution is acknowledged and that eventually leads to adoption; selection, referred to the decision making towards the best vendor and package; Preparation, pre-project activities for the implementation; Implementation, it includes many and critical activities, both technical and organizational in nature; Finally, operation phase, it deals with system usage, maintenance and business integration (Bajwa et al., 2004).

Despite of similarities Bajwa et al. (2004) model and the empirical evidence of this research, the model of IS life cycle proposed by Duarte & Costa (2012) was found even closer to the process described by the companies adopting e-invoicing (Adoption Decision and Acquisition, Implementation, Use and Maintenance, and Decline). Nevertheless, the model is not enough to represent the reality uncovered in the case study, thus one stage was added (Information seeking) and one stage was left aside (decline).

Considering the empirical evidence presented in chapter 3 and the extant literature, the framework presented is divided into four stages and the mechanisms underlying them.

5.1 Uptake process of inter-organizational e-government services and underlying mechanisms

The input to develop the framework presented in this section consists of the empirical data collected before, during and after the implementation of e-invoicing in the cases studied.

Out of the first cycle of data collection (before implementation) two main moments were identified: first moment refers to a demanding period of search for information and second one refers to the moment of realizing they had the obligation of implementing e-invoicing and the selection of a provider.

The first moment then is called in the framework as “Information seeking” phase. Information searching occurs using different sources and using different channels. After the intense search for information, both companies confirmed that they had to implement e-invoicing. But still they had to make decisions regarding how to fulfil the requirement. Within the framework proposed this phase is called “adoption decision and acquisition” following the similarities to the phases of the lifecycle of information systems (Duarte & Costa, 2012; Saxena & Mcdonagh, 2017a). In this stage, both organizations made

decisions towards selecting an e-invoicing provider and pay a fee to get e-invoicing implemented.

During the implementation of e-invoicing (second cycle of data collection), the activities were mainly technical they responded to the technical and operational tasks needed to get access and do the settings and paperwork for the organization start issuing e-invoices. Within the framework proposed this phase is called in the same way "implementation" it also shares the features of the implementation phase of the lifecycle of information systems (Duarte & Costa, 2012; Saxena & Mcdonagh, 2017a).

In the last cycle of data collection, after implementation of e-invoicing, both companies started to operate using e-invoices, they had to keep learning and also adapting working practices, at the same time and in long term they must keep paying the renewal of the agreements with the e-invoicing provider, and also watch out for changes in the regulation and updates of the software. Thus, within the framework proposed this phase is called in the same way as the last phase of the lifecycle of information systems (Duarte & Costa, 2012; Saxena & Mcdonagh, 2017a), "use and maintenance".

The framework proposed is then divided into four phases: *information seeking, adoption decision and acquisition, implementation, and use and maintenance.* The sequence of events observed in the case study carried on were grouped into those four stages[13] as explained previously. **Information seeking** includes the set of activities conducted by the organizations towards getting informed about the e-government service in terms of technical and legal requirements. **Adoption decision and acquisition** stage involves the acceptance of the inter-organizational e-government service, the explicit intention to adopt it, and the selection and acquisition of a product that best fits the needs of the organization and that fulfil with the requirements demanded by the governmental agency. At this stage, organizations can include the selection of a technological provider, who can also be understood as an intermediary in this context of inter-organizational services. The **implementation** phase comprises the configuration of the technological product that will exchange information and the legal paperwork required to start operation. In the case of a

[13] Adoption decisions and acquisition, implementation and use and maintenance names for the stages were kept from Duarte & Costa (2012).

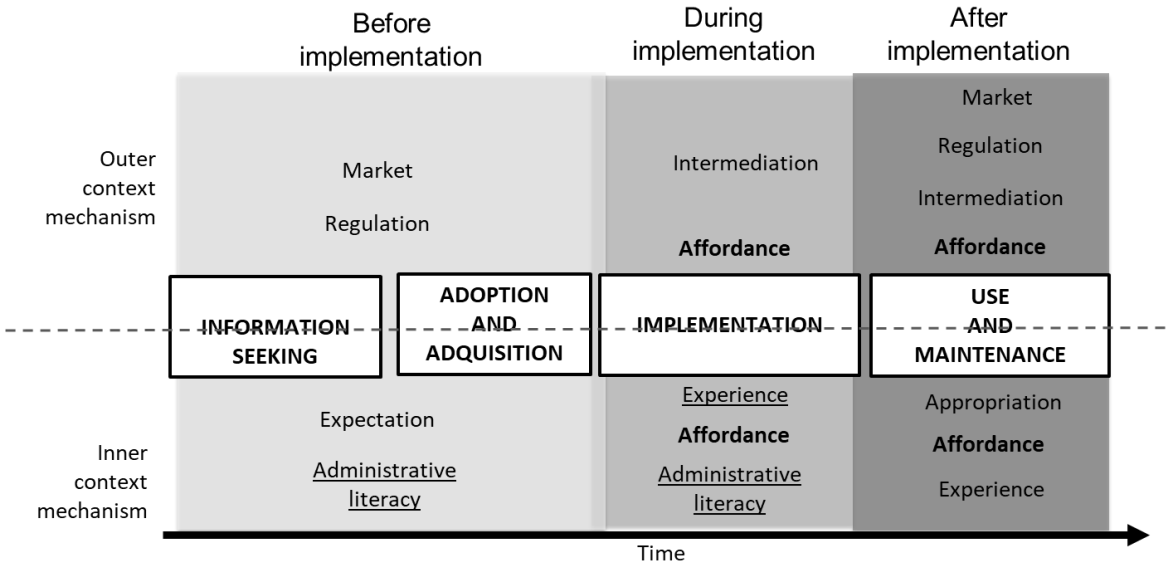
provider involved, there is frequent interaction with the it. The **use and maintenance** stage involves the continued usage of the e-service in the organization and the upgrades when required.

Each stage suggests the presence of mechanisms that explain the events occurred during the phase and the movement towards next stage. Along all the process eight mechanisms were identified: regulatory, market, intermediation, affordance, administrative literacy, expectation, experience, and appropriation mechanism. **Regulatory** mechanism operates at the outer context of the organization, it is related to the set of rules that governments made to regulate or adjust the behavior of their constituents, whether to motivate, to persuade or to enforce the desired behavior. **Market** mechanism also operates at the outer context of the organization, it emerges from the interaction of different actors such as suppliers, clients, experts, competitors, and it affects decisions, activities, plans; in short, the behavior of the organization. Likewise, **intermediation** mechanism operates at outer context, and it is activated mainly due to the limited capabilities of the organization. In the private-public sector relationship, it might contribute to bypassing the red tape of the organization and to fill the gap in knowledge or skills, thus it also can explain changes in the organization behavior. **Affordance** mechanism, in the context of inter-organizational services operates at both, inner and outer context of the organization. It is defined as action possibilities that arise from actors interacting with technology (Faraj & Azad, 2012). **Administrative literacy** mechanism operates in the inner context of the organization; however, its activation highly relies in the features of the outer context. It refers to the ability to obtain, process, and understand information from public organizations and then being able to act upon it (Döring, 2018; A. Grönlund et al., 2007). **Expectation** mechanism operates in the inner context of the organization, it reflects anticipated behavior. Users form expectations and perceptions towards technology (Davis, 1989; Lian, 2015; Shao et al., 2015; Arendsen et al., 2006; Chwelos et al., 2001; Tung & Rieck, 2005), and it could influence their intention to use e-government services. **Experience** mechanism also operates in the inner context of the organization. Experience with the technology or with similar technologies, or similar processes affects user attitudes towards initial and continued usage of a given technology (Piehler et al., 2016; Teerling & Pieterson, 2011) including e-government services. Finally, **appropriation** mechanism acts in the inner context of the organization, it relates to the

adaptation of technology into the practices and work routines of the organization (Janneck, 2009).

Based on the theoretical and empirical evidence, Figure 5-1 shows the theoretical framework for the uptake process of inter-organizational e-government services and its underlying mechanisms. Each stage is then influenced by the enactment or inactivation of a set of mechanisms, some of them can participated in more than one stage. The next subsections present each stage and the mechanisms associated with it.

Figure 5-1: Theoretical framework uptake process of inter-organizational e-government service



5.1.1 Information seeking

In the context of mandatory usage of a given e-government service, once regulation is released, businesses need to be informed about what they must do. In this sense the first activity then is related to know what they have to do (what the task is), and how to do it, which is called “task awareness” by Madsen & Kræmmergaard (2016). To be aware of the task, a process of information seeking is triggered. Information can be obtained from sources by using channels (van den Boer et al., 2017). Thus, the e-government informational and interactional services provided by government should fulfill convenience to be used in relation with the main task. During this phase multiple channels and sources can be employed and other actors different from governmental agencies can be involved.

The time that the process of seeking for information takes depend on the task complexity (van den Boer et al., 2016) but also on the access possibilities to information that meet the needs of the organization. Based on the DOI, information seeking is also a process that precedes adoption decision (Rogers, 1995).

During this stage, two activities happen at the same time, search for information but also comprehension of the information obtained. Information seeking involves sources and channel choices and it refers to the process of getting and understanding information about the task (implementation and usage of e-invoicing, in the context of this research). Obtaining information and processing it are activities that occur in a loop until a minimum level of knowledge to act is reached. However, these activities continue operating when required within any of the other stages towards uptake of inter-organizational e-government services.

The time spent by the organizations in this stage depends on the task complexity (Byström & Järvelin, 1995), but also on the availability of information and the convenience to access it, alongside with the way in which it is presented.

- **Regulatory mechanism**

During information seeking stage, regulatory mechanism operates through the legal framework in place, particularly the regulation imposed by the government towards the implementation of e-invoicing by all firms that included a deadline to start issuing electronic invoices that fulfill with the legal requirements, and that also met the technical requirements to exchange data in “real time” with the public agency.

Regulation operates at the outer context of the organization through the public agencies responsible for the inter-organizational e-service, as regulation has the power to regulate and modify behaviors of private sector firms. Thus, after legislation was released, it caused that organizations started looking for information about the matter as “*the first thing you do is to look for the regulation and start reading to find out who are the obligated parties, what are the deadlines, what are the conditions*” (Accountant 1A).

Although the search for information started with the reading of the regulation itself, the search goes beyond, as “… *one starts with the regulation. And it is very theoretical, that you don't get to see like the scope of how it really is and how it is that the issue works”.*

Thus, apart from the reading of legal documents, users look for information about how to deal with the obligation (of issuing electronic invoices and transmit the data to the governmental agency) as expressed by some respondents:

> *"I have attended all the trainings since the beginning of the electronic invoicing, so I have attended all the trainings and one ask and people ask, then one also learns from what others talk, say and ask*" (Accountant 1B).

> *" I also went to the office and I had an interview with the head of customer service and he very kindly made me sit, made the engineer come to the office, and the engineer told me how the whole process was and then he told me 'when you are doing it if you have any doubt, then come and I can help you', so far so good, but when I asked about the free service and the free signature they told me that they were not well informed about the process, so I should come back another day" (Accountant 1B)*

> *"But the biggest doubt that arose was with respect to the suppliers that were authorized. Because we thought, well, who are we going to hire? That was like the biggest doubt at the time. Who do we ask? Where do we quote? What are we going to do? Because there was a lot of ignorance about it"* (Accountant 1A)

> *"Because one reads the regulation, but... and well, what about the provider? and how do I register? and how do I do it?" (Accountant 2A)*

> To sum up, regulation in place triggered an intense process of looking for information in order to solve the doubts that emerged after it was released. Eventually organizations reach a minimum level of "task awareness" to continue the process towards uptake of the e-government service.

