Factors influencing the information sharing arrangements

An empirical study of their implementation between private companies and their banking partners in Colombia

Master thesis

By

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Factors influencing the information sharing arrangements in the private sector in Colombia

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Preface

I'd like to take this space to acknowledge all the people who have helped me on this journey of finalizing my Master in Management of Technology, at the faculty of Technology, Policy, and Management at Delft University of Technology.

All my gratitude to my graduation committee at TU Delft. I want to thank Marijn, who despite all his duties, always had the generosity and time to give me his support, advice, and recommendations towards the best possible outcome from my thesis; and Victor for his kindness, good advice, and sharing his knowledge when I needed it.

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Executive Summary

Companies that establish relationships with other organizations, submerge in a process of decision making in terms of the agreements related to information sharing that should be held between them and their allies, customers or providers. The involved organizations, in the information sharing arrangements, have to make a determination toward the type of system to be used to exchange information, and the governance of the systems to structure its management mechanisms. There is a comprehensive literature regarding the adoption of inter-organizational organization systems (IOS) including areas like factors that affect their implementation, benefits for the organizations that use them and the different existing types of IOS. There is also broad literature about information technology (IT) governance. Nevertheless, there is a lack of research debate concerning the factors that affect both, the implementation of information exchange systems and the IT governance of such systems.

This study aims to close the aforementioned gap by bringing an explanation about which factors influence the implementation of either a dyadic or a multilateral typology of information exchange system, used among companies, and the IT governance design whether it is centralized, federal or decentralized of such information system IS. Specifically, this research is addressed as an empirical study on how internal and external factors motivate companies to follow an information sharing arrangement which is formed by the typology and the IT governance of the information exchange system. The scope of this research is narrowed to the information sharing arrangements between private companies and their banking allies in Colombia, since the private companies in the South American country are the selected population; the central research question of this research is:

> *Which factors influence the information sharing arrangements between private organizations and their banking allies?*

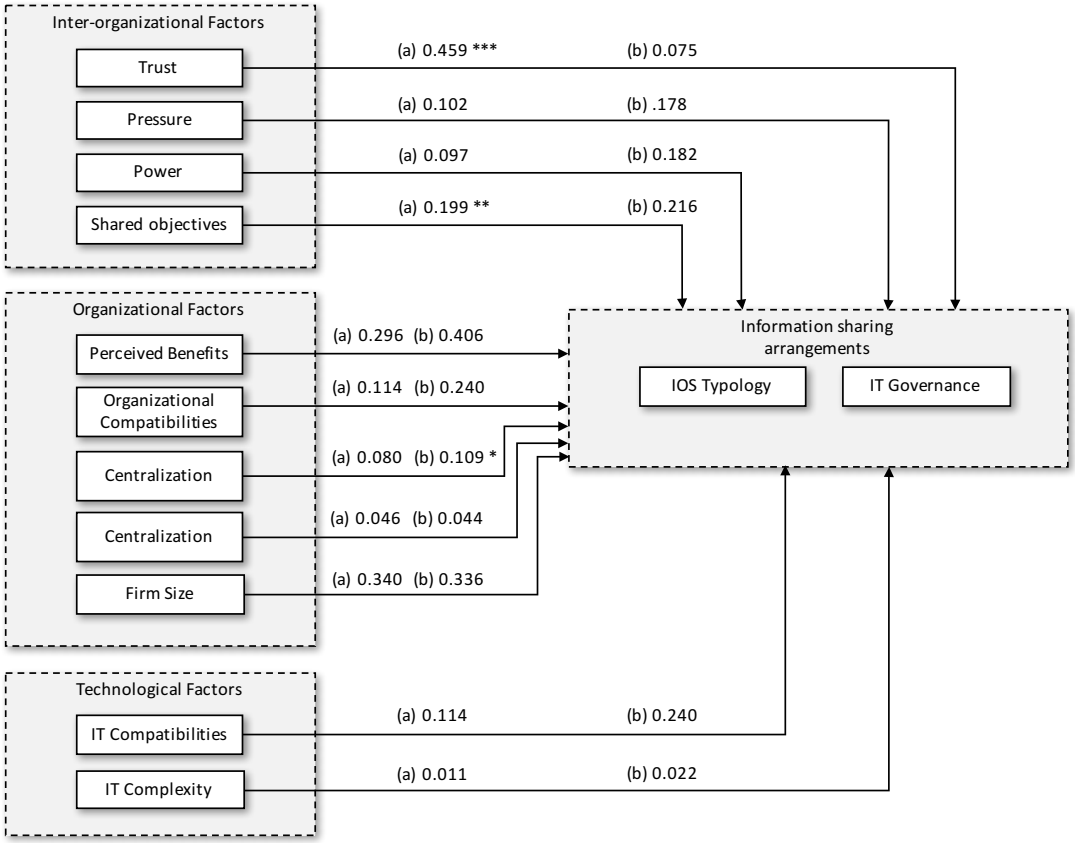
The factors that affect the implementation of the information sharing arrangements are selected by reviewing the existing literature about information systems adoption models and on factors affecting inter-organizational relationship between organizations in Colombia. The selected categories for the types of information sharing IS in this research are chosen after a systematic review; the selected typologies are dyadic, which describes a system that supports one-to-one relationship between a firm and a bank that share information; one-side multilateral, which describes system that supports a one bank many firms that share information structure; and finally multilateral, which describes a system that supports many banks and many firms information sharing relation. On the other hand, the selected IT governance designs for information exchange systems in this research are the centralized design, where just one party take all the decisions regarding IT; the federal design, where both parties participate but not in all IT spheres of decisions; and the decentralized design, where all parties participate in all the spheres of IT decisions.

Based on the selected factors, a theoretical framework is defined to conduct this study. Thus, twenty-two hypotheses that describe the relationship between each of the factors and the information sharing arrangements were stated. The inter-organizational factors are: **trust**, **pressure**, **power** and **shared objectives**; the organizational factors are: **perceived benefits**, **organizational**

compatibilities, **centralization**, **formalization** and **firm's size**; and finally, the technological factors are: **IT compatibilities** and **IT complexity**

To explain what factors and how they affect the information arrangements a quantitative design was used to describe such relation. The mechanism to perform this research is through the use of a longitudinal survey to test the correlations between independent and dependent variables. The survey was sent to a sample of 255 respondents; a response rate of 18.8% was obtained. The data were analyzed by the use of multiple discriminant analysis, which allows the statistical test of multiple metric independent variables and categorical dependent variables, to validate the hypotheses that were defined.

The findings display statistical significance for the positive correlation between the factors trust and shared objectives between the companies and their allied banks, with the typology of the information exchange system; those factors can explain multilateral typology to a 45.9% and 19.9% extent respectively. On the other hand, organizational compatibilities with the information exchange system also displayed statistical significance for its positive correlation with a decentralized IT governance design; that factor can explain decentralization to a 24% extent; as can be seen in Figure 1.



Levels of significance: *p≤0.1, **p<0.05, ***p≤0.01
(a) Influence on the adoption of the information exchange system typology
(b) Influence on IOS IT governance design

Figure 1: Tested model

For practitioners in Colombia, the contributions are related to awareness for developers of the systems for information sharing. The characteristics of the system, in terms of architecture,

infrastructure, and business requirements, ought to be open to a federal or decentralized governance; especially in the IT architecture of the systems. IOS systems should focus on modularity and flexibility, in order to make it adaptable to the organization capabilities, and not the other way around; this last statement is stated since the empirical evidence provides insights about the correlation between organizational compatibilities and the decentralized IT governance of the information exchange system.

***Keywords**: Information sharing arrangements, inter-organizational information systems, IOS, dyadic IT platforms, multilateral IT platforms*

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Chapter 1: Introduction

Information is a critical resource for organizations in relation to their competitive advantage; according to Barney (1991), and grounded on the resource-based view theory (RBV), information is one of the firm's valuable, inimitable, non-substitutable and rare resources required to obtain a competitive advantage. Thus, information technologies (IT), which support information and automate the information processing within the company, have become strategic and top management concern of the firms to outrun the performance of their competitors Barney (1991).

Despite the above-mentioned, cooperation and collaboration among companies, often including the firms' competitors, have been leading the creation of new capabilities for organizations. Thus, information sharing is of great importance to maintain the continuous value creation from the company to their customers and the stakeholders in the industry.

Firms create partnerships with different allies to gain access to different kind of capabilities that lead to improvement of their value chain (Dyer & Singh, 1998). Those relations demand technical arrangements that must be settled, between the different firms involved in the relations, to exchange information.

Information sharing nowadays is supported by Information systems (IS) utilized by two or more organizations to exchange information in an automated manner (Chatterjee & Ravichandran, 2004). Moreover, information exchange systems have the purpose to link business processes with the organizations involved in their use. They bring merged IT capabilities shared by the organizations that are involved, and they also permit the involved firms in organization alliances to cooperate and control possible conflicts through the integration of electronic means. In this manner, the extension of a business' capacity, in addition to the extension of inter firm's business processes, is allowed by information exchange systems (Robey, Im, & Wareham, 2008).

The stakeholders of information exchange systems must define the settings that ought to be used to implement the information exchange system between the different firms involved. such systems have different forms of implementation such as electronic hierarchies, with centralized distribution; or electronic markets with decentralized arrangements in terms of IS distribution and infrastructure; and IT government of the system (King, 1983; Malone, Yates, & Benjamin, 1987). The flow of information, supported by inter-firm business processes, brings known benefits regarding the capabilities of the company such as the increase of its competitiveness and enlargement of the strategic market (Chatterjee & Ravichandran, 2004). Many benefits related to the use of information exchange systems have been identified, such as cost-cutting for the involved firms, boost of the

productivity, market and product strategy improvements and competitive advantage for the involved firms in their implementation (Barrett & Konsynski, 1982).

Early systems for information exchange, also called inter-organizational information systems (IOS), implementations used to be proprietary systems; It was not common that the partners had a vote on their implementation and for this reason, and the lack of autonomy and independence that those implementations represented, they were reluctant to participate in the implementation of such IOS. Standards arose and were taken into consideration to tackle these concerns. That is how Electronic Data Interchange (EDI) was developed, following the aforementioned efforts to build such standards (Vijayasarathy & Robey, 1997).

Malone et al. (1987) provide two different approaches to inter-organizational relationships between buyers and suppliers namely electronic hierarchies and electronic markets. Regarding electronic hierarchies, they explain that there is a long-term relationship implied, with a tight management link, between companies with a different level of hierarchy in the alliance; the control over the information provided among the stakeholders in the relationship is exerted by the top level in the hierarchical structure. On the other hand, electronic markets provide a loose link between the allies, this means that partners have the facility to switch providers; and the governance and management are established by the electronic market arrangements, and not by a powerful superior actor. As shown in figure 2 and figure 3. Some recent IOS configurations are based on the electronic hierarchies and electronic markets Malone et al. (1987).

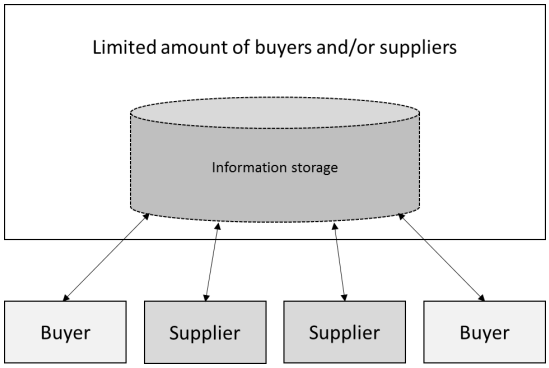

Figure 2: Electronic Hierarchy, based on Malone et al. (1987)

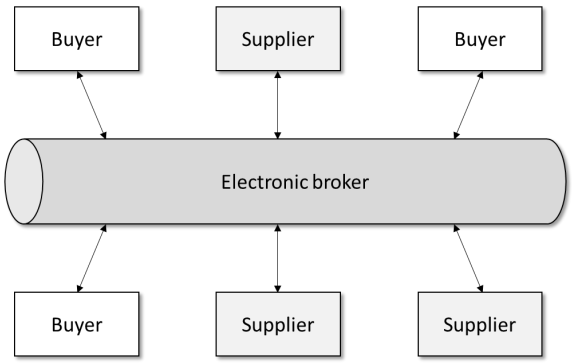

Figure 3: Electronic market, based on Malone et al. (1987)

Pursuing effectiveness and improvement of efficiency, private organizations implement and apply joint strategies among them, by using IT resources. These mutual strategies follow the rationale, that the improvement of internal operations is no longer the only concern for the organizations. Thus, companies are now concerned about inter-firm operations and inter-organizational business processes; setting strategic alliances among different partners to improve their value chains. Information sharing arrangements are configured among two or more companies, to specify a management and governance structure, by implementing a specific typology of IS to exchange information, as well as setting the degree of centralization of IT governance for the implemented system. This research studies the factors that influence the typology of information exchange systems, and the IT governance for the implemented system between private organizations and their banking allies in Colombia.

1.1 Research Problem

Several studies have analyzed the factors that influence the decision to adopt IOS between allied firms (Chau & Hui, 2001; Chwelos, Benbasat, & Dexter, 2001; Premkumar & Ramamurthy, 1995; Premkumar, Ramamurthy, & Nilakanta, 1994; Vijayasarathy & Robey, 1997). Nonetheless, little is known about which factors influence the decision to implement a specific typology for information exchange systems and IT governance design. Although companies implement arrangements for information exchange with their partners, little is known concerning the drivers for implementing those agreements.

There is literature regarding the inter-organizational exchange, client-provider relations and the factors that affect inter-organizational relations in Colombia (Marín-Idárraga & Campos, 2015; A. Rodríguez Orejuela, Hernández Espallardo, & Rodríguez Ramírez, 2011; H. A. Rodríguez Orejuela & Hernández Espallardo, 2008).

The different research stated in the previous lines present a research gap in two different ways. First, the absence of research with regards to the IOS typologies and IT governance implemented between firms; and second, the current research in Colombia concerning inter-organizational relations, which lacks the technical component to complement the literature in this country.

1.2 Research Objective and Research Questions

This study aims to provide an explanation regarding two main subjects; first, which factors influence the information sharing arrangements, between firms exchanging information with their banking partners; and second, to what extent the arrangements are correlated to those factors. Since frequently alliances between companies require them to implement information systems to share information; this study provide a theoretical framework which explains the correlation between factors and information sharing arrangements. To achieve the stated objective, this study will focus on the relationship between private firms and their banking partners, since this type of relationship represents a predefined style of arrangement between the company and its allies.

The main research question, following the stated objectives, is:

RQ: Which factors influence the information sharing arrangements between private organizations and their banking allies?

The research question of this study conducts the research and the structure of this report. To identify the factors that are involved in the information sharing arrangements, the literature on information exchange systems will be evaluated, as well as an empirical research to validate such relation.

To solve the research question, other sub-questions will be answered to support the main objective of the study.

RQ1: Which types of information exchange systems can be identified?

It is important to know which types of information exchange systems exist for implementation among different businesses in a network of inter-organization partnership. With this insight, it is possible to establish the relationship between the factors and the arrangements correlation which is going to be measured.

RQ2: Which factors, that influence information sharing arrangements, can be identified in the literature?

To answer the main research question, this study will base its theory on existing research. The factors that influence information sharing arrangements in private organizational alliances will be reviewed in previous studies, then evaluated and categorized. These factors play an important role, since the theoretical framework of this study, is built using them; the hypotheses that form the conceptual model, are based on those previous studies. In order to build a sound theoretical framework that can fit the Colombian reality, as the chosen population, the factors will also be chosen in terms of their relevance in this country.

RQ3: What is the influence of each factor on the information sharing arrangements?

The correlation between the different factors on the different types of arrangements will be measured to answer this sub-question. To do so, a survey will be conducted in Colombia. The outcomes of this survey might confirm or challenge factors in the literature (Steinfield, In Tucker, Gonzalez, Topi, & Diaz-Herrera, 2014).

1.3 Research Relevance

This research will contribute in two manners to the scientific literature. In a general way, this study provides a new theoretical framework through hypothesis testing regarding the influence of factors on information sharing arrangement between different companies in the private sector.

In a more specific way, this study will also contribute to the literature regarding the inter-organizational relations in Colombia at least in three aspects. First, the framework provided by this study will bring factors that influence the inter-organizational relations. Second, this research will hand over a high-level view of the technical aspect of the inter-firm relations, which will complement the organizational aspect of the relationships, which has been investigated in this country. Finally, it will provide a perspective of the private sector regarding inter-organizational information systems in Colombia; this will complement other studies in the public sector.

This study also brings new knowledge for practitioners in Colombia, regarding decision-making process, at the moment of establishing information sharing arrangements for their information exchange systems implementations.

Management of technology (MOT) serves as a bridge between two sides within the organization, the business side and the technology side of the company. In other words, management of technology is the link between the technology and its support to the business needs of the organization. Bearing in mind that this study is focused on information and communication technologies (ICT), this research project presents a framework that is aligned with the IT management and IT governance designs.

1.4 Thesis outline and research framework

This report's structure shows the phases that were followed throughout the study. Starting from the problem definition, through the review of literature for developing a theory based on a conceptual model, stating the research methodology and finally, analyzing the gathered data to display and discuss results and state the conclusions of the research. The phases are shown as a logic flow as displayed in figure 4.

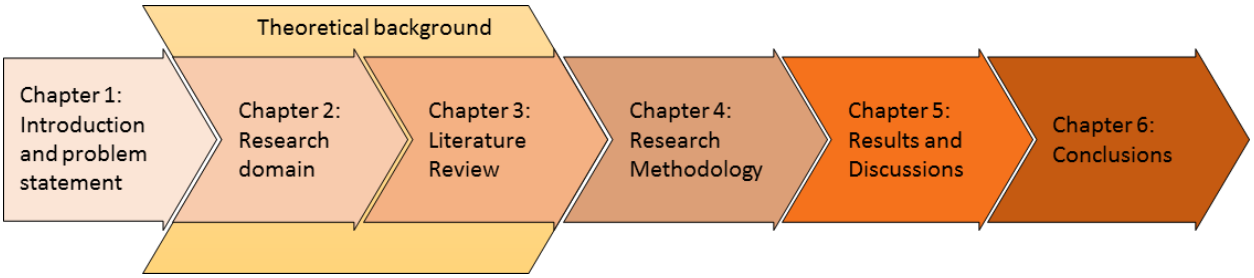

Figure 4: Research and report structure

The introduction and problem statement of the research are explained in chapter 1. This chapter presents the motivations and objectives to study the subject at stake. It also states different questions as guidelines to be followed by the study.

The research domain explains the scope and boundaries that are taken into consideration in this research. Such boundaries are related to the location in which the study will aim its attention at, an industrial niche in which the research will focus, and type of relationship to be taken into account. The research domain is explained in chapter 2. This chapter will bring insights towards the foundation of a theoretical background of this study by establishing its scope and boundaries.

The literature review, which will provide a theoretical background concerning the information sharing arrangements and the factors that influence them, will be contained in chapter 3. It will mainly review previous research related to information exchange systems and their typologies, inter-organizational information technologies governance levels of centralization, and the main factors that affect the typologies and IT governance designs. On the other hand, based on the theoretical background, the theoretical framework which will be challenged and present the basis of this research, will be designed and stated in chapter 3. This chapter, as well as chapter 2, will provide theoretical background regarding the required knowledge to build the theory that supports this research.

The type of research that will be explained in chapter 4. The data collection procedure that better fit methods for gathering the data, the procedure to select the sample and the process of analysis, related to the gathered data will be stated in the research methodology phase. The fourth chapter of this document, contains the research design, and the research framework which works as a blueprint for the data analysis and the validation of the presented model in chapter 3.

The statistical analysis will validate and challenge the theoretical framework, designed and stated in chapter 3. The analysis will be made by using statistical tests using methods according to the

characteristics of the gathered data. The explanation of the results, regarding the statistical analysis of the gathered data, and the proposed discussion of this research regarding those results, are stated in chapter 5. These results will be presented based only on the collected data. The discussion of the results will provide an explanation regarding the validity of the hypotheses that form the theoretical framework of this research.

Finally, the conclusions of the research will be presented in chapter 6. The conclusions will be part of the deductions based on the theoretical framework, the results and discussions, and the limitations of the research. The conclusions will present a sound argument regarding the theoretical framework and will present possible future subjects of study related to the topic investigated in this research.

1.4.1 Research Framework

The research framework shows the blueprint to guide the study as portrayed in figure 5. It represents the steps, to meet the research objective (Verschuren, Doorewaard, Poper, & Mellion, 2010). The logic behind this proposed research framework is stated in the following lines.

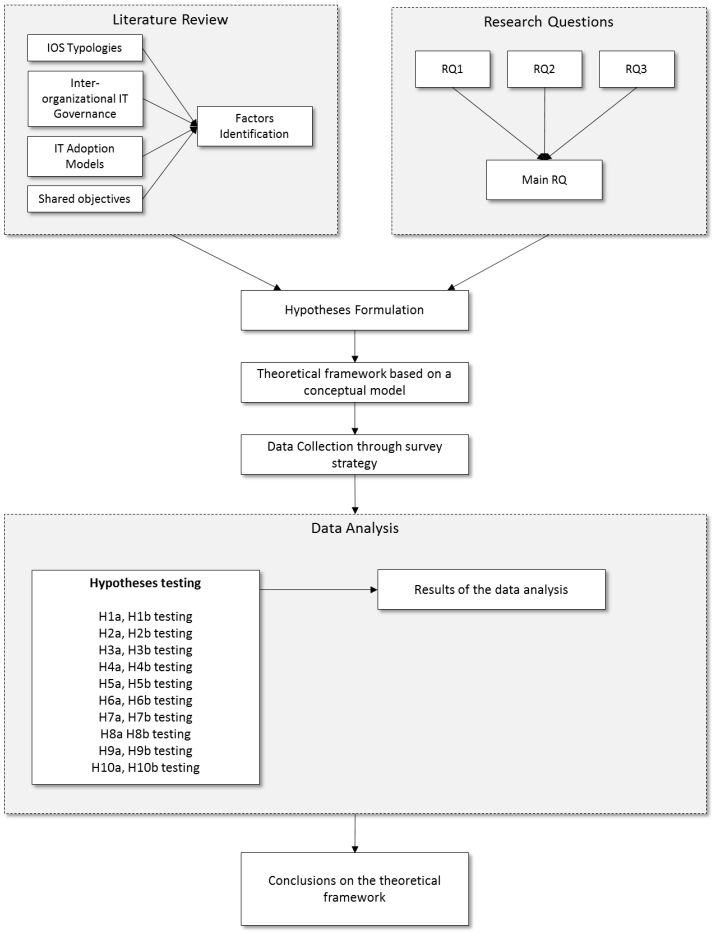

Figure 5 Research Framework

The literature review brings definitions regarding the already stated concepts related to the problem at stake. These definitions, which have already been stated in the literature review section, are information sharing arrangement types and the factors which influence those arrangements. In the same way, the research question, supported on the three research sub-questions, which will be answered throughout the development of the study, are formulated based on the problem statement.

Having the literature review and the research as a base of the study, a final conceptual model will be designed. The conceptual model draws the relations between the factors, and the information sharing arrangements.

When the conceptual model is design and the theoretical framework is defined, the propositions will be tested. The assessment of the proposition will be done based on organizations in the private sector and the banks in Colombia.

Chapter 2: Research domain

This chapter focuses on the boundaries and the scope of the research study. In chapter 1, the research problem was identified and stated. Based on that stated problem, the main objective for conducting this research was also set in order to provide a structure and a purpose of the study. It is time thus to state the domain of the study, in order to establish its boundaries and scope.

This chapter will have the following structure. First, it will explain the concept of information. Second, it will provide a definition for information sharing arrangements. Third, it will describe the advances in information technologies and information sharing in the banking sector. And finally, it will state the reasons for choosing Colombia as the population of the study, and it will provide an overview of the state of the art of information sharing developments in Colombia.

2.1 Information Sharing

This section aims to state the different approaches to information sharing, it starts by defining information from an academic perspective, and then it briefly presents technical developments of information sharing and its different approaches in the organizational context. At the end, a summary of the different concepts is displayed.

2.1.1 Definition of Information

The concept of information is interrelated to other two concepts, namely data and knowledge; some scholars include wisdom. A few of the many definitions of information presented in the review by Zins (2007) are shown in table 1. According to Rowley (2007), who reviews the wisdom model introduced by Ackoff (1989) states: “Data are defined symbols that represent properties of objects, events and their environment.”, they come out of observation, nevertheless, they lack meaning unless they have a relevant form. “Information is inferred from data. It is contained in description; it answers to questions that begin with statements such as who, what, when and how many”. On the other hand, “Knowledge is know-how, which is transferred from another who has it, or by extracting it through experience” (Ackoff, 1989).

Several authors seem to agree that information is built from data, giving it meaning in order to be used by people either at individual or in organizational level.

Table 1: Information definitions, from (Zins, 2007)

Author	Definition
Dr. Hanne Albrechtsen, Institute of Knowledge Sharing, Copenhagen, Denmark.	"Information is related to meaning or human intention. In computational systems information is the contents of databases, the web, etc. In human discourse systems information is the meaning of statements as they are intended by the speaker/writer and understood/misunderstood by the listener/reader." (p. 480)
Prof. Elsa Barber, University of Buenos Aires, Argentina	"Information is a message used by a sender to represent one or more concepts within a communication process, intended to increase knowledge in recipients" (p. 480)
Prof. Shifra Baruchson–Arbib, Bar Ilan University, Ramat-Gan, Israel	"Information is data that has been processed into a form that is meaningful to the recipient" (p. 480)
Dr. Quentin L. Burrell, Isle of Man International Business School, Isle of Man	"Information is that which is conveyed, and possibly amenable to analysis and interpretation, through data and the context in which the data are assembled." (p. 481)
Prof. Rafael Capurro, University of Applied Sciences, Stuttgart, Germany	Data, information, knowledge. Putting the three concepts ('data,' 'information," and 'knowledge') [...], gives the impression of a logical hierarchy: Information is set together out of data and knowledge comes out from putting together information." (p. 481)

Information sharing, based on the different concepts of information, is the exchange of information across individual or organizational boundaries. The purpose of this study, as has been mentioned in chapter 1, is focused on the information sharing that crosses firms' boundaries.

2.1.2 Information science approach of information sharing

The information sharing at the individual and at the organizational level is a need that does not represent an issue at present time, thanks to vast scale networks of computers like the internet. However, challenges like heterogeneity of information imply a known problem related to the processing and interpretation of the supplied information.

Making use of information has become an issue, since combining it with other information present several challenges for the organizations (Stuckenschmidt & Van Harmelen, 2005). It is common awareness, in the information science, that heterogeneity of information is dealt with the use of semantics of information, and the use of ontology-based approaches, which are the exchange of

information by using common vocabulary and specification for the information to be shared (Gruber, 1993).

A known and accepted semantic approach for information sharing is the Extensible Markup Language (XML) by the World Wide Web Consortium (W3C). This semantic language lets the information owner, or responsible, define the information's own structure, and define tags that identify all the content within the information to be exchanged as long as it follows the W3C guidelines. On the other hand, to overcome the heterogeneity of information the ontologies come in place to set a standard notation regardless of the information to be sent. The ontologies are materialized through ontology languages like OWL and RDF; this approach helps the combination of different sources of data, no matter the source, as long as it follows the specific guidelines of the ontology languages.

Based on XML other semantic languages arise like XBRL, which is a case of this tendency. It is conceived, as its name implies, as a business reporting language that, as XML, uses tags for categorizing and structuring business data (Pinsker, 2003). XBRL is mainly used in business-to-government relationships as it is used to report business information to the public organizations that function as supervisory bodies (Praditya & Janssen, 2016).

2.1.3 Information sharing at the organizational level

Information sharing in the supply chain, which is a form of vertical information sharing (Niraj & Narasimhan, 2004), is critical for supply chain management[1] due to the support it provides to the collaboration between the firms involved. Internal operation and strategic plans of the organizations involved in the value chain are aligned by the help of information sharing; moreover, the benefits go beyond this since through cooperation and collaboration, the involved organizations improve their internal operating performance supported by the sharing of resources, capabilities and the sharing of risks (Watabaji et al., 2016).

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[1] Supply chain management, according to Larson (2001), in his review of the book: "Designing and managing the supply chain: concepts strategies and case studies" by (Levi, Kaminsky, & Levi, 2003), quotes its definition as "a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed in the right quantities, to the right locations, and at the right time, in order to minimize system's wide costs, while satisfying service level requirements".
Besides, he extends it to the business-to-customer (B2C) sector which sidesteps the stores and goes directly to the final user (p. 259)

Information sharing among competitor firms, which is a form of horizontal information sharing (Niraj & Narasimhan, 2004), is a common practice between organizations. For instance, in the banking sector, organizations exchange information about their defaulters; merchants share information about the requirements of their customers with other companies in the same industry; and firms' share information concerning the performance of their employees. According to Piccolo and Pagnozzi (2013), the incentives to share information, among competitors, are impacted by the effects that information exchange have on their profits by meanings of the 'production externalities'[2]. In cases where the externalities are few, the firms will share information with their competitors. However, in cases where externalities are large firms will refuse to share information, even when the benefits surpass the blockages, falling into a 'prisoner's dilemma'[3]. The aforementioned scenario, of a prisoner's dilemma in cases of large externalities, implies the existence of several benefits of information sharing with competitors that end in supernormal profits, which indicates the existence of competitive advantage for the organization (Barney, 1991; Cho & Jun, 2013).

Governments perceive collaboration between and among public institutions as an advantageous practice; for health organizations for instance, it is of great importance to share information to support collaboration in order to improve public health of their nations (Jones & Thomas, 2007). Government agencies know the value of information exchange through government agencies, and e-government initiatives get direct benefits from the information exchange practices for accountability purposes, efficiency and waste reduction. Several events, such as 9/11 in The United States brought the attention to the lack of efficiency in the information sharing between government agencies; such events meant a trigger for the improvement of public organizations information exchange. (Yang & Maxwell, 2011).

2.2 Information Sharing Arrangements

This section proposes a definition for information sharing arrangements, from a technical and IS perspective. The definition is brought based on the previous work of Praditya and Janssen (2016).

Information sharing arrangements, from a technical and organizational perspective is built on two main subjects, namely systems for information exchange and their IT governance. The remaining of this subchapter will present the concepts of IS, information exchange systems and inter-organizational IT government based on the aforementioned concepts. The theory behind the proposed concept of information sharing arrangements will be provided.

2.2.1 Information systems

Commonly an organization is understood as three main streams: first, the strategic stream, where the strategic decisions, the mission, the vision and strategic plans of the firms are defined; second,

[2] Externalities, in economics, are the effects of the production or consumption of goods and services on external actors which do not consume nor produce those good and services. (Buchanan & Wm. Craig, 1962)
[3] Prisoners' dilemma is an anomaly, where a pair of individuals which are motivated by their self-centeredness follow a plan of action which does not lead to the ideal outcome.

the technical stream, where the operation plans for the company product or services development are developed; and third, the operational stream, where the daily activities are planned. The corporate information system manages and stores the information related to the three main streams of the organization. This results in the information of the internal, and environmental or external operations (Fong, 2015).

2.2.2 Information exchange systems

There are several types of research that have investigated the role of information systems crossing organization boundaries. According to Chatterjee and Ravichandran (2004), the first to bring the subject to the table was Kaufman (1966) with the definition of IOS.

IOS, as defined by Robey et al. (2008), are computerized IS, that cross the limits of the organization, and are responsible for the exchange of information supporting automated relations between business processes of different organizations. Yet, there are many definitions of IOS since it has changed over time. The different definitions are summarized in table 2.

Table 2: IOS Definitions

Author	Definition
Barrett and Konsynski (1982)	"Information systems that involve resources shared between two or more organizations" (p. 94)
Cash and Konsynski (1985)	"Information systems technology that involves networks that transcend company boundaries"
Bakos (1991)	"Information systems that cross organizational boundaries, such as systems linking one or more firms to their customers and/or suppliers" (p. 296)
Steinfield, Markus, and Wigand (2005)	"A complex package of software, interorganizational business processes, and infrastructures (including networks and standards)"

The aforementioned definitions are based mainly on the conceptualization of IOS by Barrett and Konsynski (1982). Later, the integration of processes across firms and interoperability was added to the IOS definition (Robey et al., 2008). IOS bring, with the implementation of such systems, a number of benefits. Among those benefits, in the literature can be identified the coordination of operations surpassing organizational barriers, which permits customers to order products or services, as well as letting the providers renew their customers and support in the management of stock. It also brings the opportunity to firms to get e-services from a supplier. IOS bring competitive advantage by the increment of market share of the organizations; and the total cost-cutting support at the organizational level (Clemons & Kleindorfer, 1992).

2.2.3 IT Governance

Information technologies are present throughout the whole business environment. Organizations have increased their dependence on IT systems. These systems have been support three main streams of the firm, namely strategic, technical and operational streams. Thus, information technologies, besides offering support to the strategies of the businesses, they have become part of the strategic planning within the company as well as factor of success, and source of competitive advantage. On the other hand, IT also encompass financial assets investments from the companies; this requires the companies to create value for the business from the investments made on IT (Van Grembergen & De Haes, 2009).