- **Market mechanism**

Market mechanism also participates during the search for information stage, at this point apart from the government and the legal documents, colleagues, experts, and other businesses (providers and customers), even media are also sources of information. Individuals and businesses alike can help the organization to solve their doubts and provide guidance based on their knowledge and own experience. In fact, the organizations realized they had to use e-invoicing because of actors different from government itself.

In the case of Company A, they realized they were obligate to implement e-invoicing because, as expressed by one respondent: "*our boss, since he is also an accountant and lawyer and he spends his time studying and keeping an eye on all that, he was given the initial decree in one advisor, and he passed it on to us so that we could read it, study it and see what we had to do*" (Accountant 1A)

In the case of Company B, the main accountant expressed: "*I am reviewing from time to time, I belong to groups of accountants, so we are looking at what is coming out, we are studying new topics, and we are looking at what should be done*".

Based on the above, it can be noticed that market mechanism also participates in the searching for information, through different actors.

- **Administrative literacy mechanism**

Based on the empirical evidence, administrative literacy mechanism was not fully activated during this phase. However, it also operates during the search for information. Administrative literacy is defined as the individual's ability to navigate bureaucracy, and hence being able to know where to go to get information and then, being able to act upon it (A. Grönlund et al., 2007). In this sense, administrative literacy is a mechanism that underlie the search for information. If present the behavior of the businesses its likely to have been different, thus its inactivation also explains the events at this phase.

Although the empirical case suggests that both companies (A and B) could navigate bureaucracy, they did not always get the information they were looking for, thus preventing the actions they would have carried on based on the information they were expecting to know. Respondents expressed that at this stage:

> *"At that time, it was very complicated because nobody knew anything. If you called the lines they did not know, if you wrote through the chat they did not know, if you went directly to the DIAN, nobody knew so that is why the decision was made to paid to a private provider. That they had the information and the platform designed"* (Accountant 1A).
>
> "*And then, they don't tell you, yes, no, nothing. And also, at the beginning we had many inconveniences because we went to the DIAN (governmental agency) and we knew more about it than they did*" (Accountant 2A).

"When I asked about the free service and the free signature, they told me that they were not well informed about the process, so I should come back another day" (Accountant 1B).

5.1.2 Adoption decision and acquisition

At this stage users (organizations) have an acceptable level of awareness about the task imposed in the regulation and how to solve it, and many of the doubts that emerged at the beginning are solved. Thus, users move to the stage of "adoption decision and acquisition", it can be understood as an initial acceptance of the e-service. It is formally or explicitly accepted that they will have to incorporate e-invoicing into their organizations and share the data in "real time" with the governmental agency.

At this point the organization is aware of what they must do to fulfill based on the regulation and has a good idea of the implications of implementing e-invoicing service. According to Duarte & Costa (2012) at this phase there is an analysis of the market to find which solutions are available and to understand which of these have a match with the needs of the company. Particularly, for the case study conducted in this research, organizations had three ways to get implemented e-invoicing service: (1) via free of charge e-invoicing service provided by the public agency; (2) developing its own e-invoicing system that fulfill technical and reporting requirements; or (3) via private e-invoicing provider (an intermediary).

From the beginning microbusinesses discarded the option of developing an information system to issue e-invoices and exchange the data with the public agency. This left two options, whether to use the free of charge e-invoicing platform or to get a solution from a private provider. Based on different considerations, both organizations eventually reached a decision, and both selected the latter option, leading them into a process of private provider selection. The mechanisms that best explain this stage are described below.

- **Regulatory mechanism**

For the adoption and acquisition stage, regulatory mechanism also operates at outer context of the organization as the government not only mandate the obligation for implementing e-invoicing and transmit the data, but it also regulated the market of private providers. A company only can get e-invoicing from an authorized provider that fulfill with

the legal and technical requirements to offer e-invoicing. This situation limits the choices of companies that opted for this option to get implemented e-invoicing. However, at the same time this situation helps companies to know which third company (intermediaries) is able to provide what is needed to fulfil with the regulation.

- **Market mechanism**

Market mechanism is identified through different factors and actors. It operates at the outer context of the organizations. Although micro-businesses themselves are not a the most attractive customer for e-invoicing providers as usually the volume of invoices issue monthly is low compared to large organizations, micro-businesses together constitute an important market niche. Thus, providers implement marketing strategies to persuade obligated organization to purchase their services. This situation influences the choices made by the obligated organizations, alongside with different factors that the buyer organization might evaluate such as costs, benefits, compatibility with existing IT infrastructure, among others.

On the other hand, experts and colleagues can also exert influence in the adoption decision and acquisition. Company A itself influenced the adoption decision and acquisition of other organizations (its clients) as mentioned by accountant 1A: *"With our customers it was the same, we had to call them all, tell them we are going to start invoicing electronically, please stay tuned"*. New adopters might be tempted to implement what other organizations are already using, however costs and benefits are relevant factors influencing the decision as well, as expressed by respondents:

> *"So, at the beginning it was very complicated and in addition to that... we had to get a technology provider, but the technology provider has to be authorized and where do I get a technology provider? initially it was like word-of-mouth, well, I am issuing invoices with this one so give me the contact and I will call it and ask it"* (Accountant 1A).
>
> "*We were recommended this provider, we quoted with this one, we quoted with another one. And this one was cheaper*" (Accountant 1A).
>
> *"Yes, the idea is that, with the advice of the accountant, we are going to use the same supplier that they have*" (Company A's customer).

> *"The accountant gave us the telephone number; we contacted the provider and selected a service that included 500 electronic invoices per month" (Company A's customer)*
>
> *"I was looking at another, I asked for example with [name of e-invoicing provider company], the consultant told me (very honestly): 'look, we offer both the signature and the software, but you are very small, and for the amount of information that you are going to start transmitting it will be very expensive', he said. Well, he did not give me more information, but he offered me much higher prices than what my software provider could give me and that it was also probable that it was not integrated with my system, that is, it would simply send and receive the answer from the DIAN. So [name of the current software provider] is more about speeding up processes and not delaying my current processes"* (Accountant 1B)

In the academic literature towards acceptance and adoption of technology many factors that can be understood as a manifestation of market mechanism can be mentioned such as social influence, interpersonal influence, external influence, trading partners' pressure, competitive pressure (Alomar & de Visscher, 2017; S.-Y. Hung et al., 2012; Naggi & Agostini, 2011; Olaleye & Sanusi, 2017).

- **Expectation mechanism**

Within the adoption decision and acquisition phase, expectation mechanism plays a role in the decision-making process. Based on the information obtained during the information seeking stage, organizations form expectations towards the uptake process, technology itself, the effort they must make, the benefits they would obtain, etc. and those expectations influence the decisions they make (Arendsen et al., 2006; Chwelos et al., 2001; Shao et al., 2015; Tung & Rieck, 2005).

For instance, company B selected as e-invoicing provider the same company that provide them with the accountability software, the company B expected that it would bring more benefits as it would be fully integrated to the current system, it would be easy to use as they would use the same interface and they would use the already existing data of their customers and products, and it also would make the organization improve their processes.

"The [current software provider] is going to be the e-invoicing provider, so I have the advantage that everything I perform in the system will be generated as electronic, it will be transmitted and apart from that, it will be stored for a long time" (Accountant 1B).

"So [name of the current software provider] is more about speeding up processes and not delaying my current processes" (Accountant 1B).

- **Administrative literacy mechanism**

At the inner context of the organization, administrative literacy mechanism plays a big role for the adoption decision and acquisition of a e-invoicing service. However, it could not be fully activated because of the contextual conditions.

When activated, users can access to the information they need and they are able to understand that information and, thus, act upon it. Although, both organizations had in mind to implement the e-invoicing service offered at no cost by the governmental agency, they could not get the information needed to do so. Delays in responses or not responses received from their inquires prevent the access to the free e-invoicing service. In other words, the lack of fully enactment of administrative literacy mechanism explain why they did not access to the free e-invoicing service and instead they selected a private e-invoicing provider.

For instance, regarding the selection of the e-invoicing service offered by the public entity, company A expressed: "*So we said, let's try it ourselves, we are the ones who are going to start issuing e-invoices and we will see how likely it is to do it that way or not, but the truth was that it was not possible... they never answered at convenient time about the process, they did not give us an answer, so it was easier to do it with the private company"* (Accountant 1A).

Company B was also interested in using the free e-invoicing service, but in December 2019, the accountant said: *"I cannot wait any longer because it is already time. I am waiting from October, and it is already December. I waste, let's say, 3 months, and now it is time to buy the one from [name of e-invoicing provider], no more, because I need to do the tests and they are going to demand tests, even though they do not give me an answer, I need the tests first in order to comply with the obligation and then they will tell me that there were other options"* (Accountant 1B).

Because of the lack of information available about the free e-invoicing service, both companies discarded as the solution to comply with the regulation. In other words, administrative literacy could not be fully activated.

5.1.3 Implementation

The implementation phase primarily deals with the technical configuration of the e-invoicing system to issue e-invoices but also to exchange the data with the governmental agency, but also with the paperwork to get the authorization to migrate from paper or computer-based invoices to electronic invoices. Likewise, this stage includes the training of the future users (Duarte & Costa, 2012).

- **Affordance mechanism**

Affordance mechanism helps explain how a given technology can support or restrict a set of specific usage with reference to a specific user (Leonardi, 2011). It does not refer merely to specific features of the technology but also to the capability of the organization to appropriate the technology artifact (Zammuto et al., 2007). Thus, affordance mechanism manifests at this stage mainly through technical components.

For each company the implementation stage was different as they selected different providers and software solutions. For case A, the software solution selected had some constraints, it did not provide integration with the current accountability software. The data about customers and products needed to be migrated from the current system to the e-invoicing system. In case B, the e-invoicing system was fully integrated with the current accountability software, so there was no need to migrate data and also, case B keep using the same interface to issue electronic invoices.

Whereas company A could not try the system before it went into real, company B participated in the testing process towards issuing e-invoices and electronic debit and credit memos and transmitting the data to the governmental agency.

- **Intermediation mechanism**

Intermediation mechanism operates at outer context of the organization. In fact, it is activated because of the lack of fully enactment of administrative literacy mechanism. Thus, intermediation help to fill the gap in knowledge and skills in the organization and it

has the power to explain the change in the role of the organizations during the implementation process, as well as decisions they make.

Intermediaries have long existed in the field of public administration, they do not act on behalf of public agencies, but they are mandated by constituents to reduce their bureaucratic burdens. They also play a role in e-government context. They can be considered as another channel to interact with governmental agencies, sometimes they can prevent e-government self-services usage, but they can help businesses to adopt e-government services, specially within the context of IOS. By using intermediaries, companies are relieved of their bureaucracy burden and can focus on their core business activities (Löbel et al., 2016).

> *"When we went to set it up [e-invoicing connection to report the data], there were some things missing to be able to synchronize and I could not do it. It was definitely up to them [software provider company] to do it. Although it was their obligation. It was their obligation, what happened is that since they did not have it for me on the time and I needed it, I got my hands on it, but I did not know how to do it, and they solved it"* (Accountant 1B).

- **Experience mechanism**

Experience mechanism operates at inner context of the organization. It can be activated when a company is addressing a similar situation or using the same or a similar system in present that previously used. Previous experience would influence future decisions, and it affects user attitudes towards the system (Bhattacherjee, 2001; Piehler et al., 2016). As nor Company A nor Company B had previous experience with systems of this kind, experience mechanism could not be entirely activated, yet it causes the activation of other mechanisms such as intermediation mechanism.

On the other side, implementation activities also involved to get authorizations, regarding identification numbers for the invoices to be issued, regarding the date from which the company started issuing electronic invoices, etc. this paperwork was performed through the governmental agency self-service platform. Although the e-invoicing providers participated in these activities, both organizations (case A and B) had enough knowledge and experience to actively participate in getting ready the paperwork needed.

- **Administrative literacy**

Administrative literacy mechanism operates at inner context of the organization. During implementation, parallelly to the technical configuration of the system, companies need to perform paperwork so they can start issuing electronic invoices. Even though companies are already familiar with the paperwork required to issue invoices, it is likely that with the new system procedures have changed, new websites or procedures are implemented. In this sense they still need to know how to navigate bureaucracy and to understand what needs to be done. If the mechanism is not fully activated, meaning there is a lack of administrative literacy in the organization some events can be explained as for instance the struggle to perform the paperwork by themselves. But at the same time, intermediation mechanism interacts with administrative literacy, as intermediaries bridge the gap on knowledge.

5.1.4 Use and maintenance.

At this stage, the users are working with the e-invoicing system in their daily life. As the organizations cannot influence changes in the systems, it could be necessary to do some adjustments in their own working practices and organizational processes. Systems also require regular maintenance and upgrades, so the organizations need to be able to perform these activities whenever required. It is important that the users understand the usability of the system and that they perceive that it brings added value to their work (Duarte & Costa, 2012).

During the period covered in this research, both organizations (case A and B) started using e-invoicing system. It implies that they face a period of getting familiar with the systems and the electronic invoices, they informed their clients about the new invoices. Particularly, Case A has to enter the data of customers and products before start issuing e-invoices, and they also had to upgrade the system due to changes made by the governmental agency in charge of taxes and customs (DIAN). Case B got the e-invoicing functionality completely integrated to the current accountability software and they could use the existing database for customers and products.

- **Market mechanism**

Businesses receive invoices from their suppliers and issue invoices to their customers. Invoices can contain mistakes that need to be remedied before making payments, some customers might prefer invoices to be delivered electronically, whereas other prefer an invoice to be printed. The volume and value of invoices issued also depends on the number of transactions with clients, market position and macro-economic context of the firm.

Both companies were at the use and maintenance stage at the pandemic due to novel coronavirus Sars-Cov-2 was declared (March 2020), and as a consequence of the restrictions in commercial activities, both companies (case A and B) were negatively affected in their economic operations.

Company A face a reduction in their number of clients and company B was forced to stop their operation completely. In terms of the routinization of usage of e-invoicing, especially company B faced a delay, they did not issue any invoice in the period from April 2020 to September 2021. Yet, during this period of time, they had to pay to the private e-invoicing provider the fees agreed for the service.

On the other hand, as the massification of electronic invoicing was happening, more information was published about the procedures, software available, and more knowledge was shared among colleagues. Because of this, both companies could reflect on its own implementation process and at this point, both considered that they could have implemented the free e-invoicing service by themselves. However, they won't change their providers because they trust in the support offered, but it is not the case for the free of charge e-invoicing service, they do not trust they can access to support if needed.

> *"In the moment that the platform crashes, I have no one to call to ask for help. Because the moment it generates an error, I have no one to call for help. Because the moment I have any doubts about how to handle it, it is complicated. Whereas if I am paying, for example to [e-invoicing provider name], I call support immediately. If I see that the platform is down, what do I do? do I send a screenshot? or what do I do? Give me some explanation"* (Accountant 1A).

- **Intermediation mechanism**

As the system needs to be maintained, the relationship with the intermediary also needs to be maintained. During the operation with the new inter-organizational service the contract with the intermediary needs to be renewed. The support offered is key no maintain the operation working. The presence or absence of the intermediary explain events during operation time.

- **Affordance mechanism**

Affordance mechanism mainly operates through the features of the e-invoicing system implemented. At this stage, companies are fully operating with the new e-invoicing system, thus, the interaction between employees and the technology finally allows to learn, adapt, evaluate the possibilities of the new system.

As case A migrated from paper-based invoices to electronic systems, the person in charge of issuing invoices value that it was easy and help her to save time and avoid mistakes:

> *"It is easier than paper-based invoicing. In the paper-based one, if you damage it, you will have to cancel it and make the next one from the beginning, here you have time to review it, you make a pre-invoice and you can make the modifications you want before sending it. I can duplicate any invoice and modify if I needed a similar one. The only way you cancel an e-invoice would be because the client does not receive it. I put the values and calculate the VAT separately as well, how much is the VAT to be invoiced and verify"* [Secretary 1A].

On the other side, Case B also value the integration of the e-invoicing system with the accountability software, they are interested on keeping the same provider, otherwise they would lose that integration "*another one is not going to provide integration, which is kind of the advantage I value in having it within the same software provider"* (Accountant 1B).

There have been also common unexpected situations with the e-invoicing systems at both organizations (even though they use different software and selected different providers). Because the reporting of the data to the governmental agency must be done in "real time", sometimes the transmission of the data takes time and they hesitate in how to face this situation, do they should wait? For how long? How can I resend? In this situation,

support from the provider help them to deal with the delay, whether entering to the system or explaining the reason for the situation.

- **Regulatory mechanism**

Similar to the early stages of the uptake process, regulation still plays a role during the operation of the company using e-invoicing. Government is responsible for the upgrades of the e-service whether in legal or technical aspects, but also government oversight function. Thus, the way companies adapt their practices to issue e-invoices and to process incoming e-invoices is somehow limited by the legal framework.

- **Appropriation mechanism**

Appropriation mechanism operates at inner context of the organization. It explains the adaptation of working practices in both organizations, but also it explains that organizations do not consider going back to the old invoicing system. Users are engaged using the new e-invoicing system as they perceive benefits from its usage.

Because of the mandatory usage of e-invoicing, users do not have choice in using the system, however, they are not rejecting the new system, instead they are incorporating it into their operation and individual working practices.

- **Experience mechanism**

The way experience mechanism operates at inner context of the organization, it also related to the adaptation of working practices. In both organizations there were lessons learned, as they started using it regularly, a better comprehension of the new e-invoicing system. Also, after having went through the search for information and the implementation process and as they keep operating with the system, both organizations get experience on how to solve future similar problems or common problems that might appear.

5.2 Mechanisms' interaction

Some contextual conditions surrounded the entire uptake process of e-invoicing from the moment the regulation was released until the fully operation of the companies with the e-invoicing system. Also, mechanisms can be activated or not based on contextual

conditions another mechanisms presence or absence. The context that encompassed the uptake process described and explained in this study includes the following conditions:

- Regulations made e-invoicing mandatory for companies of all sizes, and it also set deadlines to start operation.
- Both companies are classified as micro-businesses under Colombian law.
- A Pandemic was declared and restrictions in economic activities last for almost two years in Colombia.
- More than 80 private e-invoicing providers available in the market (based on the authorization
- Three options to get implemented e-invoicing (own software, private provider, free of charge e-invoicing service provided by the public agency DIAN).

Regarding the interaction among the mechanisms identified in this research, the Table **5-1** shows the closest relationship between mechanisms. Regulatory mechanism is mainly related to administrative literacy mechanism as both operate towards the regulatory framework applicable to the organization and the e-invoicing itself. Although regulatory mechanism operates at the outer context if deeply affects the inner context of the organization. Similarly, Market and Intermediation as closely related, an intermediary is in principle part of the market, but once there is an official agreement, it acts on its own. Market can also affect expectation as the offers and information provided to the organizations can shape expectations.

Regarding affordance mechanism, it is identified that it interacts also with expectation, experience, and appropriation. As a reminder, affordance is related to the possibilities that emerge from the interaction of the user with the technology. At the beginning expectations can be formed based on the features of the technology, however, based on the experience and appropriation the affordances can vary and also their potential effects.

Administrative literacy, apart from interacting with regulatory mechanism, is also related to intermediation mechanism. In fact, the gap in the knowledge that companies can face in regard to regulatory framework is usually met by intermediaries. They become experts in the legal framework so to respond to the needs of companies.

Finally, intermediation mechanism plays a role in the enactment of the appropriation. When intermediation mechanism is activated, the conditions to adapt practices are favored.

Table 5-1: Mechanisms' interaction

Mechanisms	Regulatory	Market	Affordance	Expectation	Experience	Administrative literacy	Intermediation	Appropriation
Regulatory						**X**	**X**	
Market				**X**			**X**	
Affordance					**X**			**X**
Expectation								
Experience								**X**
Administrative literacy							**X**	
Intermediation								**X**
Appropriation								

5.3 Discussion of the results

The main findings of this research are presented in the following table 5-2 and compared to previous literature.

Table 5-2: Findings vs previous literature

Main findings in this research	**Previous literature**
Mechanisms of **expectation, experience, market, regulation and affordance** have a significant role in the uptake process.	This finding is consistent with previous literature as they emerged from variance theories used in the field of e-government (Correa Ospina et al., 2021).

Information seeking behavior as an explicit stage.	This finding aligns with Madsen & Kræmmergaard (2016). In the context of citizens, they expanded Teerling & Pieterson (2011) channel choice process model by adding **'Task awareness'** as the initial step. Van den Boer, Arendsen, Pieterson and others (2011, 2012, 2014, 2016, 2017) have addressed the topic of **information seeking by businesses, and sources and channel choices** by businesses. However, it has not been studied as part of uptake process of transactional e-services.
Administrative literacy mechanism	The concept of administrative literacy has been explored as a requirement for using e-services by citizens (Grönlund et al., 2007; Cestnik & Kern, 2014; Döring, 2021). In this research it was found that it is also important as a driver in the context of businesses. And results are also in agreement with previous research about the convenience of the e-services and not only the ability of the user. Which is coherent with the socio-technical theory postulates.
Intermediation mechanism	Within the context of e-government, intermediaries have been found to play an important role in the adoption of e-services (Janssen & Klievink, 2008; Al-Sobhi et al., 2010; Weerakkody et al., 2013; Sharma & Mishra, 2017). In this research they dynamics of the intermediation play relevant role during and after the implementation of e-invoicing.
Administrative literacy mechanism	The concept of administrative literacy has been explored as a requirement for using e-services by citizens (Grönlund et al., 2007; Cestnik & Kern, 2014; Döring, 2021). In this research it was found that it is also important as a driver in the context of businesses. And results are also in agreement with previous research

	about the convenience of the e-services and not only the ability of the user. Which is coherent with the socio-technical theory postulates.
Intermediation mechanism	Within the context of e-government, intermediaries have been found to play an important role in the adoption of e-services (Janssen & Klievink, 2008; Al-Sobhi et al., 2010; Weerakkody et al., 2013; Sharma & Mishra, 2017). In this research they dynamics of the intermediation play relevant role during and after the implementation of e-invoicing.

Regarding how different theoretical perspectives can contribute to understand the different stages of the proposed framework, Table 5-3 presents a possible link between phases uncovered and existing theoretical perspectives, noticed that some of the theories mentioned in the table are not presented in the Chapter 1, it means the studies using those theories for businesses uptake of e-government services were not found in the literature review.

Table 5-3: Stages - Theoretical perspectives

Stage	**Theoretical perspective**	**Explanation**
Information seeking	Theory of planned behavior Media richness theory	TBP assumes that decisions are rationally made, in this sense its constructs help to explain the information seeking stage and their mechanisms. On the other hand, at this stage, MRT also help to understand the selection of channels to get the information needed.
Adoption decision and acquisition	Expectation theory Task Technology Fit	Specially the acquisition of the technology to fulfill with the e-invoicing requirement highly relies on expectations formed

		based the enactment of market mechanism, but also task technology fit model helps to explain how to select the best option for the company. For instance, there were three possible channels to implement e-invoicing (authorized provider, own software, free of charge platform). Each company selected the best option to fulfill the task.
Implementation	Technology Acceptance Model	Based on the findings of this research, TAM (its constructs) can help to understand the implementation phase. Before the actual implementation, users had not had the opportunity to visualize and interact with the technology, thus they did not have perceptions about the technical system, they just had expectation. But once they got access to the technology judgements about how easy to used or useful it is started to be formed.
Use and maintenance	Domestication theory	New technologies become domesticated, a process of transformation that goes from seeing an artifact as radical, exciting, unfamiliar, or possibly even dangerous, to seeing it as

		routine, mundane and an ordinary part of life.