IT must be governed to ensure that the strategic planning and the investment made on IT are aligned with the business strategies as mentioned by two different sources as displayed in table 3.

Table 3: IT Governance definition according to different sources

Source	IT Governance
IT Governance Institute (ITGI, 2003)	" IT governance is the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives. " (p. 10)
Calder and Watkins (2015)	"The framework for the leadership, organizational structures and business processes, standards and compliance to these standards, which ensures that the organization's information systems support and enable the achievement of its strategies"
Van Grembergen and De Haes (2009)	"Enterprise Governance of IT addresses the definition and implementation of processes, structures and relational mechanism in the organization that enable both business and IT people to execute their responsibilities in support of business/IT alignment and the creation of business value from IT-enabled business investments" (p. 1)

As a final remark, with regards to IT governance, Weill (2004) highlights the importance of IT governance on the organization. He claims that IT governance is significant because it has an effect on the benefits received from the investments of IT on the organizations. The return of investment made on information technology in the organizations are boosted by a set of actions to improve internal business processes and other methods for corporate governance provided by IT governance.

2.3 Information Sharing and IT in the Banking Sector

This section present different advances in the implementation of information exchange and information technologies in the banking sector. The banking sector is chosen as part of the subject of this study, since there is a lack of research in the literature about the adoption and governance of information exchange systems in this sector.

It is common to relate IOS with supply chain management and value chain with good reason, since the purpose of IT in the organization is to support the value chain, and support the competitive advantage of the organizations (Kumar & Van Dissel, 1996). Nevertheless, information exchange systems in the banking sector represents a research gap. Thus, it is of main importance to fill that chasm and provide a base for future research.

2.3.1 Information sharing in the banking sector

Non-symmetric information in credit markets have been shown to bring on credit rationing[4]. This phenomenon can be avoided by borrowers' information exchange between banks. Pagano and Jappelli (1993) have stated that through what is known as "credit bureaus", which are information brokers, lenders are able to build better knowledge regarding new customers. They display the process as follows: "The latter (*the bank or lender interested in the information*) collect, file, and distribute the information voluntarily supplied by their members, and operate on the principle of reciprocity: lenders who do not provide data are denied access to the bureau's files" (p. 1693).

Tchamyou and Asongu (2017) studied the impact of information sharing through "bureaus"; they came to the conclusion that the information sharing bureaus increment the formal development of the financial sector while decreasing the informal development in that sector. The aforementioned formal development increase occurs in cases where private credit bureaus are established at the very least 26% of the coverage by the information sharing broker.

2.3.2 Information technologies breakthroughs in the banking sector

Information technology has played an important role in the banking sector, banks are interested in implementing state of the art technologies. On the one hand, internet and other information technologies have led banks towards the development and implementation of different banking solutions, such as web banking, mobile banking, and even e-banking; this last example involving a whole new business model in the banking industry. On the other hand, all these developments have

[4] Credit rationing, in economics, is phenomenon that happens when the banker sets an interest rate on credits, proceeding then to provide more modest size of the credit than the required by the debtors. This phenomenon is considered a market failure (Jaffee & Russell, 1976).

led to several risks that make the support of IT in the banking sector critical in terms of security, privacy and risk management (Ghaziri, 1998; Raju, 2016).

Read (1983) highlights several developments of information technologies in the banking sector, among which can be found developments that automate the accounting and the bookkeeping of the customers of the financial institutions; progress in the handling of vouchers; paper removal or diminution thanks to the banking system; and "self-service banking adoption" (p. 23) among others developments that improve the banking industry. Further, in terms of information exchange systems, Han, Kauffman, and Nault (2004) present the case study of J.P. Morgan Bank which utilizes an IOS with one of their organizational customers. The name of the IOS used is “RiskMetrics” (p. 111) which is described as follows: the system acquires data of risk position like risks concerning credits for creditors and prices of derivate security, and it generates quota of the risk of the firm’s portfolio. Concerns were placed regarding private information, nonetheless, according to the case no private information from the customer was exploited by the agent.

2.4 Information Sharing Developments in Colombian Financial and Public Sector

In this section, the motives for choosing Colombia and the state of the art of the information sharing and IT developments in Colombia will be stated regarding the financial and public sector.

The first motive for choosing Colombia as the population for this study is that is the country of origin of the researcher. This supposes an understanding of the population, an easy access to a relevant sample and an understanding of the spoken language of the population; these facts makes it a good starting point for tackling the gap this research aims to close.

The second motive is that there is a literature base in Colombia regarding information exchange between organizations in terms of e-commerce acceptance, knowledge sharing, ICT adoption in the public sector, inter-organizational relations and financial impact on the economic growth (Cortés Villafradez & Hernández Luna, 2016; Marín-Idárraga & Campos, 2015; Murillo Vargas, 2009; Osorio-Gallego, Londoño-Metaute, & López-Zapata, 2016; Tavera Mesías, Sánchez Giraldo, & Ballesteros Díaz, 2011; Vanegas Ruiz & Flórez Corredor, 2015). This existing literature will be complemented with this research in terms of adoption of typologies of information exchange systems and inter-organizational IT governance.

Finally, in the interest of setting a starting point for broader research, this study aims to open new research possibilities starting by developing countries with similar characteristics to those of private organizations in Colombia such as firms in South and Central America.

The Colombian national tax and customs authority (DIAN for its acronym in Spanish), have made several inter-agency strategic alliances, through implementation of information sharing, the cooperation, and collaboration. This national agency has also established treaties with different organizations in the private sector, following the legal guidelines regarding information privacy, people intimacy and collaboration (Dirección de Impuestos y Aduanas Nacionales, 2006).

According to the DIAN, Colombia will exchange tax information with one hundred and six countries through the "International tax convent". Following these agreements, The United States shares with Colombian state, since 2015, information concerning Colombian expats living in the US and vice versa. Apart from that, "the banks in Colombia have had to start reporting the banking account information of individuals with balances over 50'000 as from June 30, 2014" (Portal Actualicese.com, 2015).

Colombian state, following the international financial reporting standards (IFRS) in Colombia, is adopting XBRL as a standard for information reporting, so that the public organizations submit their financial information to the regulatory bodies (Superintendencia Financiera de Colombia, 2016; XBRL Colombia).

The healthcare sector in Colombia have been implementing IS in a piecemeal manner. A large amount of those implementation initiatives has failed for several reasons namely lack of resources and inaccurate plan of action, among other similar implementing issues. According to the legal framework in Colombia, the ICT national plan has the goal of "achieving high-quality levels and coverage of health services, through the implementation of technological infrastructure and appropriation and efficient utilization of ICT in the health sector" (p. 88) (Bernal-Acevedo & Forero-Camacho, 2011). For the past few years, the information consolidation in Colombia has been the main purpose of the development of different IS. Among those IS there are (1) the single registration of affiliates to the healthcare system, (2) Individual registration of service provision, (3) Integrated Contribution Settlement Template; and (3) medication system. Healthcare in Colombia still lacks a system that integrates the information of the aforementioned IS (Ortegón, 2014).

2.5 Research Domain Conclusions

There are several definitions of information in the academic context; nevertheless, there has been an agreement, regarding the specification towards the way information should be shared across individual and organizational boundaries, through the use of semantic languages and by the use of ontological approaches.

Information sharing is a practice that brings benefits in the private sector, especially resulting in competitive advantage for the firm's involved in its use. This is for both, vertical information exchange, in a value chain; and horizontal information exchange, with firm's competitors.

Information exchange in the public sector, bring many benefits for the public organizations like efficiency and accountability for the agencies involved, which mean better services for the population in the end.

The information sharing arrangements are formed by two main components namely government and IOS typology. IOS systems are implemented following a specific typology that meets the requirements of the stakeholders; and the governance of IT plays an important part by consolidating that relationship.

Information sharing is critical for capital markets. It enables the symmetry of information which leads to the lack of the phenomenon of credit rationing. This implies chances of avoiding market

failure by not complying with the interest rates and credit requirements of the borrowers in a market. This is supported by information brokers, or as it is known in the banking industry, the credit bureaus. Where the banks, no matter if they are allies or competitors, share their borrowers' information to facilitate the symmetry of the information in capital market.

IT has supported the banking industry in the last year, by providing means to share information and by bringing new tools to the banks to increment their value chain, vis-à-vis their customers either whether they are individuals or organizational customers.

Chapter 3: Literature Review and Theoretical Framework

This chapter will answer the first research sub-question: "Which kind of inter-organizational information systems can be identified?", and the second research sub question: "Which factors that influence information sharing arrangements can be identified in the literature?" The first sub question will be answered by identifying the different information exchange system typologies existing in the literature. The second sub question will be tackled by stating the factors that influence adoption of information exchange systems and inter-organizational IT governance.

To set a structure for the literature review, the first section of this chapter will address the adoption of innovation by summarizing different innovation adoption frameworks. The second section will present the different typologies of information exchange systems. The third section displays different theories regarding inter-organizational IT governance; that way the second and third sections will bring literature about the technical information sharing arrangements between the organizations as was defined in section 2.2. The fourth section will analyze the factors found in the literature. The fifth section will state the theoretical framework on which the rest of this study will be based. And finally, the sixth section will summarize the literature review and will also state the

The main source for previous studies regarding the topic at stake was research available on internet; when relevant literature was found, related references where also read following a snowballing research technique (Given, 2008). The academic literature to be reviewed for this study consist of books, academic and professional journals, business reports, theses and conferences.

3.1 Information Systems Adoption

In this section, research concerning innovation adoption is presented. In the first part innovation will be conceptualized, then different innovation adoptions frameworks will be shown to provide an understanding of the different models that can explain the implementation of IOS in the organization.

3.1.1 Models and theories of adoption of IT

In this subsection, different models and frameworks of innovation and IS adoption are presented. Since this study focus on the information sharing arrangements choices, such models will help structuring and designing the theoretical framework on which this research is based to deliver a

solution to the research problem and the research questions. The presented models are the technology acceptance model (TAM) (Davis, 1986; Davis, Bagozzi, & Warshaw, 1989), the extended technology acceptance model (TAM2) (Venkatesh & Davis, 2000), the unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003), the model of diffusion of innovation (DOI) (Rogers Everett, 1995), and the technology-organization-environment (TOE) framework (Tornatzky, Fleischer, & Chakrabarti, 1990).

IT in the organizations demand directors and IT employees within the organizations to work with hardware and software. End-users are not always enthusiastic about the use of IS that would bring to the company important performance achievements. The use of IT within the organization is a matter of great importance; Davis et al. (1989) for instance states: "Computer systems cannot improve organizational performance if they aren't used" (p. 982).

Davis et al. (1989) developed a model of the acceptance of IS. The model answers three main questions, namely the motivational variables of the users to utilize an information system, the causality that relates one motivational variable to another, and how motivation can be measured.

The technology acceptance model (TAM), as shown in figure 6, posit that the use of information systems is driven by behavioral intention (BI). In the same way, BI is driven by the «attitude of the user(s) toward using the system» (A) and by the perceived usefulness of the system (U), which also affects A. U is directly affected by perceived ease of use E and finally, attitude toward use (A) is impacted by the perceived ease of use (E) (Davis et al., 1989).

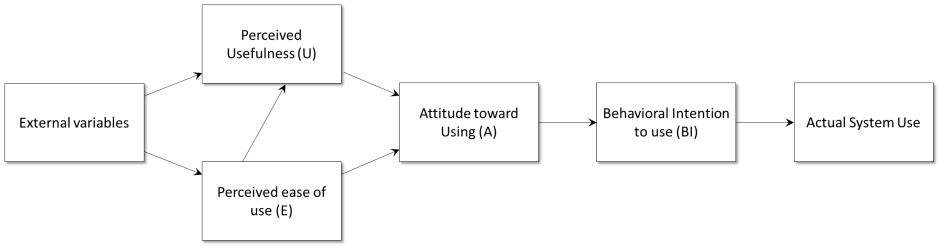


Figure 6: Technology Acceptance Model (TAM) by Davis (1986)

A postponement of the TAM was developed by Venkatesh and Davis (2000). The authors referred to this extension as the TAM2. The authors claim that there are three interdependent social forces, namely subjective norm, or the person's observation that nearly all people, who are significant to that person, consider that he should or shouldn't perform the behavior at stake; voluntariness or "voluntary usage contexts" (p. 188); and Image, which is related to preserve a promising image in a locus group. The TAM2 model is displayed in figure 7.

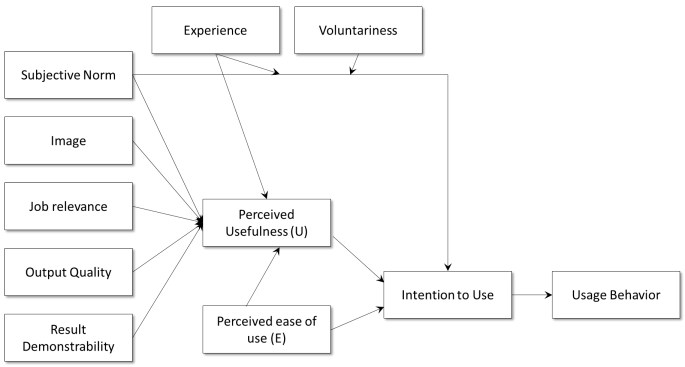


Figure 7: Technology Acceptance Model Extension (TAM2) by Venkatesh and Davis (2000)

Venkatesh et al. (2003), unifying different theories concerning acceptance of IS in the organizational environment, formulated a model based in previous acceptance theories. Once tested their UTAUT model, they concluded that the new model surpassed the previous models obtaining a coefficient of determination of 69 percent. That meant that 69% of the variance, between the acceptance of IT and the independent variables as shown in figure 8, was explained.

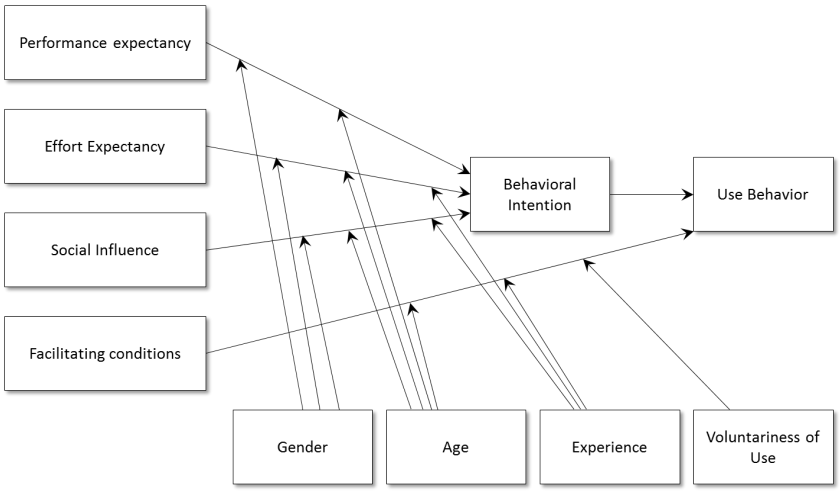


Figure 8: Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003)

Following with the literature review of the models of acceptance of IT, Rogers (1995), in his work: "Diffusion of innovations", presents a model for spread of innovations in the organizations. Innovations in the organizations follow two decisions of adoption, namely the "collective innovation-decisions", which are the decisions of rejection or adoption of innovations made in a conjoint manner among the different parts of a system; and the "authority innovation-decisions", which obey to the decisions of rejection or adoption of an innovation made by powerful and high ranked members of a system.

The model of diffusion of innovation (DOI) presents the organizational variables that influence the organizational innovativeness. The organizational variables are divided in three categories as displayed in figure 9. The individual characteristics, which present the attitude of the leaders of the organization toward the changes brought to the organization by the innovation at stake. Rogers (1995) states that the "internal characteristics of organizational structure" (p. 359) refers to centralization, complexity (in terms of the expertise and knowledge of the employees of the organization), formalization, interconnectedness, organizational slack (refers to the lack of commitment of human resources within the organization), and size of the firm. Finally, the external characteristics of the organization refers to "the degree to which the members of a system are linked to others who are external to the system. An open system exchanges information across its boundaries" (Rogers, 1995) (p. 356).