5.4 Chapter summary

This chapter presented the theoretical framework that answer the research question: How do micro-businesses incorporate inter-organizational e-government services into their operation and what are the underlying mechanisms that explain their uptake process? The framework identifies eight mechanisms that manifest across four phases of the uptake process. Empirical evidence for the framework is also presented through the chapter. Table 5-4 presents the uptake stages vs the mechanisms identified.

Table 5-4: Summary of the uptake stages and underlying mechanisms

Mechanisms	Uptake stages			
	Information seeking	**Adoption decision and acquisition**	**Implementation**	**Use and maintenance**
Regulatory	X	X		X
Market	X	X		X
Affordance			X	X
Expectation		X		
Experience			X	X
Administrative literacy	X	X	X	
Intermediation			X	X
Appropriation				X

6. Conclusions

This chapter concludes this thesis. It comprises four subsections: section 5.1 presents a brief summary of this research and the chapters of the thesis; 5.2 presents a general conclusion of the findings; section 5.3 discusses the contributions of this study; and finally, section 5.4 outlines future research in the topic.

6.1 Short summary

This dissertation was divided into three parts, each part responds to one of the specific objectives of this research. First part is constituted by Chapter 1 presenting the background for this study; the context, and a literature review in the topic of adoption and usage of e-government services by businesses. This led to the study of the uptake of inter-organizational e-government services by microbusinesses, and e-invoicing as a specific case of inter-organizational service.

Chapter one, responds to the objective of identifying in the academic literature, constructs, theories, and models related to the uptake of e-government services and characterize them. Based on the literature review it was identified that research has been mainly focused on acceptance/adoption and by identifying factors towards intention to use (using variance theories) has tried to predict the usage of e-government services by uncovering a plethora of factors influencing intention to use e-government services by businesses. This meant that research addressing the phenomena of usage or e-government have not really considered the uptake as a process, and instead have mainly paid attention to adoption decision, which can be seen as part of the process. Therefore, the research question for this study was: **How do micro-businesses incorporate inter-organizational e-government services into their operation and what are the underlying mechanisms that explain their uptake process?** Based on factors identified in the literature review towards the usage of e-government services by

businesses, five mechanisms were postulated as explanation of uptake of e-government by businesses: expectation, experience, affordance, regulatory and market mechanisms.

The second chapter of this thesis presented the methodology. In this chapter the ontological and epistemological approach of critical realism is described alongside with the methodological design based on multimethodology (Mingers, 2006). The process perspective taken in the research is also presented, keeping in mind the search for mechanisms that help to explain the process. In this chapter, all the details for conducting the fieldwork are described. A longitudinal critical realist case study conducted among two organizations during the uptake process of e-invoicing as regulated by the Colombian government.

The second part of this dissertation responds to the second specific objective, to describe the uptake process of inter-organizational e-government services through a multiple case study in a group of Colombian micro-businesses, and it is presented in chapter 3. The fieldwork was carried out and the results from each cycle of data collected (three cycles) is presented in subsections: before implementation (section 3.2, Starting the journey towards electronic invoicing), during implementation (section 3.3, Implementing electronic invoicing) and after implementation (section 3.4, Using electronic invoicing). It is important to notice that implementation here refers to the technical configuration of the system. In this chapter the process through which companies went through can be observed.

The third part of this research is related to the chapter 4 and the third specific objective, to identify mechanisms that explain the uptake process of inter-organizational e-government services by micro-businesses. Based on the data collected and analyzed a theoretical framework towards explanation of uptake of inter-organizational e-government services by microbusinesses is proposed. It consists of four phases and 8 mechanisms explaining the uptake process. Information seeking and adoption decision and acquisition can be explained in terms of market, expectation, administrative literacy and regulatory mechanism; implementation phase is affected by affordance, experience, administrative literacy and intermediation mechanism; and use and maintenance is influenced by experience, regulatory, appropriation, intermediation, affordance and market mechanism.

6.2 General conclusion

As stated by Avgerou (2013) predictive theory tries to predict the outcomes based on input conditions, on the other hand, explanatory theory addresses why and how observed phenomena occur, and thus, helps us to better understand the world. This research took a processual perspective towards the phenomenon studied using critical realist paradigm. It implies that the studied went beyond the description of the phenomenon and it identified the underlying mechanisms that might explain the uptake process inter-organizational e-government services by micro businesses under specific context.

During the research process different theoretical lenses were identified towards the study of adoption of e-government services by businesses, most of them with in the perspective of variance theory (TAM, UTAUT, UTAUT2, DOI, TPB, UMEGA, ETC, etc.). Although none of them were explicit selected for this study, the factors identified in previous studies were taken into account to postulate a set of mechanisms that helped to explain the uptake process of inter-organizational services. It is difficult to directly link those variance IT adoption theories with the mechanisms postulated, for instance TOE and EGAUM models can be linked to expectation, experience, affordance, and regulatory mechanism. This is not particularly surprising as those models consider factor different in nature.

Results presented in this document are supported by empirical evidence from three cycles of data collection within a multiple case study conducted among two organizations (micro businesses). Each cycle responded to a different moment in the uptake process (before, during and after implementation of e-invoicing).

As a result of this research a framework was proposed towards uptake of e-invoicing by microbusinesses in the context of e-government. Four stages and eight mechanisms explain the uptake process. And they together answer the research question: **How do micro-businesses incorporate inter-organizational e-government services into their operation and what are the underlying mechanisms that explain their uptake process?**

The proposed explanatory theoretical framework for the uptake of inter-organizational e-government services by microbusinesses consist of four phases: *information seeking, adoption decision and acquisition, implementation, and use and maintenance.* Each stage

suggests the presence of mechanisms that interact among them and explain the events occurred during each phase, and the advance towards next stage. Mechanisms identified include experience, regulatory, market, intermediation, affordance, expectation, appropriation, and administrative literacy mechanism.

Although in general there was a good coincidence between the mechanisms from literature and the ones that were supported and emerged from the empirical data. Especially at the first moment of analysis (before implementing e-invoicing), coincidence was close between theoretical postulations and empirical findings, this is not surprised as most of the previous research is focused on this stage and towards adoption decision, intention to use.

Similarly, it can also be mentioned that channel choice, plays an important role before actual implementation, during the information seeking stage. Even though governments hold different channels to interact with their constituents and, in recent years, government agencies have started to offer online services. However, it has been observed that users frequently use more than one channel in a single encounter (Madsen et al., 2019; Madsen & Kræmmergaard, 2016a; Teerling & Pieterson, 2011; Wirtz & Langer, 2017). Likewise, e-government channel or electronic channels seem to be more appropriate for information collection, whereas traditional service channels are more likely to help with problem solving (C. Reddick & Anthopoulos, 2014).

Users might select electronic channels based on different factors, such as self-efficacy with regards to technology skills and the task knowledge. Self-efficacy refers to a users' self-evaluation towards their skills to perform a behavior or action (Alruwaie et al., 2012; Bandura, 1986). If perception of self-efficacy is poor, then, as state by MRT, the selected channel will probably be the one that can give convenient feedback, where face to face channel the richest medium. This could be observed in the behavior of both citizens and enterprises, even though, the cases studied tried electronic channels, both prefer to go to the physical attention point of the governmental entity to ask for information.

Based on this research it can also be mentioned that the quality of informational and interactional e-services must really provide convenience to implement inter-organizational e-government services, otherwise the journey users have to go through adds to the burden they already have. Information seeking is a very demanding and consuming phase towards the uptake of transactional services such as e-invoicing. Transactional

services account for a broad impact in the organizational context because it accounts for saving time, effort and costs, and thus, it is expected increase of the efficiency of internal government processes (Irani et al., 2006). In this sense, routinization of usage of self-service applications to get information or perform transactions that are available in electronic ways is relevant.

Particularly about intermediation mechanism, findings from this research are aligned to Al-Sobhi et al. (2010) findings suggesting that intermediaries are a very useful channel in improving trust and facilitating e-government adoption and diffusion. Although research on private business models has shown that IT can lead to disintermediation or re-intermediation posit that human interfaces and boundary spanners are still required to process complex legal matters. IT therefore does not change intermediaries' general functions or make them obsolete (Löbel et al., 2016).

Intermediaries played a key role in the uptake of e-invoicing amongst the companies studied in this research. Even though there is a free of charge platform offered by the governmental entity, as state by Lindgren & Jansson (2013) technology should not be taken for granted. In fact, at infrastructure dimension, performance failure has a huge impact for potential users of electronic services. Performance failure occurs whenever an e-service does not function as it promises, such as when information not legible is displayed, a transaction is not processed or, a page does not load properly (Seo et al., 2018). Both companies were attracted by the offer of a free of charge platform but also, they had concerns about the IT infrastructure and the support offered by the governmental agency.

Task complexity, on the other hand, exert influence in various decisions through the process. Technology should favor the simplification of tasks, e-government and potentially wipe out the institutional bureaucracies when pursuing access a public service (Joseph & Du Plessis, 2015). However, at least during the period of time looking for information and gaining understanding about the task it, both companies perceived and increase in the burden they were already responsible for.

Haag et al. (2013) questioned if micro firms can benefit from the electronic exchange of invoicing data at all or if they are even better off with the prevailing paper-based process? They argue that besides of a mandatory enforcement of the e-invoicing adoption

procedure, both, government, and e-invoicing provider should think of incentives to SMEs to artificially increase the advantages and reduce their resistance to e-invoicing usage. However, after the longitudinal case study conducted in this research, it is possible to say that even with the initial resistance (that was mainly due to the uncertainty), after the adaptation to the new system, both companies appropriate the new system which can lead to get benefits beyond the benefit for the government.

Also, it is fair to mention that even though it is expected that adoption, integration, and usage of inter-organizational e-government services lower transaction costs for businesses and speed up service delivery, among microbusinesses, as it was observed in this study, in fact it can increase costs. It is the case of the organizations that participated in this study. Both organizations are using intermediaries, both companies agreed that the previous invoicing systems used, whether paper-based or computer- based where cheaper than the current.

Some of the causation codes identified are involved in the explanation of events happening at different times, for instance, support from the provider is a code that was identified before, during and after implementation. Showing that intermediaries played an important role during the whole process.

From technical side, technology features can also help to explain events during the process. Before implementation features are considered and analyzed by the users and in turn technology features influence the process. During implementation, they (technology features) started being experienced and after, when the system was in usage, features are appropriated and adapted to the organization. Similarly, software integration was a code that emerged from the data analyzed before, during and after implementation, it shows the significance of inter-organizational systems to be integrated into the existing technology at the organization.

On the other side, trialability is important before and during implementation, but it seems not to be relevant after it. However, user training started during implementation and yet after implementation it was found their influence and still ongoing training. Price or cost of the e-service was relevant before implementation, it was a key aspect on making decisions towards the solution and the provider, but also the cost of maintenance become relevant after implementation.

Existing skills or lack of them at the organization are important before and during implementation but after implementation the necessary skills are meant to be acquired during the training and the experience through the process itself.

6.3 Contributions

This subsection outlines the contributions of this study in the form of theoretical contribution (subdivision 5.3.1) and contribution to practice (subdivision 5.3.2).

6.3.1 Theoretical contribution

Every research question intends to contribute with new knowledge usually by filling some gap in a general understanding of a given phenomenon, whether by describing, explaining, predicting or other forms of contribution. According to Whetten (1989) a theoretical contribution should provide new and compelling “whys”, it means new understandings or explanations in regards to some phenomenon studied. It could involve developing new concepts or redefining old ones and theorizing relationships among concepts.

This study contributes to the uptake of technology in organizations as a result of the digitization of the public sector and by providing a general overview of the entire uptake process, rather than focusing in only one part of them, the study has also shown that existing literature was limited in scope to explain the complete e-government uptake process by businesses users, as research in the field have mainly paid attention to the intention to use e-government based on the literature on intention to use a given technology.

The framework proposed explains in a holistic manner the uptake process. It describes at least four stages that businesses went through during the uptake process (information searching, adoption decision and acquisition, implementation, use and maintenance). It also uncovers some stakeholders involved in the process and it identifies mechanisms as an explanation of events happening during those stages. Hence, this thesis contributes to the literature on e-government and uptake of e-services.

Although research on information seeking behavior and channel choice to get information have been conducted, the identification and description of information searching as the

first phase towards the uptake of e-government services, can be mentioned as a contribution of this research. Similarly, the approach taken towards the identification of mechanisms to explain the uptake process constitutes a contribution from this work and particularly, administrative literacy and intermediation mechanisms that emerged from the empirical contributes to the knowledge field of uptake of technology by businesses in the context of public e-services.

From a theoretical point of view, this research also contributes to the literature in usage of e-government services. It presented a framework based on empirical evidence in which research on IT acceptance / adoption and IS life cycle are combined to describe and explain (based on mechanisms) the uptake process of e-government among businesses. This is considered to fit as a middle-range theory by Hedström & Swedberg (1998).

It is also worthy to mention that studying uptake of technology in organizations can contribute to the field of industrial engineering, in terms of process standardization in organizations, but also in terms of the affordances derived from the interaction of the social and technical system.

6.3.2 Practical contributions

One of the most prominent practical contributions of this work, is perhaps making visible the information searching stage in the mandatory context of e-services. This stage is demanding in time for business' users. And there are many driving questions during the search such as: What does it mean for us? Do we have to do it? When needs to be done? How can we do it? What do we need? How much will it cost? What is the impact? Who can help us? And many more.

Although the search for information is an activity that continue during the uptake process even after implementation, before the adoption decision, the acquisition of a solution and its implementation there is a period when business' users almost spend time exclusively in this task, that it is a time-consuming task and that adds to the burden that organizations already have. Thus, suggesting that governments should not give for granted that the information available is enough and in the mediums it is available. For instance, in coherence with MRT face-to-face is the richer channel to get information and users use this channel to get as much information as possible, however, it is desirable that

electronic channels try to cope with a minimum convenience towards the provision of information that users are looking for so to reduce the time users spend in offices, but also the inefficiency to provide the same information user by user. If users are well-informed and they understand the regulatory framework, the functioning of the governmental agency and what they have to do, administrative literacy mechanism would activate, thus allowing users to make better decisions during the process, which can involve doing the tasks and solving common problems by themselves, which in turn could help them, for instance, to save money.

On the other hand, intermediation mechanism plays an important role towards the uptake of inter-organizational e-government services to report information to governments. As it can be notice in the results, intermediation is important, especially during and after implementation, it means for the technical activities involved, but also to help the organizations while operating with the system. Although for the context of this study, governmental agency was offering a free of charge e-invoicing system, users perceived they were alone in facing problems or solving doubts, and intermediaries help them to fulfill with the obligation.

Small organizations that are pressured into adopting EDI will reap limited benefits unless they are willing and capable of investing the resources necessary to integrate the system within their operations (Iacovou et al., 1995).

The main practical contribution from this research towards governments is related to the process uncovered. Each stage and mechanism involved could contribute to the design of projects towards massification of e-services among businesses. For instance, the role of administrative literacy and intermediation as a mechanism.

Finally, for businesses, this research presented a framework that can make them more aware about decisions and challenges they might have to face when in the task of incorporating inter-organizational services into their operation.

6.4 Limitations of the study

Some limitations for this research should be mentioned:

- Longitudinal data, specially from the third cycle could have been benefit of new interviews and observations, however time was a limitation.
- Pandemic caused by Sars-CoV-2 affected the face-to-face data collection and observation which could enrich the data collected.
- More cases could have provided strength to the triangulation of results and finding differences and coincidences. However, due to pandemic from 4 organizations contacted, 2 of them did not continue in the study.
- The search equation used to find relevant literature review it is a limitation itself based on the resulted obtained.

6.5 Future work

Acceptance/adoption of technology is an active research theme in information systems field. Amongst the populations studied, individuals, groups and organizations are a common division. As this work is limited to organizations, future work might benefit to study uptake of technology as a process within individual and groups of users, but also in different sort of organizations (size, economy sector, etc.).

On the other hand, this work identified some stakeholders involved on the uptake process, but because of the limited scope of this research, investigation on stakeholders' roles and influence on the uptake process can contribute to a better understanding of uptake of technology by users as a consequence of public sector digitization.

Similarly, as this work focused on the uptake process of e-government services, next phase of similar study should pay attention to the effects or impact in short, medium, and long term of the adoption process.

A next stage of this research could involve the development of a quantitative approach validation of the results in wider population.

Inter-organizational services generate vast amounts of data, with in the context of e-government 3.0, research can be conducted on how to employ this data for the benefit of the state and companies.

In addition, this work was conducted in a context in which the uptake of e-government services was triggered by regulation in place making it mandatory, and no by the initiative of the businesses themselves, thus, uptake process may differ under different circumstances.

Finally, quantitative studies derive from the findings of this study can contribute to validation of the findings in wider population of users.

6.6 Diffusion of the research

As part of the research process and during the doctoral program, some events were attended to share the research process and advances and receive feedback. Thus, to get validation and enrichment of the research process and results.

▪ **Conference Presentations and other academic participations**	
August 18, 2018	Conference: Twenty-fourth Americas Conference on Information Systems (AMCIS), New Orleans, Louisiana, USA Title: Theoretical Perspectives on Usage of eGovernment Services: A Literature Review
August 31, 2020	PhD Colloquium EGOV 2020, Linköping, Sweden [Virtual] Title: From information seeking to continued usage of transactional digital government services: business users' perspective
January 28, 2021	18th Scandinavian Workshop on E-Government (SWEG), Copenhagen, Denmark [Virtual] Title: Inter-organizational digital public services uptake: business users' perspective

○ **Research visits**	
February - March, 2020	Trinity College Dublin - TCD, Trinity Business School, Research Centre for Digital Business. Dublin, Ireland. Activities during the visit: Attending seminars about qualitative research methods. Review of methodological aspects of ongoing own research (my PhD research). Contact person: Deepak Saxena, PhD (deepak.saxena@tcd.ie)
May – June, 2022	University of Oulu, OASIS research group. Oulu, Finland. Activities during the visit: Presentation of doctoral research and exploration of research collaboration in Information Systems field. Contact person: Harri Oinas-Kukkonen, PhD (harri.oinas-kukkonen@oulu.fi)
○ **Publications**	
2021	Correa Ospina, M. L., Saxena, D., & Díaz Pinzón, B. H. (2021). Mechanisms underpinning the usage of e-government services by businesses: A proposal based on previous empirical research. JeDEM - EJournal of EDemocracy and Open Government, 13(2), 154-183. https://doi.org/10.29379/jedem.v13i2.685
○ **Supervisions**	
July 2019 – June 2021	Title: "*Estudio comparativo del costo total de propiedad entre cloud, grid computing e infraestructura física en pymes de Bogotá del sector textil*" [Comparative study of the total cost of ownership between cloud computing, grid computing and

	physical infrastructure in SMEs in the textile sector in Bogota, Colombia] *Master's in Administration* Student supervised: German Eduardo Ceballos Martinez Co-supervised with: Beatriz Helena Diaz Pinzon, PhD.
○ **Journal reviewer**	
September 2021 - present	Since September 2021, I have been participating as a reviewer in the JeDEM - EJournal of EDemocracy and Open Government. As of January 2023, I have been assigned three papers for revision.

Finally, it is important to mention that during my doctoral studies I have gained experience in university teaching.

○ **Teaching**	
Semester 2022-2 (October – November)	Lecturer, Faculty of Economic Sciences, Universidad Nacional de Colombia Courses: Enterprise applications (Code 2029188-2), Management Information Systems (Code 2016053-3) *Taught in Spanish language.* Undergraduate level - 8h/week
Semester 2022-2 Semester 2021-2 Semester 2021-1 Semester 2020-2 Semester 2019-1	Lecturer, Faculty of Economic Sciences, Universidad Nacional de Colombia Course: Business Process Integration (Code 2027491) *Taught in Spanish language.* Postgraduate level - 3h/week

October – November 2021	Lecturer, Permanent and continuing education program, Faculty of Economic Sciences, Universidad Nacional de Colombia. Module: Data management *Taught in Spanish* 6h/week

A. Appendix: e-government Colombian regulation

Topic	Year	Regulation
Open government	1985	Law 57 / 1985
Regulatory framework (electronic government)	1995	Conpes 2790 / 1995
Services and procedures	1995	Decree Ley 2150 / 1995
Services and procedures	1999	Law 527 / 1999
Regulatory framework (electronic government)	2000	Conpes 3072 / 2000
Regulatory framework (electronic government)	2000	Presidential directive 02 / 2000
Open government	2000	Law 594 / 2000
Services and procedures	2000	Decree 1747 / 2000
Regulatory framework (electronic government)	2001	Decree 127 / 2001
IT management	2002	Presidential directive 10 de 2002
Regulatory framework (electronic government)	2002	Law 790 / 2002
Regulatory framework (electronic government)	2003	Decree 3107 / 2003

Open government	2003	Acto legislativo 01 / 2003
Services and procedures	2003	Law 794 / 2003
IT management	2003	Conpes 3248 / 2003
IT management	2003	Decree 2816 / 2003
Open government	2004	Law 892 / 2004
Services and procedures	2004	Conpes 3292 de 2004
Services and procedures	2005	Ley 962 de 2005
Regulatory framework (electronic government)	2008	Decree 1151 de 2008
Seguridad y privacidad de la información	2008	Law 1266 / 2008
Regulatory framework (electronic government)	2009	Law 1341 / 2009
Regulatory framework (electronic government)	2009	Circular No. 058 / 2009 de la Procuraduría General de la Nación
Information privacy	2009	Law 1273 / 2009
IT management	2010	Decree 235 / 2010
Regulatory framework (electronic government)	2012	Decree 2693 / 2012
Services and procedures	2012	Decree 019 / 2012
Services and procedures	2012	NTC 5854 / 2012
Services and procedures	2012	Decree 2364 / 2012
Seguridad y privacidad de la información	2012	Statutory law 1581 / 2012
Services and procedures	2013	Statutory law 1618 / 2013
Regulatory framework (electronic government)	2014	Decree 2573 / 2014

Open government	2014	Law 1712 / 2014
Regulatory framework (electronic government)	2015	Decree 1078 / 2015
Open government	2015	Statutory law 1757 / 2015
Open government	2015	Decree 103 / 2015
Services and procedures	2017	Decree 1413 / 2017
Regulatory framework (digital government)	2018	Decree 1008 / 2018
Citizen services	2020	Decree 620 / 2020
Regulatory framework (digital government policy update)	2022	Decree 767 / 2022
E-invoicing regulation		
Regulation about e-invoicing	1995	Law 223
Regulation about e-invoicing for businesses	2015	Decree 242 / 2015
Technical requirements for e-invoicing	2016	Decree 1625 / 2016
Schedule to implement e-invoicing in Colombia	2018	Resolution 0000072/2018
Schedule updated towards implementation of e-invoicing in Colombia (new technical requirements)	2019	Resolution 000020/2019
Schedule updated towards implementation of e-invoicing in Colombia	2020	Resolution 000042/2020

B. Appendix: Summary of relevant literature about uptake of e-Government services by businesses.

.