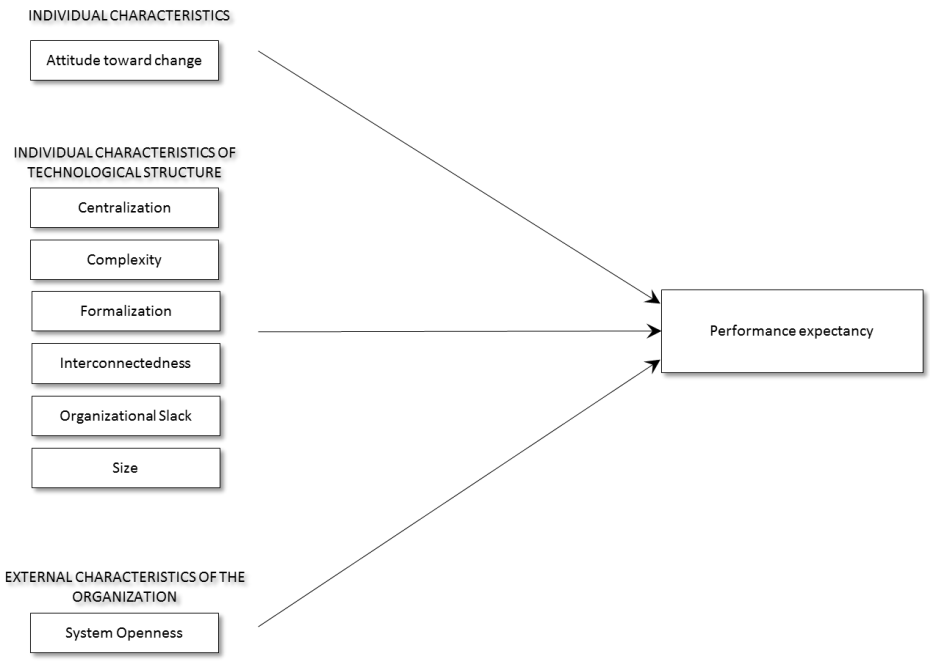


Figure 9: Diffusion of Adoption (DOI) by Rogers (1995)

Tornatzky et al. (1990), in their book "The process of technological innovation", present the technology-organization-environment framework (TOE), which is displayed in figure 10. This framework focusses in the context that surrounds the innovation adoption process. The context involves internal and external environments with regards to the organization. Concerning the TOE framework, three main group of factors or "contexts" affect the decision-making process towards innovation adoption which are: the organization context, the environment context and the technology context.

The organization context refers to the firm's internal characteristics like firm size, organizational structure (in terms of hierarchy, formalization and structure of management); the quality of the human resources of the firm and the amount of resources uncommitted to the innovation adoption within the firm; and the communication process and linking structures of the firm (Tornatzky et al., 1990).

The technological context mentions to the inner and outer technologies that are important to the firm's performance. The practices related to the technologies, and technological tools used within the organization, are considered part of the technological context. This context is divided from the organization context, in order to apply a particular focus of how other technologies, internal and external to the firm, can affect the adoption of a new technological innovation (Tornatzky et al., 1990).

The environment context refers to the factors that are not controlled by the organization, yet directly impact the organization performance. The factors within the environment context are: the characteristics of the industry and market in which the firm performs, the infrastructure support, concerning technologies and the regulations of the public sector (Tornatzky et al., 1990).

The context concept in the TOE framework, presented by Tornatzky et al. (1990), have an important relation with the process of innovation adoption. The context itself does not define the process but it might represent a barrier or a facilitator of the process of adoption of innovation.

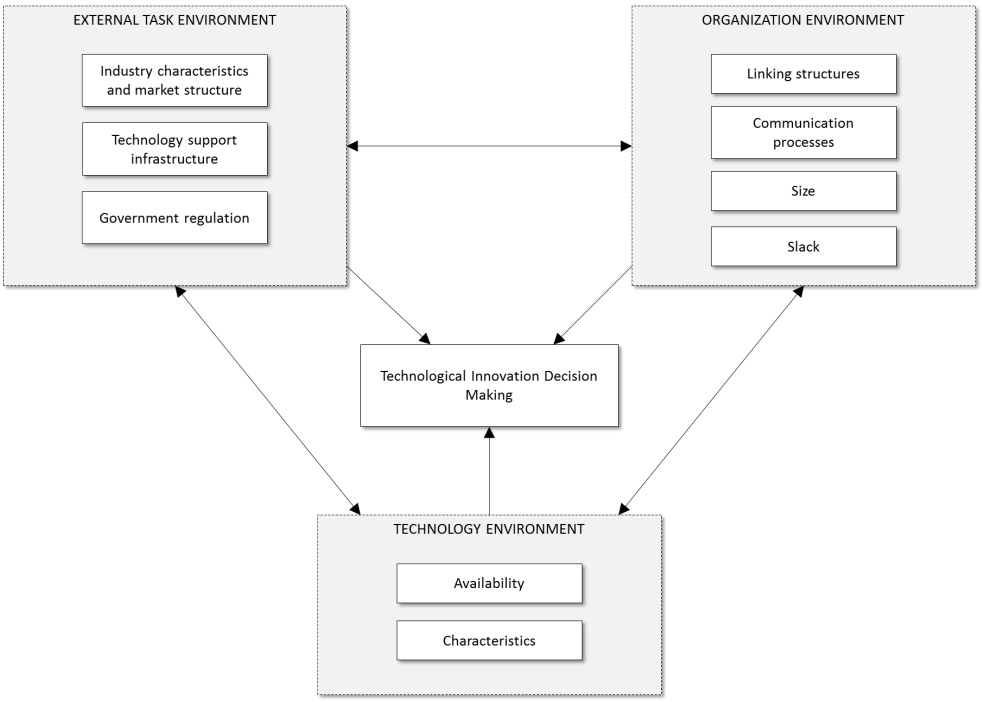


Figure 10: Technology Organization Environment Framework (TOE) Tornatzky et al. (1990)

Oliveira and Martins (2011), in their review of IT adoption, present the institutional theory by Scott and Christensen (1995). The institutional theory claims that apart from the aim toward efficiency, the organizational decisions are driven also by their social and cultural values; thus, the institutions are affected by cultures, structures, and routines operating at multiple levels. Due to the market and/or industry pressures, and according to the institutional theory, firms that share the same operating field have the tendency to grow into homogeneity with each other. This homogeneity is presented since pressure, exerted from different sources like customer, industry or competitors pressure, influence the firm to follow a trend.

3.2 Information Exchange System Typologies

This section will list the types of information exchange systems that have been found in the literature. Several scholars have identified different information exchange systems between organizations. The typologies presented in this study are dyads, multilateral, horizontal, vertical, proprietary, standard-based, open and private.

3.2.1 Inter-organizational information systems

Choudhury (1997), based on previous research by Malone et al. (1987), proposes two different types of information exchange systems, namely electronic dyads, and multilateral. The differences arise by comparing different implementations of information exchange systems between two or more companies. The identification of dyads comes with recognizing systems that link one company to another (typically one buyer and one supplier). The identification of multilateral systems, is supported by the recognition of systems that allow one company compare different options (one buyer compare different sellers or service providers).

Electronic dyads are reciprocal agreements which build individual logical links between one company and each of its allies as shown in figure 11; this kind of agreements between companies are established through cooperation between the involved firms. Their implementation are based on mutual standards for EDI to let the organizations communicate through electronic means (Choudhury, 1997).

Multilateral information exchange systems let the company exchange information with multiple allies based on a single link. Hence, this type of arrangements works in an effective way, as intermediary or mediator, between the company and its partners as shown in figure 12 (Choudhury, 1997).

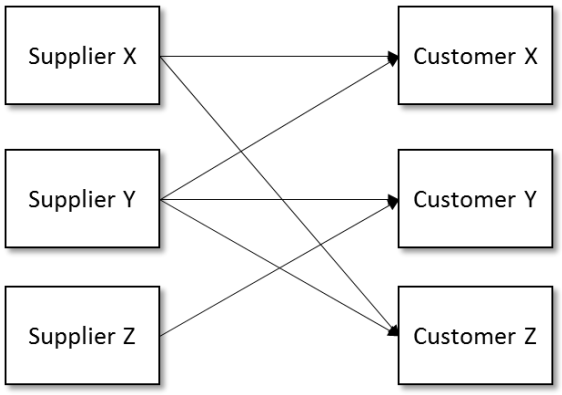


Figure 11: Electronic Dyads based on Choudhury (1997)

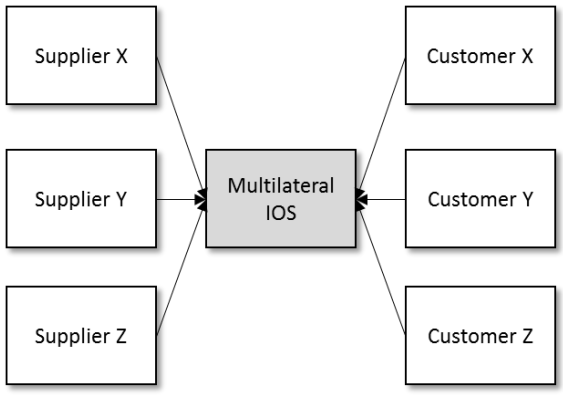


Figure 12: Multilateral IOS based on Choudhury (1997)

Discussing the benefits of each type of information exchange system (Choudhury, 1997), based on (Malone et al., 1987), uses two concepts regarding the benefits of each typology, namely electronic integration and electronic brokerage. Electronic brokerage refers to the exchange of information among the inter-connected firms. On the other hand, electronic integration refers to the linkages

between two firms to increase the efficiency of information sharing. These two concepts were briefly tackled in chapter 1 (see figure 2 and figure 3). Dyadic information exchange systems present higher electronic integration between the two firms that implement them; while multilateral information exchange systems provide higher brokerage, which is related to the availability of information for the stakeholders.

The most popular objective of the IS for information exchange is the support of the organization's value chain in order to excel among its competitors. Nevertheless, currently different information systems that support cooperation among the firms involved in a collaborative inter-organizational relation have risen (Kumar & Van Dissel, 1996)

Hong and Kim (1998) propose a framework based on the developments and challenges described by Kumar and Van Dissel (1996) in which the alliances between businesses are formed. This framework categorizes information exchange systems into three different types, specifically horizontal linkages, vertical linkages and cross-linkages. The categorization is made regarding the type of interdependency between the involved firms.

Horizontal linkage is a type of configuration for information exchange constituted through the inter-firm links of companies that carry out common value tasks. This type of system reflects the level of agreement to which the system connects homogeneous groups of organizations; they can adopt their common operations regarding the process of collaboration with this type of system (Hong & Kim, 1998).

Vertical linkage is a type of configuration for information exchange systems; it establishes relationships between companies performing different duties in a value delivery process. The main purpose of the vertical linkage type of system involves several operational and strategic benefits including internal process efficiency, market access, and complementary advantages according to Hong and Kim (1998).

Cross-linkage is a type of configuration for information exchange systems that uses horizontal and vertical linkages together. Some junctures demand this type of system when there is a combination of different roles in the value chain with some partners derived from vertical processes, and a collaboration with other partners that promotes horizontal cooperation. This kind of information sharing system is usually implemented by companies in which their processes heavily rely on IT resources. This is why the strategy of companies that select this type of system is, usually, to include in their budget large amounts to address the IT investment (Hong & Kim, 1998).

Steinfield, Markus, and Wigand (2011) more recently classified information exchange systems according to different categories. The classification is standard-based and proprietary information exchange systems. This classification is related to the way the systems are implemented. Smaller partners in a network are more able to adopt systems that are already based in the technology market rather than the utilization of proprietary systems. Nevertheless, large companies frequently design their systems using proprietary technologies without considering the requirements of smaller partners.

Single inter-connection between two firms means that the implementation of the sharing arrangement is done through a unique linkage between two firms in a partnership or alliance. Hub-

based systems on the other hand, makes information available to all the involved organizations in a simultaneous manner. (Steinfield et al., 2011).

The management of a hub-based arrangement could be private, meaning that only invited partners can access the IOS or shared where even competition can access it. A private hub is managed generally by one actor in the value chain. This actor, namely a dominant company, incorporates into the hub its own trading allies. Open shared hubs on the other hand implement shared governance and management and utilizes open standards; for instance, the "extensible business reporting language" (XBRL), which is a form of XML-based data standards, build upon an open public network like the internet (Steinfield et al., 2011; Zhu, Kraemer, Gurbaxani, & Xu, 2006).

3.2.2 Technological platforms

Tiwana, Konsynski, and Bush (2010), define platforms as an information system that has a modular and extensible architecture. It provides functionality that can be extended by the use of modular micro-systems which are integrated with the core system through the interfaces that it provides.

Gawer and Cusumano (2014), provide a definition of platform from an industry point of view, where the platform is a technical infrastructure in which different components that form the information system such as software and hardware available so providers and/or developers use core functionality to create new capabilities to the system.

Tilson, Lyytinen, and Sørensen (2010), on the other hand, bring a higher-level definition by stating that platforms are systems and organizational structures that provide services and functionality, so an industry or a company can operate. They referred to it as digital architectures.

Technological platforms provide an important insight for this research in terms of their needed use for industries and firms in order to operate. It is clear that platforms work as central resources where the users and the developers can extend the platform functionality; that way, it is possible to bring and create new capabilities to the needs of the organizations. There is a similarity between the multilateral aspect of the inter-organizational information systems and the characteristics of a platform toward its utilization by its users.

3.3 Inter-organizational IT Governance

This section presents different studies and theories regarding IT governance for inter-organizational IT approaches. IT Governance provide a series of guidelines regarding which part of a company, and to what extent that part of the company, is responsible for IT decisions. It also contributes to the definition of who is accountable for different aspects of IT within the firms. In this study, one approach of IT governance will be tackled, namely inter-organizational IT governance; it is part, along with information exchange system, of the basis of the information sharing arrangements.

Inter-organizational IT governance is important because it shapes the IT strategies of the involved organizations in an inter-organizational relation. It also supports the alignment of such strategies with the strategic goals defined by the collaboration, cooperation and/or alliance among the firms that have celebrated an arrangement (van den Broek & van Veenstra, 2015).

The traditional way of understanding and applying IT governance, in general, is done by following three main designs, namely centralized, federal and decentralized IT governance. Centralized governance implies that the management of IT utilization, IT infrastructure and IT project management are managed by the corporate IT area or division. In a decentralized design IT area or division, and different management areas within the organization, have the authority over IT utilization, infrastructure and project management. While a federal design is a hybrid of the previous mentioned designs (Sambamurthy & Zmud, 1999; von Simson, 1990).

Based on the different IT governance designs, Weill (2004) defines different IT governance maturity levels in term of centralization and decentralization. He states those maturity levels as business monarchy (where the top management of the firm take the strategic decisions concerning IT), IT monarchy (where IT strategic decisions are taken by the IT executives), feudal (where business unit managers take decisions), federal (a combination of different levels of management, take decisions toward IT strategies), Duopoly (IT executives and other groups are involved in IT strategic management) and anarchy (Each individual in the firm manage the IT resources at hand). On the other hand, Weill (2004) also defines five different spheres on which the design of IT governance is applied within a firm namely IT principles or high-level decisions on IT resources, IT architecture, IT infrastructure, requirements from the business and IT investment. These categorizations of IT spheres are taken to define the dependent variable of IT governance, which will be explained in the research methodology in chapter 4.

van den Broek and van Veenstra (2015), based on the work of other researchers, propose different inter-organizational IT governance. Although those researchers originally propose the models of inter-organizational governance. The proposed inter-organizational IT governance are: Market, Hierarchy and Network.

A market IT governance implement contracts as their coordination mechanisms and the control over the data is kept by each organization (decentralized). In a hierarchy IT governance on the other hand, the information exchange between or among the involved organizations is orchestrated, arranged or managed by a dominant member which is in charge of the organization of the exchanging process. The coordination mechanism is the power applied by the dominant member or members in the alliance, and the information control is defined also by that dominant member. In a network IT governance, there is no contract nor power exerted; the agreement among the members of the system is based on the trust between each other. The information is controlled at the individual level in each organization; the exchange of information is performed on demand depending on the requirements of information exchange of each participant of the network.

The inter-organizational IT governance is an IT subject that must be furthered studied. There is a knowledge gap concerning the IT governance of IT resources that impact several organizations in an alliance, network or system of firms in general (van den Broek & van Veenstra, 2015).

3.4 Factors influencing the information sharing arrangements

In this section, the factors that influence the adoption of the different typologies of systems for information exchange and inter-organizational IT governance that exist in the literature will be presented. This section of the third chapter will answer the second research question "*Which factors, that influence information sharing arrangements, can be identified in the literature?*". The factors will also be based on the different IT adoption models, and the organization of factors will be discussed following the TOE framework.

The factors taken into account in this research are those that have been found to influence the adoption of information exchange systems, as well as factors that affect the IT governance decisions within the companies. Following the TOE framework, three main categories will be considered to analyze the factors, which will be the independent variables of this research. The three categories are homologous to the three settings of the TOE structure. These categories are organizational category, which represents the organizational context; inter-organizational, which represents the environment context; and the technological, which represents the technology context.

Along with the identification of the factors, three different sets of hypotheses (identified with the letter H and a number, i.e. "H1") according to the group in which the factors are categorized following the TOE framework, are stated with respect to the correlation with the information exchange system typology and with the system IT governance design.

3.4.1 Inter-organizational factors

The inter-organizational factors relate to the environment context in the TOE framework. This context involves the industry formation and the regulatory environment. To nurture the inter-organizational factors that influence the information sharing arrangements different theories will be used.

The identified inter-organizational factors are trust, pressure, power and shared objectives. These factors are taken following three literature review strategies. First, from different adoption research and case studies. Second, theories from adoption models and frameworks. And third, theories from inter-organizational relations as their support is a purpose of the information sharing arrangements.

3.4.1.1 Trust

Hart and Saunders (1997) define trust as the level of confidence that an organization has towards the behavior of another organization(s) regarding the expectations of the former, as well as the goodwill of the latter(s). According to Arrow (1973) cited by Hart and Saunders (1997), "Trust is a component of every inter-organizational relationship" (p. 24). Thus, based on those previous researches, trust is assumed as an imperative factor that influences information sharing arrangements.

H1a: High levels of trust positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H1b: High levels of trust positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.1.2 Pressure

Refers to the influence that allies and/or competitors can generate to an organization towards the implementation and use of a technology. Organizations respond to pressure even when there seems to be an absence of need or requirement of the technology (Chwelos et al., 2001). Pressure is a factor that is taken mainly from the institutional theory, which as stated in section 3.2 affects the decision-making process of the organizations by receiving pressure from different sources namely industry, market and customers. It is taken as an inter-organizational factor, because it is part of the environment and it does not come from within the organization, implying an influence from the environment context, according to the TOE framework.

H2a: High levels of pressure positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H2b: High levels of pressure positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.1.3 Power

According to Hart and Saunders (1997), power is presented as the ability of an organization to apply stimulus on another organization to operate in a certain way. Power exerted from the business partner affects the decision-making process within the company that proposes a specific implementation as well as its strategic partners. Several scholars state that the influence of a company over its partners influences the adoption of an arrangement, this power might also come from the influence of the partner's competitors (Chau & Hui, 2001; Hart & Saunders, 1997; Robey et al., 2008).

H3a: High levels of power positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H3b: High levels of power positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.1.4 Shared objectives towards information exchange system implementation

The goals of the company in terms of strategy and performance, is part of the purpose of IT governance within the company, which tries pursuits to augment particular behavior to accomplish those goals (Weill, 2004). In this study, strategic and performance goals will be analyzed in terms of how it impacts the IT governance of the information sharing arrangements between organizations and their financial partners.

H4a: Shared objectives positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H4b: Shared objectives positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.2 Organizational factors

Organizational factors, correspond to the organization context of the TOE framework, which refers to the internal settings and capabilities of the firm. In this group of factors, one insight from the TAM framework will be used which is the perceived usefulness, which in this research is called perceived benefits of the system. The diffusion of adoption theory, also present insights that will be taken for the construction of the theoretical framework of this study. Such insights translated into factors are the relation between firm size, organizational compatibility and organizational structure, some of which are used also by the TOE framework like organizational structure and firm size.

3.4.2.1 Firm's size

The size of the company affects the innovation adoption processes, the business processes within the company, and the type of management and governance. Company size affects the dependence of the business partners (Grover, 1993; Premkumar & Ramamurthy, 1995; Weill, 2004).

H5a: The size of the firm positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H5b: The size of the firm positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.2.2 Perceived benefits

Perceived benefits can be understood as the advantage an organization can notice by using information exchange system. These benefits could be perceived as direct, like cost reduction or improved quality of information. Or they could be perceived as indirect, like improvement of internal business processes and the linkages with the trading partner (Robey et al., 2008). Yao, Palmer, and Dresner (2007) state that internal, customer related and supplier related perceived benefits, affect the use of electronic-enabled supply chains. In this study, the perceived benefits approach will be taken beyond the claim by Yao et al. (2007), and it will be measured in terms of its impact regarding the information sharing arrangements between firms and their financial partners.

The perceived system usefulness and its perceived easiness of use, as presented in the TAM and TAM2, is an insight from these two models to study the factor as it affects the system adoption and the design of governance that the firms use in the system implementation with their banks (Bradley, 2012; Davis, 1986; Davis et al., 1989; Venkatesh & Davis, 2000). Nevertheless, the perceived benefits go further by exploring performance benefits by the use of the system (Yao et al., 2007).

H6a: Perceived benefits positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H6b: Perceived benefits positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.2.3 Organizational compatibility

Rogers (1995) presents compatibility of an organization toward the acceptance of a technology as the extent to which the innovation at stake is recognized as agreeable with existing requirements, past experiences, and the principles of the possible adopter.

According to Schultz and Slevin (1975) as cited by Premkumar et al. (1994), organizational compatibility, assesses the alignment of an innovation and an organization's values, beliefs and systems. In this study, the organization compatibility will be assessed in terms of how the organizations consider it can influences the information sharing arrangements between companies.

H7a: Organizational compatibilities positively influences implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H7b: Organizational compatibilities positively influences implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.2.4 Organizational structure

Organizational structure is designed within the organizations in order to restitute lacking of flexibility of organizational structure and its limitation regarding required changes in the business needs (Weill, 2004). Organizational structure, as defined by Mintzberg (1989), is a combination of different dimensions. In this study, based on the DOI framework, hierarchical structure and formalization will be taken into account to test its influence on the information sharing arrangements between private companies and their banking allies.

H8a: Hierarchical organizational structure negatively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H8b: Hierarchical organizational structure negatively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

H8c: Formalized organizational structure negatively influences implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H8d: Formalized organizational structure negatively influences implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.3 Technological factors

Technological factors, correspond to the technological context of the TOE framework. The technological setting. Takes as insight the inner and outer technologies to the organization, and their influence on the decision making toward an innovation within the organization. In this case, the technical factors are related to behaviors of the human resources towards the system, the complexity of learning and using the system as stated in TAM, TAM2 and UTAUT in what is called the easiness of

use and the compatibilities of the external system with the internal system as an analogy to the internal and external technologies in the TOE framework.

The technological factors taken into consideration for this research, are the IT compatibilities, bearing in mind the internal systems and their rapport with the; and the IT complexity, related to the

3.4.3.1 IT Compatibilities

Taking into account the already stated definition of compatibility, according to Schultz and Slevin (1975) as cited by Premkumar et al. (1994), technical compatibility assesses the alignment of a technology with existing systems within the organization. In this study, the IT compatibility will be measured in terms of information exchange system being compatible with existing IT systems within the firms.

H9a: IT compatibilities positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H9b: IT compatibilities positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

3.4.3.2 IT Complexity

IT Complexity, following the definition of innovation complexity by Rogers Everett (1995), represents how much the IT is hard to implement, use and understand in the organizational context. The TAM and TAM2 models, present the opposed concept namely ease of use, which is the perception of how easy to use the system is (Davis, 1986; Davis et al., 1989). This study takes both concepts into IT complexity as a relevant factor for the information sharing arrangements.

H10a: IT complexity negatively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.

H10b: IT complexity negatively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

3.5 Theoretical Framework

This section delivers the theoretical framework as the blueprint for this study. Grounded on the research questions and on the insights gathered from the theoretical background, a preliminary conceptual model will be developed. This conceptual model is based on the identified factors that impact the information sharing arrangements adoption and the different type of IOS, and will be the basis for the conduction of this study.

The different factors have been categorized in organizational, inter-organizational and technological factors, the measurement in the preliminary conceptual model will use these three categories. The different type of information sharing arrangements, will be grouped according to the structure of the arrangement in centralized and decentralized information sharing arrangements.

Describing the conceptual model, the independent variables are organizational factors, inter-organizational factors and technological factors. The dependent variables are the type of information sharing arrangement as shown in figure 13. The conceptual model summarizes the already stated hypotheses and will serve as the basis of the study and driver of the data collection. The generated hypotheses will bring answer to the main research question of the study.

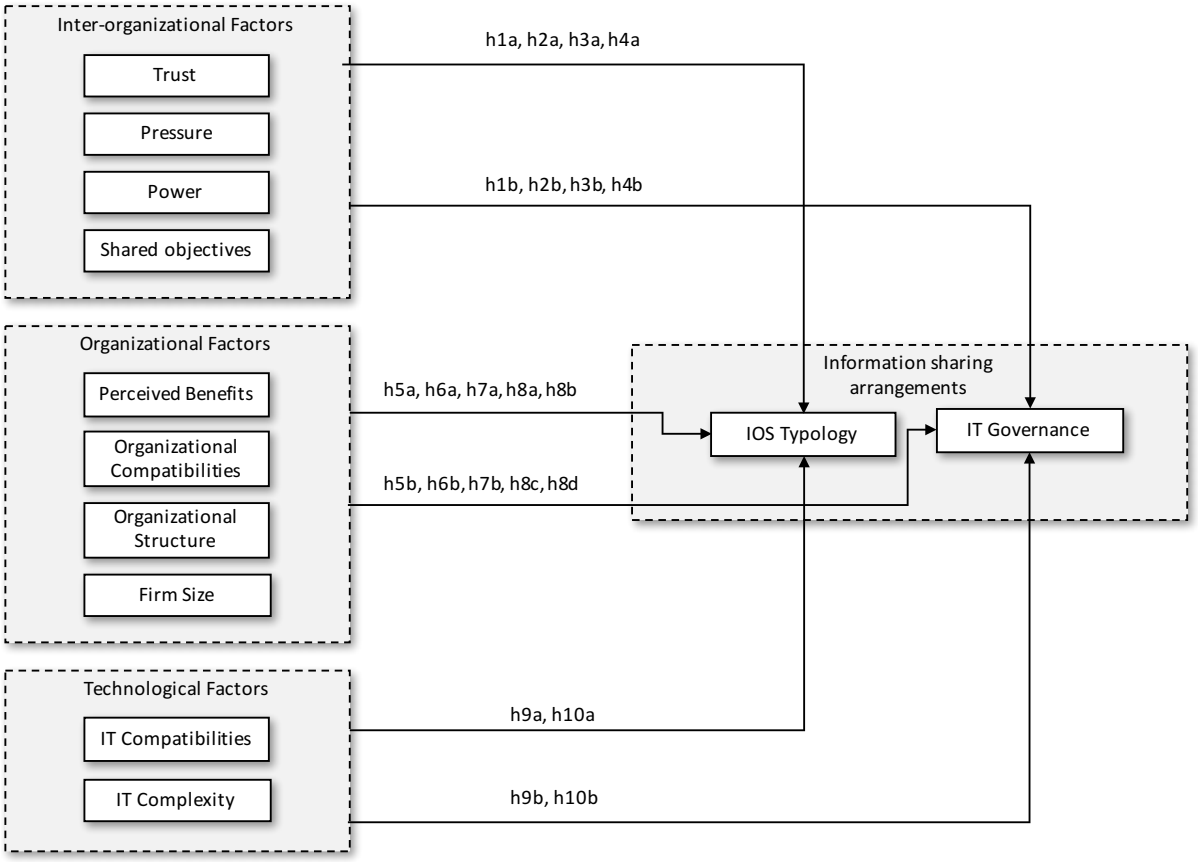


Figure 13: Conceptual Model

3.5.1 Suitability of the framework to the selected population

The theoretical framework fits the Colombian population insofar as its main components are based on the adoption of information exchange, inter-organizational relations and IS in the current literature from the country.

In different studies based on Colombia, the factors trust, perceived benefits, system complexity, organizational compatibility, technology compatibility and firm's size have been found as correlated to IS and information exchange systems (Osorio-Gallego et al., 2016; Tavera Mesías et al., 2011). Formalization and centralization has been found to impact on the inter-organizational relations between organizations in the public sector in Colombia (Marín-Idárraga & Campos, 2015).

Power and pressure are factors that have an impact on the inter-organizational relations in the Colombian banking sector (Cortés Villafradez & Hernández Luna, 2016; Murillo Vargas, 2009). Even though it is not related to the adoption of an IS, it is important for the Colombian context since it involves the financial scope which is part of the context of this research.

Finally, shared objectives will be explored in the Colombian context. Even though there is no extensive literature in the Colombian population, it is a driver of IT governance that will provide insights for future research in the country, with regards to IS implementation and adoption.

3.6 Conclusions of the Literature Review

Based on that proposed by Choudhury (1997), the typologies of information exchange systems to be used in this research are dyadic, multilateral and one-side multilateral, which is a middle ground between dyadic and multilateral. On these typologies, the analysis of the type of information systems adopted and implemented between private companies and their banking allies in Colombia. The chosen typologies are shown in figure 14. Multilateral information systems have several similarities with the concept of platforms. Nevertheless, platforms become a broader structure where the capabilities can be extended and can be used for more than exchanging information. They also become a resource to the organizations obtain gains from it by competing with other platforms creators, while in the case of information sharing systems it might not be the case.

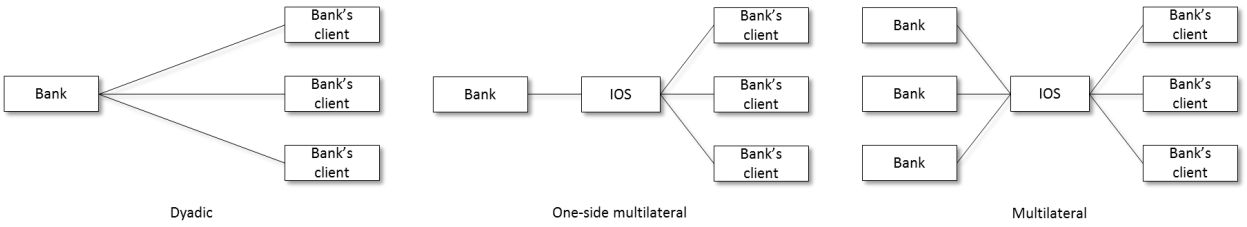


Figure 14: IOS Typologies adapted for the information sharing arrangements.

For the purpose of this research the centralized, decentralized and federal designs of IT governance will be used, since these designs represent a standard when categorizing the IT governance of information systems. Nevertheless, in this case those IT governance designs will be used at the inter-organizational level. On the other hand, the five spheres of Weill (2004) will be used to define the IT governance dependent variable.

To provide an organized structure in the conduction of the present study, this research will follow a specific guide based on arguments that support that choice. The TOE framework, according to the review of the literature presented in the previous subchapter provides deep explanation of external, internal and technological factors toward innovation adoption. Thus, TOE framework will be partially used to analyze the different contexts, as well as the factors within those contexts, that influence the information sharing arrangements between the private companies and the banks in Colombia. Insights from other models will be used as factors in the theoretical framework.

Different factors have been identified to affect information systems implemented between companies with specific relations, those factors are summarized in table 4; the factors have not been studied completely in terms of their influence on IT governance, and is part of the research gap that this study plans to fill. The list of factors provides an answer to the second research question of this study: "*Which factors, that influence information sharing arrangements, can be identified in the literature?*".

Table 4: Factors influencing information sharing arrangements

Factors	Source
Inter-organizational factors	
Trust	(Arrow, 1973; Hart & Saunders, 1997)
Pressure	(Chwelos et al., 2001)
Power	(Hart & Saunders, 1997)
Shared objectives towards IOS implementation	(Chau & Hui, 2001; Hart & Saunders, 1997; Robey et al., 2008)
Organizational factors	
Firm's size	(Grover, 1993; Premkumar & Ramamurthy, 1995; Weill, 2004)
Perceived benefits	(Bradley, 2012; Davis, 1986; Davis et al., 1989; Venkatesh & Davis, 2000; Yao et al., 2007)
Organizational compatibility	(Rogers, 1995; Schultz & Slevin, 1975)
Organizational structure	(Mintzberg, 1989; Weill, 2004)
Technological factors	
IT Compatibilities	(Premkumar et al., 1994; Schultz & Slevin, 1975)
IT Complexity	

Finally, a conceptual model that forms the basis of the theoretical framework of this study is drawn and twenty-two hypotheses that propose the relation between the different factors and the information sharing arrangements are defined as displayed in table 5.