Authors	Year	Technology / e-service / channel	Research philosophy	Country of data collection	Approaches to theory development	Methodological choice	Research strategy	Time Horizon	Context	Theories	Business size
Tung L.L.	2005	General e-services	Positivist	Singapore	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Diffusion of Innovation Theory	Large
Arendsen, Rex	2006	High impact governmental e-services	Positivist	The Netherlands	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Inter-organizational systems	Technological, Organisational and Environmental (TOE) framework	Small and Medium
Arendsen, Rex	2008	High impact governmental e-services	Positivist	The Netherlands	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Inter-organizational	Adoption Model for Electronic	Large

									systems	Data Interchange Systems (Chwelos)	
(Jansen et al., 2010)	2010	Information e-services	Positivist	The Netherlands	Deductive	Mono-method - Quantitative	Vingette	Cross-sectional	Self-service applications	MIX of IS Theories	Entrepeneurs
Sambasivan, Murali	2010	E-procurement (system)	Positivist	Malaysia	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Inter-organizational systems	DeLone and McLean's model of IS	All sizes
Arendsen, Rex	2011	E-invoicing	Positivist	The Netherlands	Deductive	Mono-method - Quantitative	Vingette	Cross-sectional	Inter-organizational systems	Mix of IS theories	Large
(Lee et al., 2011)	2011	E-tax filing	Positivist	Korea	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Mix of IS theories	All sizes
(Naggi & Agostini, 2011)	2011	E-invoicing	Interpretativism	Italy	Inductive	Mono-method - Qualitative	Case study	Cross-sectional	Inter-organizational systems	Not explicit theory	Small and Medium
(S.-Y. Hung et al., 2012)	2012	E-procurement (system)	Positivist	Taiwan	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	TPB	All sizes
Van den	2012	Information e-	Positivist	The	Deductive	Mono-	Survey	Cross-	Self-	Media	Small and

Boer, Yvon		services		Netherlands		method - Quantitative		sectional	service applications	choice theories, information seeking theories	Medium
Haag, Steffi	2013	E-invoicing	Positivist	Germany	Deductive	MIxed-method simple	Survey	Cross-sectional	Inter-organizational systems	Mix of IS theories	Micro, Small and Medium
Reddick C.G.	2013	General e-services	Positivist	Canada	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Mix of IS theories	All sizes
Urciuoli L.	2013	e-Customs	Positivist	Multiple locations	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Inter-organizational systems	Mix of IS theories	All sizes
Van den Boer, Yvon	2014	Information e-services	Positivist	The Netherlands	Deductive	Mono-method - Quantitative	Vingette	Cross-sectional	Self-service applications	Media choice theories, information seeking theories	Small and Medium
Arendsen, Rex	2014	Tax, customs, import, export B2G systems	Positivist	The Netherlands	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Inter-organizational systems	Technological, Organisational and Environmental (TOE) framework Iacovou et	All sizes

										al. (1995) EDI-impact and ability model	
Thi, Lip-sam	2014	General e-services	Positivist	Jordan	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Technological, Organisational and Environmental (TOE) framework	All sizes
Kindel, Kristiina	2014	General e-services	Positivist	Estonia,Germany,Sweden	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Mix of IS theories	Small and Medium
Shao, Bingjia	2015	E-tax filing	Positivist	China	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Technological, Organisational and Environmental (TOE) framework	All sizes
Lian J.-W.	2015	E-invoicing	Positivist	Taiwan	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Inter-organizational systems	UTAUT2	All sizes
van den Boer, Yvon	2016	Information e-services	Positivist	The Netherlands	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Media choice theories	Small and Medium

Alghamdi, Saleh	2016	General e-services	Positivist	Saudi Arabia	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	E-Government Adoption and Utilisation Model (EGAUM)	All sizes
(Mohd Nawi et al., 2016)	2016	E-procurement (system)	Interpretativism	Malaysia	Inductive	Mono-method - Qualitative	Case study	Cross-sectional	Inter-organizational systems	Not specific theory reported	Not reported
van den Boer, Yvon	2017	Information e-services	Positivist	The Netherlands	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Media choice theories, information seeking theories	Small and Medium
Alomar, Mohamad Amin	2017	E-procurement (system)	Positivist	Belgium	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	MIX of IS Theories	All sizes
Olaleye, Sunday Adewale	2017	E-invoicing	Positivist	Nigeria	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Inter-organizational systems	UTAUT	All sizes
(Rammea & Grobbelaar, 2017)	2017	General e-services (or more than one self-service)	Interpreta-tivism	Lesotho	Inductive	Mono-method - Qualitative	Case study	Cross-sectional	Self-service applications	HOT	Not specified

Seo, Dong Back	2018	E-procurement (system)	Positivist	Indonesia	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Mix of IS theories	All sizes
Santa, R.	2019	General e-services	Positivist	Saudi Arabia	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	Mix of IS theories and trust	All sizes
Pinem, Ave Adriana	2018	E-service to report investment activities	Positivist	Indonesia	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	ECT	All sizes
Vejačka, Martin	2018	General e-services	Positivist	Slovakia	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	TAM	All sizes
(Soong et al., 2020)	2020	E-procurement (system)	Positivist	Malaysia	Deductive	Mono-method - Quantitative	Survey	Cross-sectional	Self-service applications	TAM, UATUT	Small and Medium

C. Appendix: Letter to participants.

[original in Spanish]

Consent to participate in research and protection of participants.

I have received information about the research project about the usage of e-government transactional services, particularly electronic invoicing. I understand that this research project is conducted by Martha Liliana Correa Ospina and directed by Dr. Beatriz Helena Díaz Pinzón within the PhD in Engineering - Industry and Organizations of the Faculty of Engineering of the Universidad Nacional de Colombia, Bogotá and is funded by Colciencias [currently,Minciencias].

I understand that if I agree to participate in this study I will be interviewed on different occasions about my experience with the implementation and use of electronic invoicing and the use of other electronic services to carry out different procedures and comply with the regulations that my company must comply with Colombian public entities. I also understand that the information collected will be used for the development of a doctoral thesis and academic articles and that it will not be used for commercial purposes.

I understand that there are no costs associated with this study to be incurred by the company or its participants. I also understand that my contribution is confidential and that neither my identity nor that of the company will be revealed, possible references for academic purposes would be made as Company A, Company B or Participant 1, Participant 2, etc., I understand that the interviews may be recorded and that some photos or videos of how I perform some procedure may be taken for the purposes of the research (prior consent) and that the records will only be accessed by Martha Liliana Correa Ospina. I understand that I have the possibility to contact Martha Liliana Correa Ospina (mlcorreaos@unal.edu.co, cell phone XXXX) to resolve any questions about the

research and my participation in it. I also understand that my participation is voluntary, and I am free to withdraw at any time.

By signing this document, I accept my participation in the research.

Name and surname: _____

Signature: _____

Position: _____

Date:_____ Company:_____

Researcher in charge:

_____

Martha Liliana Correa Ospina

PhD Candidate

Doctorate in Engineering - Industry and Organizations

C.C. XXXX

D. Appendix: Interview guiding questions / Observation template.

Interview guiding topics	
Cycle 1: Before e-invoicing implementation	- Organization characterization (economic sector, business core activities, use of IT, regulatory framework applicable). - Current invoicing process. - Expectations, doubts, knowledge about e-invoicing. - Current state of e-invoicing incorporation. - Narrative about the process, experiences, decisions made before the current state.
Cycle 2: During e-invoicing implementation	- Narrative about the process followed towards e-invoicing since last interview. - Current state of e-invoicing incorporation. - Option selected for implementing e-invoicing. - Software tool/program to issue e-invoices. - Decisions made during the process - Changes within the organization operation while implementing the new system.
Cycle 3: After e-invoicing implementation	- Narrative about the experience during the operation with the new system.

	- Comparison with the old invoicing process at the organization. - Attitude towards the new system - Changes within the organization operation while using the new system. - Reflection about expectations, doubts, knowledge about e-invoicing at the start of the process versus actual time. - Current expectations, doubts, concerns about e-invoicing. - Self-assessment about the process. Lessons learnt.

Observation guide

Date	
Company	
Start time	
End time	
Description of the company area observed	
Actors	
Activities	
General comments	

E. Appendix: Literature analysis – Mechanism hypothesized

Factor	Category	Hypothesized mechanism	Context
Effort expectation	Expected complexity	Expectation mechanism	
Complexity			
Ease of use			
Age			
Service convenience	Expected operational benefits		
Operational performance			
Operational effectiveness			
Perceived usefulness			
Perceived benefits			
Relative advantage			
Cost of access/using			
Perceived administrative burden reduction			
Cost-savings			
Performance expectancy			
Perception of high-quality offline service provision	Service experience	Experience mechanism	
Perceived quality of services			
Service convenience			
Previous experience			

Prior experience			Inner context
Satisfaction			
Productivity	Usage experience		
Successful system implementation			
Ease of use			
Perceived administrative burden reduction			
Trust in e-government			
Perceived expertise of the government			
Positive attitude towards government			
Performance risk			
Perceived security			
Financial risk			
Time-savings			
Perceived Risk			
Organizational readiness	Institutional capabilities	Affordance mechanism	
Digital skills			
Human resources			
IT infrastructure			
Self-efficacy			
Lack of knowledge (theme and procedure)			
Organizational IT experience			
Compatibility			
Organizational size / firm’s size			
Attitude towards change / IT			
Executive support			

Facilitating conditions			Outer context
Management efforts			
Education			
Awareness			
Web design (service quality)	Technology behavior		
System quality			
Performance failure			
Security			
Social influence	Partner's influence	Market mechanism	
Interpersonal influence			
External influence			
Trading partners' pressure			
External pressure			
Competitive pressure			
Assurance of service (by service providers)			
Business opportunities			
Responsiveness of service providers			
Regulation and policies	Regulation and policies	Regulatory mechanism	
Government oversight			
Involvement of business in regulatory changes			
Task characteristics (specificity)	Task characteristics		
Amount of information available			
Amount of information available about e-government			
Quality of information			
Source to get information			

Technical assistance from governments			
Exact situation			

Example of mechanism postulation from theories and factors:

Theory	Factor	Category	Hypothesized mechanism
UTAUT	Effort expectation	Expected complexity	**Expectation mechanism**
TOE framework	Complexity		
TAM	Ease of use		
-	Age		
-	Service convenience	Expected operational benefits	
-	Operational performance		
-	Operational effectiveness		
TAM	Perceived usefulness		
UATUT	Perceived benefits		
DOI	Relative advantage		
-	Cost of access/using		
-	Perceived administrative burden reduction		
-	Cost-savings		
UTAUT	Performance expectancy		

F. Appendix: Interview's analysis - list of codes

- **Attribute coding**

Code category	Attribute code	Description	Illustrative quotation
Context	Inner	Inner context refers to the inner mosaic of the firm; the structural, cultural and political environments which, in consort with the outer context, shape features of the process (Pettigrew, 1997).	"*Personally, I think it is easier for my work to see the invoice in paper than in the computer*"
	Outer	Outer context includes the economic, social, political, competitive and sectoral environments in which the firm is located (Pettigrew, 1997).	"*We started to hear about e-invoicing from the groups of professionals we belong to and from our customers*"
Stage	Before	Before implementation of e-government inter-organizational service refers to the stage in which the organization is performing activities such as searching for information, the adoption decision is made, and the product or service that best fits the need of the organization is selected and acquired.	"*We had many doubts like what to do, how to do it? Thus, we attended conferences about the e-invoicing*"
	During	Implementation of e-government inter-	"*Our provider did most of the*

		organizational deals with the configuration and adaptation of technology within the organization as well as the paperwork to start issuing e-invoices and exchanging data.	*procedure for us, and they trained us*"
	After	After implementation e-government inter-organizational service involves the continued usage of the system/service in the organization and regular maintenance/upgrades whenever required.	"*We had to call every customer and tell them that now we were going to begin to issue electronic invoices that please check their emails*"
Socio-technical aspects	Social	It is concerned with people, relationships, reward systems and authority structure (Bostrom & Heinen, 1977).	"*We started to hear about e-invoicing from the groups of professionals we belong to and from our customers*"
	Technical	It includes the processes, task and technology needed to transform input to outputs (Bostrom & Heinen, 1977).	"*To use the free e-invoicing service, we have to enter all the information, we had to pay for the digital certificate to sign the invoices, so there was still a cost*"
Actors	Manager	Person who manages the organization.	"*Our boss told us about the e-invoicing and that we need to start looking for information*"
	Accountant	Person in charge of accounting tasks.	"*Me and other accountant were*

			in charge of looking for information, ask for quotations and everything"
	Person, who issues invoices	Person in charge of creating and sending invoices to customers.	"*The secretary is the one who issues the invoices, so she participated during implementation, she had to learn*"
	Person, who process invoices	Person in the organization who receives and processes incoming invoices from providers.	"*The secretary also receives the invoices we have to pay, but we receive few invoices*"
	Software provider	External organization that provides software solutions to the organization such as accountability software.	"*We asked for a quotation to our current software provider, the one that provider the software we use as a bookkeeper for us and our clients*"
	Governmental agency	Public agency that demands the usage of inter-organizational service to exchange data about invoices.	"*We went to ask for information to the physical office of the governmental entity*"
	e-invoicing provider	External organization that acts as an intermediary between the company and the government for the service provision of electronic invoicing and data exchange.	"*Our provider did most of the procedure for us, and they trained us*"
	Digital certificate provider	External company that provides a digital certificate used to sign electronic invoices. Validity of the	*"We had to submit many legal documents to get the digital*

		certificated is limited, it needs renewal and periodic payments.	*certificate from the provider, this provider is different from the software provider"*
	Customers	It refers to a person or business that buys goods or services from the companies participating in the research.	"*We started to hear about e-invoicing from the groups of professionals we belong to and from our customers*"
	Suppliers/Providers	It refers to a person or organization that provides goods or services to the companies participating in the research.	*"We receive already electronic invoices from out providers, but we need to print them to verify the products when we receive them"*
	Experts/colleagues	People who are perceived as specialists in some area of knowledge and that that provide information and advice to the companies.	"*We started to hear about e-invoicing from the groups of professionals we belong to and from our customers*"
Channels	Calls	It involves the use of telephone or mobile.	*"Today I will call the e-invoicing provider, because I need to start the tests"*
	Physical visits	It refers to face to face interaction.	"*We went to ask for information to the physical office of the governmental entity*"

	Chat	Communication by text messages through web platforms.	*"We sometimes use the chat channel not text, but they take ages to reply, and it is usually not very helpful"*
	E-mail	Electronic mail	*"We received an e-mail warning of deadline to start issuing e-invoices"*
	Websites	Web platforms, it requires the usage of the internet.	*"I visited the DIAN's website, and I registered to start issuing electronic invoices, but it asked for information I did not have, so I called the e-invoicing provider to ask for help"*
	Remote access computer software	Usage of computer software to access and control remotely an electronic device.	*"The request for invoices numbers was performed with the provider's help, they connected to our computer by Team Viewer software"*

- **Descriptive coding**

Descriptive code – CASE A	**Descriptive code – CASE B**	**Description**
Invoices	Invoices	Document related to a commercial transaction
Dates (Deadlines)	Dates (Deadlines)	Latest date by which something must be done
Technology	Technology	In this context, particularly referred to

		information technology (software and hardware)
Usability (technology)	Usability (technology)	It refers to the ease of use of technology.
Trialability	Trialability	Possibility of technology to be tested before use it.
User training	User training	Process to get the necessary skills to perform a task
Computer software	Computer software	Set of instructions, programs, routines, procedures that run on a computer system.
Technology providers	Technology providers	Companies that provide information technology solutions for other companies.
Legal framework	Legal framework	It relates to normativity/regulation in place.
Business history	Business history	Past events within the organization that are relevant to present events.
Business operation	Business operation	What the business does in their daily functioning to reach its goals.
Organizational structure	Organizational structure	It refers to the way the company is organized
Job functions	Job functions	Tasks associated with job positions.
Contingency	Contingency	Alternative plan, in case a risk is materialized and affects regular operation.
Clients / Customers	Clients / Customers	It refers to a person or organization who buys goods or services from the companies participating in the research.
Experts' recommendations	Experts' recommendations	Advice or suggestions made by people who is perceived as specialist in some matters.
E-invoicing providers	E-invoicing providers	Private companies that are authorized to sell e-invoicing services to enterprises.
E-invoicing requirements	E-invoicing requirements	Technical, organizational and legal conditions needed to implement and use electronic invoicing
E-invoicing questions	E-invoicing questions	Doubts related to electronic invoicing.
E-invoicing implementation	E-invoicing implementation	Technical activities related to the configuration of the system
E-invoicing impact	E-invoicing impact	Positive, negative or neutral consequences of the usage of e-invoicing
Software restrictions	Software restrictions	It refers to the lack of some desire features in the software or a particular behavior that is constricted.
Costs – Prices	Costs – Prices	Money related code
Quotations	Quotations	Offer made by a provider with regard to a service or good.

Free e-invoicing service	Free e-invoicing service	Electronic service offered by the governmental agency in charge of customs and taxes to issue electronic invoices and that is free of charge to use.
Cultural change	Cultural change	It refers to the changes in the behavior of the organizations.
Governmental agency web platforms	Governmental agency web platforms	Electronic services offered by governmental agencies through websites
Bottlenecks	Bottlenecks	Period in which many requests are made by users, and it interferes with the regular service (usually associated with deadlines).
YouTube tutorials	YouTube tutorials	Audiovisual material published on YouTube that shows step by step how to perform a procedure.
User training	User training	Activities of instruction to teach something new to a user.
User resistance	User resistance	Opposition to changes.
User support	User support	Assistance received from a third part.
Manual user	Manual user	Document that contains step by step the procedure to perform a task.
Red tape	Red tape	Paperwork (administrative burden).
Pandemic (Coronavirus SarsCov2)	Pandemic (Coronavirus SarsCov2)	Situations related to the pandemic, such as restrictions that affect the operation of the organization.
Work from home	Work from home	Tasks that are part of the job but performed from home.
Bookkeeping		Accountant activities performed on behalf of others.
Advantages of e-invoicing		Positive aspects mentioned regarding using e-invoicing.
	IT infrastructure	It refers mainly to the hardware available.
	Previous experience implementing technology	Previous experience implementing technology in the organization.
	Government control	Regulatory framework regarding duties that can be related to penalties.
	Environment	Green practices towards reducing environmental footprint.
	Validity of e-invoices	Features of a valid and legal e-invoice

- **Process coding**

Process code	Description
Searching information	It refers to the activity itself of information seeking to solve questions that emerged during the process. The search for information has the purpose of finding answers by themselves (by the organization).
Asking questions	It refers to submitting inquires, specific questions directed to someone or some organizations and expecting clarification.
Waiting for responses	It is a period of time in which the organization is expecting some reply after an inquiry submitted to someone or to an organization. It is named as a process code as waiting is in progress, the organization might be or not doing something else, but the response is likely to trigger some action or decision.
Requesting quotations	It is the action of formally ask for prices and conditions upon the agreement of a service (acquiring e-invoicing).
Selecting e-invoicing provider	It is the action of choosing one among the possible options (amongst the providers available) that they might have had to get e-invoicing system.
Making decisions	Generic code, used to represent when the company faced some kind of decision, for instance, a selection of provider, where to look for information, wait for an answer, even change previous decisions.
Implementing e-invoicing	It refers to all the technical tasks for the configuration of the new e-invoicing system and the legal procedure to operate with e-invoices.
Testing technology	The action of testing technology refers to the tests and assessments conducted after the technical configuration of the new e-invoicing system. It can lead to adjust or to confirm the implementation.
Training users	Training user for the use of the new system involves the instruction for the operation with the new system. They might be simulation about the real environment.
Issuing e-invoices	It refers to the operation issuing real and legal electronic invoices. From the moment in which the company start operating with e-invoicing system, so they report in real time to the governmental agency, and they also issue e-invoices for their customers.
Changing practices	It refers to the adaptation and changes in procedures because of the new system. For instance, instead of using paper and envelope to issue and deliver the invoice, now the software and email are used, also on how to storage those.
Processing e-invoices	It refers to the processing required for the incoming invoices from providers or suppliers.
Evaluating the	It refers to those moments in which some kind of evaluation was

current situation	made, and some checking was performed, or questions raised.
Paperwork performing	It refers to the action of performing legal procedures.

- **Causation coding**

Causation code	**Description**
Regulation	It refers to the normativity in place making mandatory some procedures for enterprises that other way they might not perform.
Deadline	It is related to regulation that set a limit date to perform legal procedures, thus causing the enterprises to perform what is required beforehand.
E-invoicing provider offer	It refers to the services agreed with the e-invoicing provider selected such as storage, support, costs, etc.
Support from provider	It is related to the assistance received when needed.
External advice	Influence from the social network of the organization.
Customer pressure	In the context of this research, it refers to the customers demanding electronic invoices, thus exerting pressure on the company.
Price / Cost of e-service	The price/cost of the e-invoicing service agreed between the company and the provider (whether it is perceived as high or fair).
Compatibility	Technical aspect of the new software that makes possible to run with the existing information systems.
Software integration	Technical aspect of the new software that allows the new software to communicate with the existing information systems.
Trialability	It refers to the possibility of trying the new system before it is going into production stage.
Technology features	It refers to the functionalities of the new system (e-invoicing system).
Quality of system	It refers to the assessment of the value of the new system and that it runs without errors.
Lack of information available	It refers to the difficulty of finding the information that is needed. Because it is no available in the sources that can be accessed.
Misinformation	Information that is not accurate or that is wrong and lead to misunderstandings.
Lack of diffusion	Not being aware of news or some information because of not knowing it exists or it is available.
Poor guidance	Getting guidance, but not enough to act upon.
Unclear information	Information that is difficult to understand or that is

	ambiguous
Lack of skills	No having the skills or abilities needed to perform an activity.
Concerns	Worries about certain consequences of an action of decision.
Risk avoidance	Lack of willingness to take the risk of making mistakes or open the possibility of getting penalties.
e-invoicing impact	It refers to the assessment or perception about the effect or consequences of e-invoicing for the organization.
Dissatisfaction	Disappointment with regards to the service or product received.
Volume of invoices	Judgement about the number of invoices that are issued in certain period of time and whether it is perceived as not that many or a lot invoices.
Bureaucracy burden	Rules and administrative procedures that businesses have to comply with.
Time pressure	It is related to deadlines, and it is the pressure perceived when the deadline is close.
Usability	Feature of technology related to the perception of being easy to use or having the skills to make use of it.
Complexity	Feature of technology related to the perception of being difficult to use or no having the knowledge or skills to make use of it.
Poor guidance	It refers to inadequate or not enough detail in the information needed to perform a procedure.
Agreement signed (e-invoicing provider)	Terms and conditions agreed formally between the e-invoicing provider and the company.
Trust in the provider	Company's belief in the reliability of the provider, and in their capacity.
Lack of knowledge	Lack of understanding about certain matter.
IT infrastructure	Existing IT infrastructure in the organization such as hardware and software.
Prior experience	Previous experience in same or similar tasks.
Easy to use	Assessment or perception about the system considered as easy to operate.
Usefulness	Assessment or perception about the system as being helpful.
Instantly reporting to public agency	Real time information transfer to the public entity.
Compliance	It refers to the state of being in accordance with the regulation applicable to the organization.
Change on regulatory framework	It refers to changes in the current applicable regulation to the organization.