Table 5: Hypothesis summary

Hypothesis
H1a: High levels of trust positively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H1b: High levels of trust positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

H2a: High levels of pressure positively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H2b: High levels of pressure positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.
H3a: High levels of power positively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H3b: High levels of power positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.
H4a: Shared objectives positively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H4b: Shared objectives positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.
H5a: The size of the firm positively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H5b: The size of the firm positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.
H6a: Perceived benefits positively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H6b: Perceived benefits positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.
H7a: Organizational compatibilities positively influences implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H7b: Organizational compatibilities positively influences implementation of highly decentralized IT governance between private companies and their banking allies.
H8a: Hierarchical organizational structure negatively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H8b: Hierarchical organizational structure negatively influences the implementation of highly decentralized IT governance between private companies and their banking allies.
H8c: Formalized organizational structure negatively influences implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H8d: Formalized organizational structure negatively influences implementation of highly decentralized IT governance between private companies and their banking allies.
H9a: IT compatibilities positively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.

H9b: IT compatibilities positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.
H10a: IT complexity negatively influences the implementation of highly multilateral information sharing system typologies between private companies and their banking allies.
H10b: IT complexity negatively influences the implementation of highly decentralized IT governance between private companies and their banking allies.

Chapter 4: Research Methodology

In this chapter, the methodology for conducting this research is stated. First, the research design that suits the research to be conducted is stated. Second, the data collection method to support the theoretical framework designed (see Chapter 3). Third the sampling and finally, the data analysis process is described.

4.1 Research Design

This section discusses the selected research design for conducting the study. In this step, an accurate research design that fits the research objective and one that gives an answer to the main research question is selected.

The purpose of the study is to test the hypotheses stated in the theoretical framework. The study aims to explain the nature of the relationship between the different factors that affect the information sharing arrangements between private companies and allied banks in Colombia as have been described in the scope of the research (see chapter 2).

The theoretical background provided a number of factors that affect the information sharing arrangements in a broad sense. The research design is needed to have a direction on how to collect the needed data to bring answers to the research questions, and a solution to the research problem (Sekaran, 2006). The quantitative research design has been chosen in order to follow an empirical science approach to the theoretical framework stated for this study (Creswell, 2009).

Quantitative research is used to validate theories that are objective in nature through the examination of the relation between concepts. In quantitative research there are experiments, where there is a treatment, and validates if the treatment influences an outcome; used, mainly, for cause and effect (or causality) research; and correlational studies where a relation between independent and dependent variables' relationships are tested (commonly using a survey).

Survey research describe brings the numeric interpretation of tendencies, behavior, and perspectives of a population through the analysis of a sample of the aforementioned population. There are mainly two types of survey research namely cross-sectional and longitudinal study. The first is performed one time, while the latter is performed at different points of time to validate the changes due to it.

Since this study will measure the influence of a set of factors on information sharing arrangements, this study is correlational and cross-sectional survey research.

4.2 Data Collection

The data collection section states the mechanisms to gather the needed data to test the hypotheses that form the theoretical framework of this research.

4.2.1 Surveys

Surveys will be the main tool in this study to test the hypotheses which are derived from the final conceptual model. They will measure, according to the knowledge of the selected employee, how the company in which he or she works, makes the arrangements with other companies, and which factors influence in the decision of selecting a specific information exchange system typology and IT governance design.

In the step of designing the surveys there must be an iterative process that assesses the validity and reliability of the survey mechanism to test the hypotheses. The structure of the survey and its questions must be elaborated and tested through a peer-review process. This way the survey will be aligned to the requirements of this study.

The constructs of the survey must be tested for reliability and validity. Validity represents how the concept under investigation is measured by the instrument that is used. On the other hand, reliability measures the consistency of the instrument (Sekaran, 2006).

The participant companies must be as diverse as possible. It is important to select a relevant sample of small, medium and big enterprises to analyze their behavior towards information sharing arrangements.

No personal data, except for age and gender of the respondents for demographic analysis, was asked. Likewise, no raw data was shared with anyone but the research committee, to meet privacy rights of the respondents of the questionnaire (Sekaran, 2006).

4.2.2 Variables operationalization and measurement

The variable operationalization is made by using previous research on the conceptualization and operationalization of the factors, and for both, IT architecture and IT governance. In this subsection, a specific variable operationalization in order to define their measurements is stated.

Demographic variables, namely age, the role of the respondent in the company and gender of the respondent will be covered by specific single questions.

4.2.2.1 information exchange system typology.

The typology is a dependent variable which displays the extent to which the system used for information exchange between the companies and the banks are categorized as a dyadic or a multilateral. A multilateral typology, for the purpose of this study, is a type of system in which the information exchanged by companies use a common focal point. A dyadic typology, on the other hand, is a type of system in which each company has a one to one and unique infrastructure for exchanging information.

4.2.2.2 inter-organizational IT Governance design.

The IT governance is a dependent variable, which displays the extent to which the decisions and the accountability for the IT assets, involved in the information sharing arrangements, are centralized or decentralized. This variable is operationalized through five dimensions, which correspond with five IT assets involved in the inter-organizational IT governance. Those five dimensions are 1. IT principles, 2. IT architecture, 3. IT infrastructure strategies, 4. business application needs and 5. IT investment and prioritization (Weill, 2004).

4.2.2.3 Trust.

According to (Krishnan, Martin, & Noorderhaven, 2006), trust has three main components, namely "reliability, fairness and goodwill" (p. 901). The measurement of trust will be made through a Likert scale which measures the three stated components. The items to measure trust, are taken from (Krishnan et al., 2006), which took them from Aulakh et al. (1996) and Sako and Helper (1998)

4.2.2.4 Pressure.

Is an independent variable which indicates the extent to which external parties influence in the decision of a company to implement a certain architecture and/or governance scheme to exchange information with the bank partners. The elements used to measure the pressure variable were reused from (Premkumar & Ramamurthy, 1995), which use three elements that test the level of pressure applied by customers, suppliers and the industry.

4.2.2.5 Power.

Displays the extent to which the extent to which the decisions of a company are influenced by another one. The measurement is taken from (Premkumar & Ramamurthy, 1995).

4.2.2.6 Firm size.

Is an independent variable which displays a demographic characteristic of a company, and for the purpose of this study, the variable will be measured in terms of the number of workers in the organization

4.2.2.7 Perceived benefits.

This variable will be measured in terms of the common and the cooperative benefit due to the information sharing arrangements between the company and their bank partners. According to (Rai, 2013), the value creation in inter-organizational alliances is composed of the common benefit, private benefit in terms of cooperation and the private benefit in terms of competition. In this study, the common and cooperative benefits measurement will be taken into consideration. The competition benefits refer to the advantage gained from the alliance measures how the agreement benefited the focal firm to outperform its partner.

4.2.2.8 Shared objectives.

Displays the alignment in terms of the agreement on the goals and the vision of the company and its banking partner. The measure of this independent variable is adapted from the study by (Min & Mentzer, 2004).

4.2.2.9 Organizational structure.

Displays the internal structure of the focal firm in terms of three dimensions namely standardization, formalization and centralization of the authority (Schilling).

4.2.2.10 Organizational compatibility.

Displays the harmony and the alignment between the information sharing arrangement and the company's values. The measure of this variable is based on the study by (Premkumar & Ramamurthy, 1995).

4.2.2.11 IT Compatibility.

Displays the extent to which the focal company's IT resources are compatible with an information sharing arrangement with its banking partner. The measurement of this variable is adapted from (Grover, 1993).

4.2.2.12 IT Complexity.

Displays the level of IT competence within the organization and the management and/or support regarding the use of IT towards organizational objectives. The measurement of this variable is adapted from (Chwelos et al., 2001) IT Sophistication.

The questions of the survey, which are shown in appendix A, show how each dependent and independent variable for this study is measured. The corresponding question to each independent variable is shown in table 6.

Table 6: Constructs operationalization

Construct	**Operationalization (referred in appendix A)**
IOS typology	Questions 20, 21 and 22
IOS IT Governance	Questions 26, 27, 28, 29, 30 (Strategic IT governance: 26, 29, 30; technical IT governance 27, 28)
Trust	Questions 43, 44, 45, 46
Pressure	Questions 13, 14, 15, 16
Power	Questions 18, 19, 47, 48
Shared Objectives	Questions 23, 24, 25
Perceived Benefits	Questions 31, 34, 35, 36, 48, 49, 50, 51, 52, 53, 54
Organizational Compatibilities	Questions 36, 37
Hierarchy (organizational Structure)	Questions 55, 56, 57
Formalization (organizational structure)	Questions 58, 59, 60, 61
Firm Size	Question 6
IT Compatibilities	Questions 37, 38

Construct	Operationalization (referred in appendix A)
IT Complexity	Questions 39, 40, 41

4.2.3 Sampling

In order to state the sampling design used for this research, it is important to describe the population. The population for this research are private companies in Colombia which make use of information systems for their daily operation.

Bearing in mind the population for this research, the unit of analysis for this study is the private organization in Colombia without any constraint regarding industry or size.

The sampling design followed one main strategy and one contingency strategy, being both strategies nonprobability sampling, due to the absence of an accurate sampling frame. The lack of a sampling frame occurs because the chambers of commerce in Colombia are organized in clusters by regions, and it is not possible to identify companies that correspond to the population from the lists that some of them offer[5].

The main sampling strategy was the use of LinkedIn[6] to identify employees in IT areas or account areas of companies in Colombia and contact them through the direct message functionality offered on the platform. Professionals were also reached from different LinkedIn groups of interest, and sending a direct message to them to invite them to participate in the survey.

The contingency sampling strategy followed two mechanisms: The first mechanism for selecting companies to respond to the survey was the researcher's first line of connections, such as family and friends. The second mechanism of selection was recommended contacts from the researcher's first line of connection. Subjects knew by the researcher's family members and friends.

The questionnaire was delivered by different channels. Direct message through LinkedIn was sent to a hundred and ten contacts, gathered from the main sampling strategy. An email and two reminders (see Appendix B) were sent to ninety-three contacts. Direct messages to fifty-two people, from the contingency sampling strategy, was sent using social networks like Facebook and WhatsApp. The final sample was two hundred and fifty-five and the final respondents were 42, which corresponds to a rate of response of 18.8%. Nevertheless, two of the responses were discarded because they were answered from public organizations (public organization was a control variable).

Assumptions on the sample

Regarding the demographics of the sample, in terms of gender of the respondents, it is expected that half of them are male respondents and half of them are females based on the assumption that half of the population follows the same trend.

[5] Not all the chambers of commerce provide an open list of the registered organizations. Those that provide these lists, do not specify the characteristics of the firm.
[6] http://www.linkedin.com

Concerning the level of education of the respondents, it is expected that all of them have at least a bachelor degree and more than a half have even higher degrees. And regarding the region they work on, it is expected that most of the respondents come from Bogotá which is the capital of the country.

The main expected assumption on the sample is the preference towards a one-side multilateral typology from the banking companies and the private companies. This assumption follows the idea that banks prefer not to share the information exchange system with their competitors to maintain their advantage on not sharing with other banks the information about their customers. While private companies prefer the same typology for privacy and security assumptions.

Regarding IT governance, it is expected that the prevailing design is a centralized one, based on the assumption that power is higher in the banking allies of the private companies, and they exert their power to control the data and make the decisions on the information exchange system. The assumptions here are that power influences positively the centralization of the governance of the system.

4.3 Data Analysis

In this section, the analysis strategies for the gathered data is stated. The structure of the data follows the design of the survey which has been explained in the previous section (See section 4.2.3). To analyze the data multiple discriminant analysis through SPSS will be used.

4.3.1 Data Examining

The dependent variables namely IOS typology and IOS IT governance are categorical in nature. Different categories are identified. For IOS typology the gathered categories are multilateral, one-side multilateral and dyadic; while for IOS IT governance, the gathered categories that describe governance design are de decentralized, federal and centralized. These categories have already been explained in the literature review (see Chapter 3).

The independent variables are measured in a metric way since five-level Likert scales can be considered metric. This applies to all independent variables except firm size, which asks the respondents about the number of employees that work for their employer (Sekaran, 2006).

The data was examined by analyzing the frequencies of each of the variables. The skewness and kurtosis of each variable were used to determine the normal distribution of each of the variables that form the different factors. Twenty-one out of thirty-nine variables showed a non-normal distribution, hence transformation for the data was used in order to achieve this critical assumption for multivariate analysis.

In order to perform multivariate analysis on the data four assumptions, according to Hair, Black, Babin, Anderson, and Tatham (1998) must be followed, which in turn are the assumptions of the parametric tests. These assumptions are normality of the variables, the homogeneity of variances between the independent variables and the dependent variables, linear relationships between variables and the absence of correlated errors.

Examining the data, it has been noticed that initially, twenty-one out of thirty-nine different variables did not show a normal distribution based on their skewness and their kurtosis, and following this attributes normality test method mentioned by Hair et al. (1998). To achieve normalization, several transformations on the data were performed. Depending on the variables' skewness and kurtosis, if the skewness displayed a value less than zero, the variable was transformed by raising the variable values to the power of two or three; if the skewness was greater than zero, the variable was transformed by applying the square root or logarithm of the value. There was no outliers and missing data issues since all the questions of the questionnaire were required.

By transforming the data, normality and homogeneity of variances between the variables were achieved for most of the variables. Those that did not achieve normality, based on the skewness and kurtosis, were analyzed in terms of their relationships with other variables to check if they can be discarded. Transformations also helped linearity among variables which is another assumption of multivariate analysis (Hair et al., 1998) in appendix C, the correlations among variables is presented.

4.3.2 Statistical analysis

Based on the design of the research and more specifically the design of the survey, from different statistical analyses, the multiple discriminant analysis, for multivariate analysis is chosen due to the structure of the dataset and the type of data of the dependent and independent variables. The correlation between the variables that make up a concept is a condition to assure the consistency of the measure of that concept. Henceforth two different analyses were performed to guarantee this condition namely correlation among variables and factor analysis.

4.3.2.1 Correlation tests

Taking into consideration the categorization used to group variables namely inter-organizational, organizational and technological, adopted from the TOE framework (see chapter 3), the correlation tests were performed among the different variables of the same group using the Pearson's correlation test. Considering a high correlation between variables those that present a correlation coefficient higher than 0.8 according to (Field, 2013), the variables that were grouped by context did not display a strong correlation (see appendix C).

4.3.2.2 Exploratory factor analysis (EFA)

The main goal of the EFA is to describe the fundamental configuration between the variables that are going to be analyzed. In general, factor analysis delivers the mechanisms to analyze the configuration of the inter-related variables. There is where the concept of factors appears; factors are sets of variables that are highly correlated. The factors are supposed to signify dimensions from the gathered data. These way two outcomes can be derived from the factor analysis namely reduction in the quantity of variables, and underlying or hidden variables within the data (Hair et al., 1998).

EFA assumptions

There are a number of assumptions regarding EFA which will be stated in the following lines.

The first assumption states that the sample size should not be less than 50, and if at all possible it must be larger than 100. As a general accepted assumption, the number of observations per variable

must be of five observations per variable. Nevertheless, in case of lower cases, the outcomes of the analysis must be interpreted with (Hair et al., 1998). To be closer to achieve this assumption, the factor analysis will be performed on groups of variables according to their categorization in the theoretical framework.

The second assumption states that there must be, as a matter of fact, a structure behind the set of variables. In other words, even if statistically there are correlated variables, there must be a conceptual logic in terms of concepts that logically relate the variables that will be analyzed (Hair et al., 1998). In the case of this research, the relation between concepts display the structure behind the set of variables.

The third assumption consists of normality and homogeneity of variance (Hair et al., 1998). This assumption has been solved when preparing and transforming the data, since it is also an assumption of the multiple discriminant variable, as has been stated previously on this same section.

Finally, the fourth assumption is the inter-correlation among the variables (Hair et al., 1998). To check this assumption correlation tests using Pearson's correlation were performed of the groups that were used in the factor analysis as can be seen in appendix D. On the other hand, the factor analysis.

4.3.2.3 Multiple discriminant analysis

Discriminant analysis is an accurate statistical mechanism for those cases where the dependent variable is defined by different categories and the independent variables are defined by continuous numbers. These claims mean, for the dependent variables, even though it might be numeric, represents different categories and are not continuous (an accurate example for this, is the categorization of IT governance design: centralized=0, federal=1, decentralized=2); and, on the other hand, the independent variables are continuous (interval or ratio) (Creswell, 2009). Furthermore, the dependent variables don't provide the possibility to be aggregated because they do not present statistically significant correlation among them as can be seen in appendix D.

The process of discriminant analysis draws in a function, called discriminant function, which is the derivation of the total weights of more than one independent variables. Those independent variables discriminate the dependent variables in predefined groups. The function takes the form of:

$$(1)\ Z_{jk} = a + W_1 X_{1k} + W_2 X_{2k} + \cdots + W_n X_{nk}$$

In this function (Function 1), Z_{jk} is the value of the discriminant function for a specific group k; a constant that a demarcates the intercept; W_i is the weight for the predictor variable i; X_{ik} independent variable i for group k (Creswell, 2009).

Sekaran (2006) states that discriminant analysis supports the recognition of independent variables that segregate a categorical dependent variable. A linear combination of the independent variables states the discriminating function, which classifies the categories to be analyzed.

The output from SPSS displays the eigenvalues, which shows the variance in terms of percentage and the canonical correlation. The squared canonical correlation is the weight that a group of independent variables has on the dependent variable (Field, 2013).

Chapter 5: Results and Discussions

In this chapter of the document, the third research sub-question: "What is the effect of each factor on the information sharing arrangements?" is tackled. By analyzing the data and eventually answering the research sub-question RQ3, the different hypotheses that conform the theoretical background will be tested.

The first analysis is to evaluate the reliability of the variables' measures. The reliability of the variables was measured using the Cronbach's alpha. Then, correlation among the different variables that conform each of the measures will be tested, in terms of correlation among each other and the two dependent variables IT governance and information exchange system typology.

5.1 Features of the gathered data

In this section, the descriptive statistics of the data is displayed. The gathered data are grouped in two main groups namely demographic data, which also served as control variables and the variables of the model.

The independent variables of the model, as has been stated previously (see chapter 4), were measured using Likert scales with 5 response levels, except for firm's size which was asked in terms of the number of workers of the firm. The descriptive statistics for each of the variables that form the concepts are shown in figure 15.

The mean, and standard deviation of each of the variables were measured in terms of their values before using the transformation to achieve normality. After an accurate analysis of the variables and taking care of not losing the measuring of the concept, some variables were discarded to achieve normality, so the multivariate data analysis could be performed as already stated previously (see chapter 4).

The dependent variables of the model, were measured using categorical measures. The descriptive statistics for both dependent variables are shown in figure 16.

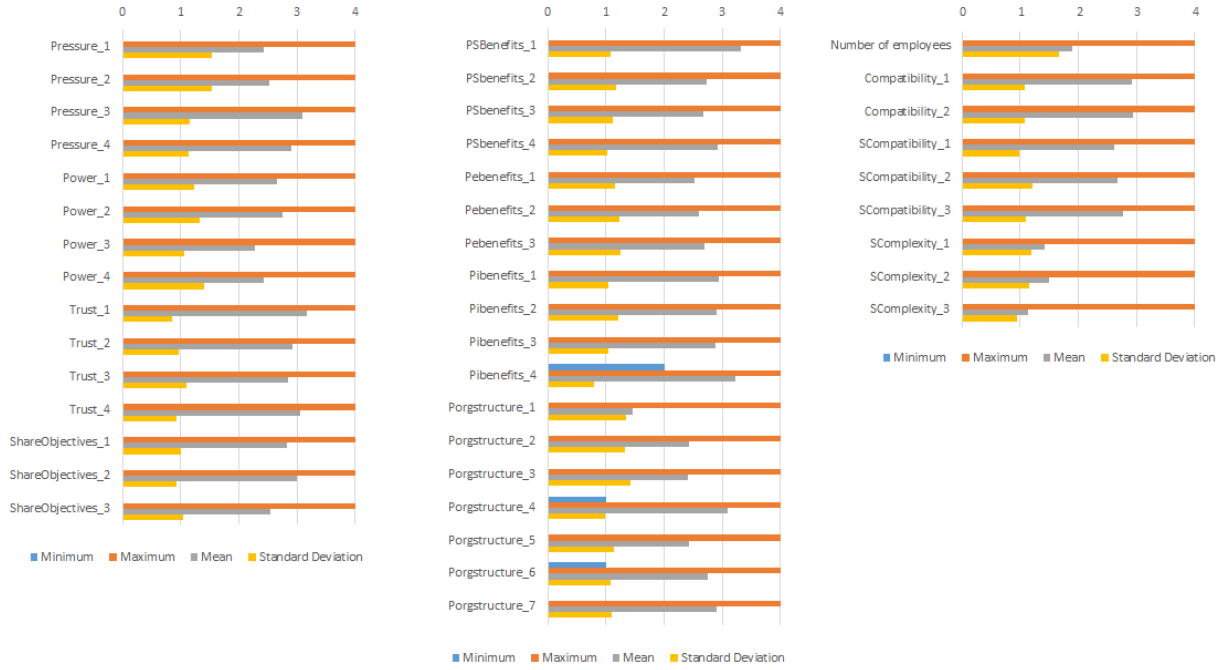


Figure 15: Independent variables descriptive statistics

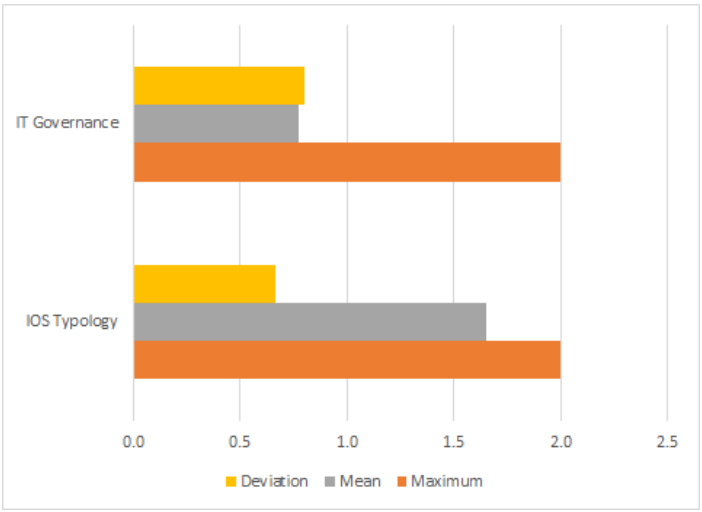


Figure 16: Descriptive statistics of dependent variables

Demographic characteristics of the respondents are stated in the following tables displaying age (table 7), gender (table 8), level of study (table 9), type of organization (table 10), sector of the organization (table 11), coverage of the organization (table 12) and region in which the respondent is located (table 13).

Besides the demographic characteristics of the respondents, the relation between the demographic data and the two dependent variables will be measured. These measurements will provide an overview of how these data influences the decision on information sharing arrangements.

For the analysis of the relationship between the demographic variables and the dependent variables, the data was simplified; inter-organizational IT governance was reduced to two categories, namely centralized, and federal or decentralized (1. Centralized, 2. Federal or decentralized). IOS typology was reduced to two categories, namely multilateral, and dyadic or one-side multilateral (1. Multilateral, 2. Dyadic or one-side multilateral).

The analysis was performed using the Pearson's Chi-Square. This analysis followed the assumption that when the cells with expected count less than five is higher than the 20%, the fisher's exact test is used to validate the significance to accept or reject the null hypothesis of the test which is: "there is not enough evidence to support the correlation between the variables". When the cells with expected count less than five is lower than the 20%, the Pearson's chi-square is used to validate the significance to accept or reject the null hypothesis.

The comparison of the cells is the next step once the null hypothesis of the test has been rejected. The standardized residuals must exceed +/- 2 nevertheless, in this test the standardized residuals will be used as a direction to identify which cells are of interest (Sharpe, 2015).

The results of the tests are displayed at the end of the demographic variables presentation in table 14; the statistical evidences of the different tests are displayed in appendix E.

Age of the respondents

Table 7: Age of the respondents

Age	Frequency	Percent
Between 25 and 34 years old	28	70.0
Between 35 and 34 years old	9	22.5
Between 45 and 54 years old	2	5.0
Older than 55 years old	1	2.5
Total	40	100.0

Age is dismissed for the correlation with the dependent variables, since even if the data is reduced to two groups, one of those groups would have a frequency of 70% of the respondents. This fact would not give any representativeness for the analysis.

Gender of the respondents

Table 8: Gender of the respondents

Gender	Frequency	Percent
Male	17	42.5
Female	23	57.5
Total	40	100.0

Concerning the relation between the gender of the respondents and the system typology, the significance for each test is low based on the fisher's exact test (0.145). Thus, the test null hypothesis is accepted concluding that there is no correlation between the gender of the respondents and the typology of the system for information exchange.

With regards to the relation between the gender of the respondents and the IT governance of the system, the chi-square test displays a high significance (0.019); hence, it can be concluded that there is enough evidence to reject the null hypothesis of the test, and that there is a relation between the level of study of the respondent and the IT governance design of the system.

All cells' standardized residuals are similar (between +/-1 and +/-1.3). Male respondents interpret that the used type of governance between companies and their banks is a centralized. On the other hand, female respondents tend to understand the governance design of the information exchange system as a centralized one (Sharpe, 2015).

Level of study of the respondents

Table 9: Level of study of the respondents

Level of study	Frequency	Percent
Technologist	1	2.5
Bachelor degree	11	27.5
Specialist diploma	11	27.5
Master Degree	17	42.5
Total	40	100.0

One category was discarded from the group of level of studies of the respondents, namely technologist. This was done because there was only one respondent from this category.

Concerning the relation between the higher level of study of the respondents, and its relation with the system typology, the fisher's exact test does not display enough significance (0.898) to support the hypothesis that there is correlation between those variables.

With regards to the relation between the level of education of the respondents, and its relation with the IT governance of the implemented system, the chi-square test provides enough significance (0.018) to reject the null hypothesis and assume there is a correlation between these two variables.

The highest value for std. residuals (1.7) implies that specialist professionals tend to interpret the IT governance of the IOS between companies and banks as a centralized one. On the other hand, no conclusion can be made from professionals with a bachelor and a master degree, since none of the std. residual related to those categories is near that largest std. residual (Sharpe, 2015).

Type of the organization

Table 10: Type of organization the respondents work for

Type of organization	Frequency	Percent
Non-banking private company	30	75.0
Bank	6	15.0
Non-banking financial institution	4	10.0
Total	40	100.0

Type of organization was reduced to two categories, namely financial institutions (including local) and non-financial firms.

Regarding the coverage of the type of the organization and the typology of the system, the Fisher's test displayed a significance of 0.043; hence, the null hypothesis of the test is rejected; the conclusion is that there is statistical significance to support the hypothesis that there is a correlation between type of the organization and the system typology.

Following the assumptions provided by (Sharpe, 2015), the chi-square test displays how financial institutions, considering the largest standardized residual (-1.6), are less prone to dyadic or one-side multilateral; this conclusion is based on the negative amount of its std. residual. no conclusion can be taken from national firms since none of the std. residual related to National firms is near that largest std. residual (Sharpe, 2015).

Concerning the relation between the type of the firm, whether it is financial or non-financial firm and IT governance, the chi-square test displays a low significance (0.714). Thus, the null hypothesis of the test is accepted as valid and the conclusion is that there is not statistical significance to support that there is correlation between type of the organization and the system IT governance.

Sector of the company

Table 11: Sector of the company the respondents work for

Sector	Frequency	Percent
Airlines	1	2.5
Advertising agencies	4	10.0
Food and beverage	1	2.5
Construction	1	2.5
Consultancy	6	15.0
Radio stations	1	2.5
Energy	2	5.0
Hotels	1	2.5
Construction materials	1	2.5

Paper and plastics	1	2.5
footwear and textiles	2	5.0
Health and pharmaceutics	1	2.5
Bank	6	15.0
Non-banking financial institution	4	10.0
Other	8	20.0
Total	40	100.0

Sector of the company is dismissed for the correlation with the dependent variables, since there are more than fifteen categories and the frequencies on the categories are spread with no possibility to reduce them.

Coverage of the organization

Table 12: Coverage of the organization the respondents work for

Sector	Frequency	Percent
Local	3	7.5
National	22	55.0
Multinational	15	37.5
Total	40	100.0

Coverage of the company was reduced to two categories, namely national (including local) and multinational.

Regarding the coverage of the company and the typology of the systems, the Fisher's exact test displayed a significance of 1.0, hence, the null hypothesis of the test is accepted as valid and the conclusion is that there is not statistical significance to support that there is correlation between coverage of the company and system typology.

Concerning the relation between coverage of the company and the IT governance of the system, there is a significance of 0.071; under the assumption that this significance is accepted, then the residuals can be analyzed to check the correlation between the two variables.

Thus, the chi-square test displays how multinational firms, considering the largest standardized residual (-1.1), are less prone to centralized designs of governance; this conclusion is based on the negative amount of its std. residual. On the other hand, no conclusion can be made from national firms since none of the std. residual related to National firms is near that largest std. residual (Sharpe, 2015).

Region in which the firm performs

Table 13: Region of the organization

Region	Frequency	Percent
Antioquia	5	12.5
Atlántico	7	17.5
Bogotá	23	57.5
Cundinamarca	2	5.0
Sucre	1	2.5
Valle del Cauca	2	5.0
Total	40	100.0

The region in which the firm performs was reduced to two categories, namely companies in Bogotá and companies in other regions.

With regards to the region in which the firm performs and its relation with system typology, and the region and IT governance of the system, the significance for each test was low, 0.471 applying fisher's exact test and 0.385 respectively. Hence, both tests null hypotheses are accepted concluding that there is no correlation between the region of the company and the dependent variables.

Findings on the correlation between demographic data and dependent variables

In the findings of the analysis of correlation between the demographic data and the dependent variables, it is displayed how each demographic variable contributes to system typology and IT governance design.

Table 14: Influence of demographic variables on information sharing arrangements

Demographic variable	Detail	System typology	IT Governance
Gender	Male	Not significant	Decentralized
	Female		Centralized
Level of study	Bachelor	Not significant	Not conclusive
	Specialist		Centralized
	Master		Not conclusive
Type of the organization	Non-financial institution	Not conclusive	Not significant
	Financial institution	Multilateral	
Coverage of the organization	National	Not significant	Not conclusive
	Multinational		Centralized

5.2 Reliability of the measures of the theoretical framework

This section presents the reliability coefficients for each of the constructs in the independent variable group. The reliability of the constructs was measured by testing each set of variables with the Cronbach's alpha reliability test as shown in table 15. The values from the table display different alpha coefficients for the different measures. Three of them: pressure, trust and system compatibility measures have a good internal consistency; both of them are above 0.8. Four of them have acceptable reliability, with a coefficient between 0.7 and 0.8. Those measures are: shared objectives, perceived benefits, organizational compatibility and centralization. Finally, three of the measures have an alpha between 0.6 and 0.7, this means that these measures have a low reliability coefficient. Nevertheless, they will be used as they are not below 0.6, which is considered unacceptable (Sekaran, 2006). A detail of the reliability coefficient for each measure can be seen in appendix E concerning the reliability tests.

Table 15: Cronbach's alpha for variables reliability

Factors	**Alpha**
Pressure	0.803
Power	0.677
Shared Objectives	0.712
Trust	0.875
Perceived Benefits	0.791
Organizational Compatibility	0.766
Centralization (Org Structure)	0.716
Formalization (Org Structure)	0.641
System Compatibility	0.882
System Complexity (System ease of use)	0.676

5.3 Exploratory Factor Analysis

In this section, it is performed the exploratory factor analysis (EFA) on the three groups in which the variables are categorized. First, an exploratory factor analysis performed on the inter-organizational factors namely pressure, power, shared objectives and trust. Second, an exploratory factor analysis on the organizational factors namely perceived benefits, organizational compatibility, centralization

and formalization. Finally, an exploratory factor analysis performed on the technological factors namely system compatibility and system complexity.

For the three categories of variables no fixed number of factors was used to validate the model against the factors extracted from the EFA method. In addition to that, the implemented extraction method for the EFA on each of the categories was principal axis factor (PFA).

The EFA provides the Barlett's test of sphericity, which inspect whether the data can be reduced or not EFA on inter-organizational variables; a significance lower than 0.05 means that there is enough evidence to reject the null hypothesis of the test, which is: "The data is not appropriate for reduction". On the other hand, the Kaiser-Meyer-Olkin (KMO) measure of sampling should be higher than 0.5 Hair et al., 1998).

The factor loadings for the factors are presented in the conclusions of the exploratory factor analysis.

5.3.1 EFA on inter-organizational factors

The variables for the EFA on inter-organizational variables were the same as those used for the reliability test (see section 5.2 and Appendix E).

he Barlett's test displayed a significance of 0.0. Hence, the null hypothesis of the test is rejected and the reduction is assumed. The KMO for the inter-organizational variables display a KMO of 0.57 as can be seen in table 16 (Hair et al., 1998).

Table 16: Inter-organizational KMO and Barlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.566
Bartlett's Test of Sphericity	Approx. Chi-Square	269.298
	Df	78
	Sig.	0.000

Based on the assumptions on KMO and Barlett's tests provided by (Hair et al., 1998), the factor analysis is concluded to be possible for the collected data regarding the inter-organizational variables.