Pandemic	It refers to the widespread occurrence of an infectious disease over a whole country or the world at a particular time.
Economic restrictions	Changes in the economic environment.
Lack of sales	Reduction of sales or no making any at all.
Loss of clients	Reduction of the customers of the organization.
Loss of jobs	Reduction in the positions that the organization used to hold.
Less errors	Reduction in the mistakes made with in organization processes.
Saving time	Reduction of the time spend in certain tasks.
Invoices delivery	It refers to the way in which the invoices are delivered to the customers.
E-invoicing benefits	It is related to the code e-invoicing impact; however, benefits refer to the positive impact for the organization as a result of e-invoicing.
Integration process	Process of getting in harmony new technology and procedures with the existing systems and processes of the organization.
Adaptation	Process of getting used to the new system and making the necessary changes to operate with the new system
Willingness to change working practices	Positive attitude towards making the necessary arrangements and changes in the organization.
Lessons learned	It refers to the knowledge or skills gained out of experienced.
User engagement	Positive response and continued usage of the system by the company.
Unwillingness to change the system	Resistance to change certain systems and being replaced by new ones.

G. Appendix: Criteria to match events vs mechanisms

During the research there was two moments in which events were matched with mechanisms; the first moment involved matching the events towards the mechanisms postulated from the literature review, next table shows the criteria applied.

Table G-1: Criteria to match events with mechanisms (literature review[14])

If the event involves…	Expectation mechanism	Experience mechanism	Affordance mechanism	Market mechanism	Regulatory mechanism
Regulatory framework					X
Administrative burden					X
Solutions available				X	
Providers available				X	
Interaction with external people or organizations				X	
Expectations, guessing or perceptions	X				
Previous experience		X			
Organizational capabilities			X		
Possibilities of technology, technology features.			X		

[14] This criterion was established during the analysis of empirical data as new mechanisms emerged.

The second moment in which events were analyzed towards mechanisms used an empirical criterion established and presented in the next table:

Table G-2: Criteria to match events with mechanisms (empirical corroboration[15])

If empirical data around the event refers to or includes…	Expectation mechanism	Experience mechanism	Affordance mechanism	Market mechanism	Regulatory mechanism	Administrative literacy mechanism	Intermediation mechanism	Appropriation mechanism
Expressions in future tense	X							
Expressions in past tense		X						
Terms such as hope, believe, would like, want, expect	X							
Colleagues, other companies, experts				X				
Technology providers				X			X	
Governmental agencies					X			
Talking about regulation					X			
Technology / e-service features			X					
Technology / e-service restrictions			X					
Technology /e-service impact			X					
Organization capabilities			X					
Lack of knowledge						X		
Red tape (How to perform procedures)				X		X		
Lack of information available						X		
Satisfaction / Dissatisfaction		X						X
Transfer of tasks							X	
In need of help							X	
Not intention to change the new system								X
Routinization								X
Adaptation								X
Familiarity								X

[15] This criterion was established during the analysis of empirical data as new mechanisms emerged.

H. Appendix: Literature review on usage of e-government by citizens and businesses

Table H-1: Literature review design

Guidelines	Webster & Watson (2002)
Search equation	(TITLE-ABS-KEY ({e-government} OR {electronic government} OR {digital government} or {d-government}) AND TITLE-ABS-KEY ("acceptance" OR "adoption" OR "appropriation" OR "use" OR "usage" OR "assimilation") AND TITLE-ABS-KEY ("e-government services" OR "e-service" OR "service" OR "channel") AND TITLE-ABS-KEY ("business" OR "companies" OR "company" OR "corporation" OR "firm" OR "enterprise" OR "g2b" OR "b2g" OR "sme" or "citizen"))
Period	2005-2018
Sources	(Scopus, Web of Science and the Digital Government Reference Library[16])
Inclusion criteria	Papers addressing the acceptance, adoption from the perspective of the demand side (citizen or business)
Exclusion criteria	Papers addressing usage, development, of e-government services from supply perspective (governmental side)

[16] http://faculty.washington.edu/jscholl/dgrl/

Table H-2: Literature review summary

Main Theoretical foundation	**TAM**: 22% **UTAUT**: 14% **DOI**: 14% **ISS**: 14%
e-Service	**General e-services / e-Government websites:** 62% **e-Filling / e-Taxes systems**:20% **Others (e.g., grievance redressal system, student loans)**: 18%
Method	**Survey**: 78% **Literature review**: 14% **Interviews**: 6% **Focus group**: 4% **Others (e.g., statistical work from secondary data)**: 4%
Stakeholder	**Citizens**: 78% **Business**: 18% **Not specified**: 4%
Context	**Initial usage**: 68% **Continued usage**: 22% **Channel choice**: 10% **e-Service Maturity**: 2%

Table H-3: Literature review – selected papers

Author	Country	Stakeholder	Main Method	Context	e-Service	Main Theory / Model used
(Tung & Rieck, 2005)	Singapore	Business (large)	Survey	Initial usage	General e-Government services	DOI
(Arendsen et al., 2006)	Netherlands	Business (sme)	Survey	Initial usage	Electronic data interchange	TOE, Transaction cost economics theory
(Wang et al., 2007)	Taiwan	Citizens	Statistical work	Initial usage	Tax e-filing system	Mahajan and Peterson's models
(Wangpipatwong et al., 2008)	Thailand	Citizens	Survey	Continued usage	e-Government websites	TAM
(Carter & Weerakkody, 2008)	UK and US	Citizens	Survey	Initial usage	General e-Government services	DOI
(Tang et al., 2009)	China	Citizens	Survey	Initial usage	General e-Government services	TRA, TAM
(AlAwadhi & Morris, 2009)	Kuwait	Citizens	Focus group	Initial usage	General e-Government services	UTAUT

(Teo et al., 2009)	Singapore	Citizens	Survey	Continued usage	General e-Government services	ISS
(Wangpipatwong et al., 2009)	Thailand	Citizens	Survey	Continued usage	e-Government websites	ISS
(Rotchanakitumnuai, 2009)	Thailand	Citizens	Literature review - Interviews - Survey	Initial usage	e-revenue (Internet tax payment system)	TPB / ES-QUAL
(Almahamid & Mcadams, 2010)	Jordan	Citizens	Survey	Continued usage	General e-Government services	TAM, DTPB
(Al-Shafi & Weerakkody, 2010)	Qatar	Citizens	Survey	Initial usage	General e-Government services	UTAUT
(Lai & Pires, 2010)	China	Citizens	Survey	Continued usage	e-Government websites	ISS
(Lee et al., 2011)	Seoul, Korea	Business	Survey	Initial usage	Local Business Tax Reporting service	SERVQUAL
(Ozkan & Kanat, 2011)	Turkey	Citizens	Survey	Initial usage	Higher Education Student Loans and Accommodation service	TPB
(Hussein et al., 2011)	Malaysia	Citizens	Survey	Initial usage	Tax e-filing	TAM, DOI,

						SERVQUAL
(Mahmud Akhter Shareef et al., 2011)	Canada	Citizens	Literature review	Initial and continued usage	e-Government a static and interaction level	GAM (TAM, DOI, TRA, TPB, ISS, Others)
(Teerling & Pieterson, 2011)	Netherlands	Citizens	Interviews / Survey	Channel choice	General e-Government services	Channel choice process model
(Alruwaie et al., 2012)	-	Citizens	Theoretical Work	Continued usage	General e-Government services	SCT, ECT, ISS, E-S-QUAL model
(Khan et al., 2012)	Afghanistan	Citizens	Survey	Initial usage	General e-Government services	Civil conflicts, digital and social divide
(Kindel et al., 2013)	Estonia and Germany	Business (sme)	Survey	Channel choice	-	Media richness theory
(Milosz & Milosz, 2013)	Polonia	Business (sme)	Survey	Channel choice	-	
(Gao, 2013)	US	Citizens	Survey	Initial usage	General e-Government services	TAM, DOI, UTAUT, marketing
(Rana et al., 2013)	-	Citizens	Analysis from secondary data	Initial usage	General e-Government services	TAM, DOI, ISS, UTAUT, TPB

(Anastasopoulou & Kokolakis, 2013)	Greece	Citizens	Survey	Initial usage	Tax card	TAM, Cultural theory
(Kindel et al., 2014)	Baltic Sea Region (Estonia and Germany - Sweden)	Business (sme)	Survey	Continued usage	Social contributions of employees, corporate tax, VAT, registration of a new company, submission of data to statistical offices, customs declaration, environment-related permits, and public procurement.	
(Belanche et al., 2014)	Spain	Citizens	Survey	Continued usage	income tax returns	Bhattacherjee continuance model
(Alghamdi & Beloff, 2014)	Saudi Arabia	-	Theoretical Work	Initial usage	General e-Government services	EGAUM
(Ghazali et al., 2014)	Malaysia	Citizens	Survey	Initial usage	E-filling	TRA, TPB
(Wirtz et al., 2015)	Germany	Citizens	Survey	Continued usage	e-Government websites	TRA, TAM
(Rana & Dwivedi, 2015)	India	Citizens	Survey	Initial usage	Online public grievance redressal system	SCT

(Shao et al., 2015)	China	Business	Survey	Initial usage	e-Tax Filing	TOE
(Zhou & Seah, 2015)	-	-	Theoretical Work	Initial usage	General e-Government services accessed by mobiles	TAM3, FIT
(Alghamdi & Beloff, 2015)	Saudi Arabia	Business	Survey	Initial usage	General e-Government services	EGAUM
(Rana et al., 2015)	India	Citizens	Survey	Initial usage	e-District system	UTAUT, UMEGA
(Abdel-Fattah, 2015)	Egypt	Citizens	Survey	Initial usage	General e-Government services	TAM, DOI
(Al-Hujran et al., 2015)	Jordan	Citizens	Survey	Initial usage	General e-Government services	TAM
(Piehler et al., 2016)	Germany	Citizens	Survey	Continued usage	e-Government websites	ECT, Bhattacherjees's IS continuance model
(Elkheshin & Saleeb, 2016)	Egypt	Citizens	Survey	Initial usage	General e-Government services	TAM
(AL Athmay et al., 2016)	United Arab Emirates (UAE)	Citizens	Survey	Initial usage	General e-Government services	ISS, UTAUT

(Rana et al., 2016)	India	Citizens	Survey	Initial usage	Online public grievance redressal system	UTAUT, UMEGA
(Madsen & Kræmmergaard, 2016b)	Denmark	Citizens	Focus group / Interviews	Initial usage	Online Application for Public Benefits	MRT, CC
(Xie et al., 2017)	China	Citizens	Survey	Initial usage	General e-Government services	TAM, TPB
(Witarsyah et al., 2017)	Indonesia	Citizens	Literature review	Initial usage	General e-Government services	UTAUT, ISS
(Lallmahomed et al., 2017)	Mauritius	Citizens	Survey	Initial usage	General e-Government services	UTAUT2, GAM
(Munyoka & Maharaj, 2017)	Southern African Development Community	Citizens	Survey	Initial usage	General e-Government services	UTAUT2
(Y. Dwivedi et al., 2017)	India	Citizens	Survey	Initial usage	Online Permanent Account Number card registration system	UMEGA
(van den Boer et al., 2017)	Netherlands	Business (sme)	Survey	Channel choice	Information about taxes	Information sources
(Mansoori et al., 2018)	United Arab Emirates	Citizens	Survey	Initial usage	General e-Government	UTAUT

	(UAE)				services	
(Joshi & Islam, 2018)	-	Citizens	Theoretical work	e-Government maturity	General e-Government services	e-Government Maturity Model

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