Four factors, as expected, were extracted from the EFA and the first factor is formed by four variables of trust, the second factor is formed by three variables of shared objectives, the third factor is formed by three of the four variables of power and the fourth factor is formed by four variables of pressure.

5.3.2 EFA on organizational factors

The Barlett's test displayed a significance of 0.0. Hence, the null hypothesis of the test is rejected and the reduction is assumed. The KMO for the inter-organizational variables display a KMO of 0.638 as can be seen in table 17 (Hair et al., 1998).

Table 17: Organizational KMO and Barlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.638
Bartlett's Test of Sphericity	Approx. Chi-Square	359.069
	df	120
	Sig.	0.000

Based on the assumptions on KMO and Barlett's tests provided by (Hair et al., 1998), the factor analysis is concluded to be possible for the collected data regarding the organizational variables.

Five factors were extracted from the EFA on the organizational variables. The first factor is formed by six variables of perceived benefits. The second factor is formed by the two variables of centralization. The third factor is formed by the three variables of formalization, with a low factor loading for one of them. The fourth factor is formed by two variables of perceived benefits. The fifth factor is formed the two variables of formalization.

5.3.3 EFA on technological factors

The Barlett's test displayed a significance of 0.0. Hence, the null hypothesis of the test is rejected and the reduction is assumed. The KMO for the technological variables display a KMO of 0.690 as can be seen in table 18 (Hair et al., 1998).

Table 18: Technological KMO and Barlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.690
Bartlett's Test of Sphericity	Approx. Chi-Square	75.636
	df	10
	Sig.	0.000

Based on the assumptions on KMO and Barlett's tests provided by (Hair et al., 1998), the factor analysis is concluded to be possible for the collected data.

Two factors were extracted from the EFA on the organizational variables. The first factor is formed by the three variables of system compatibility. The second factor is formed by the two variables of system complexity.

5.3.4 Conclusions on the exploratory factor analysis

The exploratory factor analysis was conducted to analyze the internal consistency and correlation between the variables per group.

The factor loadings presented on table 19, display how the variables correspond to each factor in the inter-organizational context.

Table 19: Factor loadings in the inter-organizational context

Concept	Variable	Factor			
		1	2	3	4
Pressure	Pressure_3TR	0.079	0.056	-0.049	-0.680
	Pressure_4TR	-0.016	0.059	0.063	-0.861
Power	Power_1TR	-0.085	0.095	0.682	-0.324
	Power_2TR	-0.004	0.312	0.437	-0.310
	Power_3TR	0.441	0.170	0.124	0.049
	Power_4TR	0.170	-0.129	0.820	0.155
Shared objectives	ShareObjectives_1TR	-0.209	0.608	0.176	-0.044
	ShareObjectives_2TR	0.211	0.609	-0.166	-0.054
	ShareObjectives_3TR	0.164	0.711	-0.051	-0.169
Trust	Trust_1TR	0.648	0.072	0.377	-0.037
	Trust_2TR	0.821	-0.297	-0.061	-0.257
	Trust_3TR	0.858	-0.015	-0.043	-0.118
	Trust_4TR	0.836	0.176	-0.020	0.163

As can be seen, one of the variables of power does not correspond to factor three that better represents the rest of the variables of this concept.

The factor loadings presented on table 20, display the way variables of the organizational context correspond to each of the extracted factors.

Table 20: Factor loadings in the organizational context

Concept	Variable	Factor				
		1	2	3	4	5
System benefits	PSbenefits_2TR	-0.305	0.193	0.072	0.367	0.148
	PSbenefits_3TR	0.135	-0.169	-0.008	0.857	-0.173
	PSbenefits_4TR	0.163	0.130	-0.110	0.588	-0.135

Perceived Benefits	Pebenefits_1TR	0.611	-0.155	0.317	0.003	-0.090
	Pebenefits_2TR	0.890	-0.227	0.021	0.026	0.021
	Pebenefits_3TR	0.821	0.002	0.234	0.151	0.015
	Pibenefits_1TR	0.730	0.223	-0.261	0.174	-0.108
	Pibenefits_2TR	0.808	0.229	-0.296	-0.081	-0.024
	Pibenefits_3TR	0.691	0.396	-0.224	0.138	-0.145
Organizational compatibility	Compatibility_1TR	0.055	0.243	0.071	-0.299	0.678
	Compatibility_2TR	-0.109	-0.033	0.009	-0.002	0.789
Centralized structure	Porgstructure_1TR	0.006	-0.795	-0.150	-0.002	0.032
	Porgstructure_2TR	-0.052	-0.691	-0.011	-0.028	-0.187
Formalized structure	Porgstructure_4TR	-0.171	0.197	0.571	-0.220	-0.215
	Porgstructure_5TR	0.099	-0.016	0.497	0.145	0.185
	Porgstructure_6TR	0.028	0.074	0.728	-0.081	0.078

As can be seen, the EFA creates an underlying factor which is assumed to be benefits from the system and all the variables correspond to the factors. Nevertheless, there are several cases of low values for the factor loadings.

The factor loadings presented on table 21, display how variables of the technological context correspond to each of the extracted factors.

Table 21: Factor loadings in the technological context

Concept	Variable	Factor	
		1	2
System compatibility	SCompatibility_1TR	0.864	0.17
	SCompatibility_2TR	0.849	-0.024
	SCompatibility_3TR	0.845	0.21
System complexity	SComplexity_1TR	0.123	0.648
	SComplexity_2TR	0.069	0.788

As can be seen, the EFA creates two factors for the two independent technological variables, namely system compatibility and system complexity.

The exploratory factor analysis, even though the extraction of factors was near the reality of the conceptual model, is not reliable due to the sample size constraint of the test. For this reason, a Pearson's correlation analysis was performed. It is displayed in appendix C, and shows the significant correlation among variables of the same group.

5.4 Results Based on Multiple Discriminant Analysis and the Pearson's Chi-Square

In this section, the analysis related to the correlation between the independent variables and the dependent variables will be displayed. The method used is multiple discriminant analysis for two main reasons stated bellow:

First, the multiple discriminant analysis is appropriate for the cases where the dependent variable is nonmetric (ordinal or nominal), and the dependent variable is metric (interval or ratio). In this case the independent variables (except firm size) are interval, even though Likert scales are nominal they can be considered as interval for research purposes, and the dependent variables namely IOS typology and IT governance are nominal (Hair et al., 1998; Sekaran, 2006).

Second, the multiple discriminant analysis allows the researcher to identify which independent variable discriminates among different groups, in other words, how a group of the independent variables in the conceptual model discriminates among the IOS typology (0: Dyadic, 1:Side multilateral, 2:Multilateral) and IT governance (0:Centralized, 1:Federal, 2:Decentraliced) (Hair et al., 1998).

Each of the independent variables and their relationships with each of the dependent variables are measured independently. This way, the twenty-two different hypotheses are tested by analyzing the different cases.

5.4.1 Inter-organizational factors hypotheses testing

In this subsection, the hypotheses that state the relation between the inter-organizational factors and the dependent variables are stated. The summarized hypotheses table for such factors is displayed after the correlations are tested to show the outcome of the test.

Trust and information sharing arrangements correlation

The multiple discriminant analysis displays that there is a correlation between trust and information exchange system typology equal to 0.459 based on the largest Eigen value, which means that the variances in IOS typology can be explained by 45.9% due to the independent variable trust as shown in the first row of the inter-organizational factors in table 25. Testing the model fit for this relation, the test shows a statistical significance of 0.001. Based on that significance, and on the assumption that the significance should be less than 0.05 ($\alpha < 0.05$), the alternate hypothesis of the test, which as stated in chapter four is: "the variance of the dependent variable is correlated with the variance of the independent variable" is accepted and the null hypothesis rejected.

Based on the assumptions and the results of this test, the correlation between trust and information exchange system typology is significant, the hypothesis H1a is validated. That can be interpreted as higher trust is correlated with higher levels of multilateral systems.

The second analysis for trust is its correlation with IT governance. The test shows that the correlation between trust and IT Governance is equal to 0.075 based on the largest Eigen value, this would mean that the variance in IT governance due to pressure would be explained by a 7.5%. However, the model fit test for this shows a statistical significance of 0.876. The significance, contrary to the previous correlation test for typology, supports the rejection of the alternate hypothesis of the test. In other words, the null hypothesis is accepted.

Based on the assumptions and the results of this test, the correlation between pressure and IOS IT governance is not significant so the hypothesis H1b is rejected. That can be interpreted as trust does not have any correlation whatsoever with the IT governance of the information exchange system as can be seen in table 22.

Pressure and information sharing arrangements correlation

The first analysis of the pressure relation is with the typology of the information exchange system. It displays that there is a correlation between pressure and typology equal to 0.102 based on the largest Eigen value, which means that the variances in typology can be explained by 10.2% due to the independent variable pressure as shown in the second row of the inter-organizational factors in table 25. Testing the model fit for this relation, however, the test shows a statistical significance of 0.123 as shown in table 25. Based on the assumption that the significance should be less than 0.05 ($\alpha < 0.05$), the alternate hypothesis of the test which would be "the variance of the dependent variable is correlated with the variance of the independent variable" is rejected. In other words, the statistical significance of the test is not enough to reject the null hypothesis of the test "the variance of the dependent variable is not correlated with the variance of the independent variable".

Based on the assumptions and the results of this test the correlation between pressure and typology of the information exchange system is significant, the hypothesis H2a is rejected. That can be interpreted as: pressure is not correlated whatsoever with any levels of multilateral IOS.

The second analysis for pressure is its correlation with IT governance. The test shows that the correlation between pressure and IT Governance of the system is equal to 0.178 based on the largest Eigen value. This would mean that the variance in IT governance due to pressure would be explained by a 17.8% as shown in the second row of table 25. However, the model fit test for this shows a statistical significance of 0.117. The significance, as the previous correlation test for IOS typology support the rejection of the alternate hypothesis of the test. In other words, the null hypothesis is accepted.

Based on the assumptions and the results of this test, the correlation between pressure and IOS IT governance is not significant so the hypotheses H2a and H2b are rejected. That can be interpreted as pressure does not have any correlation whatsoever with IOS IT governance as shown in table 22.

Power and information sharing arrangements correlation

After testing the correlation between power, typology of the information exchange system and IT governance, the outcomes are similar to the outcomes of the relation between pressure, typology and IT governance.

As supported by the third row of the inter-organizational factors in table 25, the statistical fit of the models that state the relation between power and typology, and power and IT governance

respectively is higher than 0.05, which has been stated in the previous cases (trust and pressure) encourage the researcher to accept the null hypothesis of the test. Based on the rejection of the alternate hypothesis of the test, the hypotheses H3a and H3b are also rejected, as can be seen in table 22.

Shared objectives and information sharing arrangements correlation

After testing the correlation between shared objectives, typology of information exchange system and IT governance, the outcomes are quite different to the previous ones. Even though the significance of the model fit does not support the rejection of the null hypotheses, the significance of the model fit test for shared objectives and typology is 0.1.

As supported by the fourth row of the inter-organizational factors in table 25, the statistical fit of the models that state the relation between shared objectives and typology, and power and IT governance respectively is higher than 0.05 and equal to 0.1 for its correlation with typology, which has been stated in the previous cases, encourage the researcher to accept the null hypothesis of the test, however it is validated for a significance equal to 0.1. Based on the rejection of the null hypothesis of the test, the hypotheses H4a is accepted (with a significance of 0.1) which have to be cleared for academic and statistical purposes while H4b is rejected, as shown in table 22.

Table 22: Hypotheses summary regarding the inter-organizational factors

Hypothesis	
H1a: High levels of trust positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Validated
H1b: High levels of trust positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected
H2a: High levels of pressure positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H2b: High levels of pressure positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected
H3a: High levels of power positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H3b: High levels of power positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected

H4a: Shared objectives positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Validated if significance of 0.1 is accepted
H4b: Shared objectives positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected

5.4.2 Organizational factors hypotheses testing

In this subsection, the hypotheses that state the relation between the organizational factors and the dependent variables are stated. The summarized hypotheses table for such factors is displayed after the correlations are tested to show the outcome of the test.

Firm size and information sharing arrangements correlation

Since the measures to test the variables for firm size, typology of the information exchange system and IT governance, are nonmetric; a nonmetric test must be used. In this case, the chi-square for testing two nonmetric variables. None of the relations displayed a significant correlation based on the assumption of alpha<0.05 which has been used in the previous analyses, as shown in the first row of the organizational factors in table 25, which show a significance of 0.320 and 0.340 respectively.

Nevertheless, as shown in figure 17, Fisher's exact test is used since it is accurate for cases of small sample sizes, and because more than 20% of the cells have a std. residual of less than 5 (Field, 2013). Hence, the significance for the relations is taken from the Fisher's exact test which shows a significance of 0.428 for the relation between firm's size and typology, and a significance of 0.120 for the relation between firm's size and IT Governance.

Based on the levels of significance displayed by the Fisher's exact test, there is not enough evidence that can demonstrate that the firm's size has any correlation with typology and IT governance whatsoever. Thus, the hypotheses H5a and H5b are rejected as shown in table 23

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.538[a]	4	.472	.509		
Likelihood Ratio	4.973	4	.290	.422		
Fisher's Exact Test	3.865			.428		
Linear-by-Linear Association	1.492[b]	1	.222	.273	.143	.053
N of Valid Cases	40					

a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is 1.00.

b. The standardized statistic is 1.221.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	7.830[a]	4	.098	.100		
Likelihood Ratio	8.198	4	.085	.125		
Fisher's Exact Test	7.226			.120		
Linear-by-Linear Association	1.267[b]	1	.260	.304	.158	.049
N of Valid Cases	40					

a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is 2.25.

b. The standardized statistic is 1.125.

Figure 17: Chi square test of the relation between firm's size and typology, and firm's size and IOS Governance

Perceived benefits and information sharing arrangements correlation

As shown in the second row of the organizational factors in table 25, the statistical fit of the models that state the relation between perceived benefits and typology and perceived benefits and IT governance respectively is higher than 0.05, meaning that with the presented evidence is not enough to reject the null hypothesis of the test. Based on the rejection of the alternate hypothesis of the test, the hypotheses H6a and H6b are also rejected as shown in table 23.

Organizational compatibility and information sharing arrangements correlation

The statistical fit of the model that states the relation between organizational compatibility and typology is higher than 0.05 so the hypothesis H7a is rejected. However, the statistical fit of the model that states the relation between organizational compatibility and IT governance is 0.026 (lower than 0.05), which means that there is enough evidence to reject the null hypothesis of the test. Meaning that the hypothesis H7b, as presented in table 23, is accepted based on the collected data. Thus, it can be concluded, based on the test that IT governance for IOS between private firms and banks, is explained by 11.4% due to the organizational structure of the companies, as shown in the third row of organizational factors in table 25.

Organizational structure and information sharing arrangements correlation

The statistical fit of the models that state the relation between hierarchical (centralized) organizational structure, and typology as well as centralized organizational structure and IT governance respectively is higher than 0.05. These displayed results respecting the significance mean that there is not sufficient evidence to reject the null hypothesis of the test. Based on the rejection of the alternate hypothesis of the test, the hypotheses H8a and H8b are rejected as shown in table 23.

Likewise, as shown in the fifth row of the organizational factors in table 25, the statistical fit of the models that state the relation between formalized organizational structure and typology, as well as

formalized organizational structure and IT governance respectively are higher than (0.05). Just as with the case of centralization, there is not sufficient evidence to reject the null hypothesis of the test. Based on these outcomes the hypotheses H8c and H8d are also rejected as presented in table 23.

Table 23: Hypothesis summary

Hypothesis	
H5a: The size of the firm positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H5b: The size of the firm positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected
H6a: Perceived benefits positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H6b: Perceived benefits positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected
H7a: Organizational compatibilities positively influences implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H7b: Organizational compatibilities positively influences implementation of highly decentralized IT governance between private companies and their banking allies.	Validated
H8a: Hierarchical organizational structure negatively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H8b: Hierarchical organizational structure negatively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected
H8c: Formalized organizational structure negatively influences implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H8d: Formalized organizational structure negatively influences implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected

5.4.3 Technological factors hypotheses testing

In this subsection, the hypotheses that state the relation between the technological factors and the dependent variables are stated. The summarized hypotheses table for such factors is displayed after the correlations are tested to show the outcome of the test.

IT Compatibilities and information sharing arrangements correlation

The statistical fit of the model that states the relation system compatibility and typology, as well as its relation with IT governance, are higher than 0.05 so the hypotheses H9a and H9b are rejected, as shown in table 24, due to the lack of evidence to reject the null hypotheses of both tests. The rejection of the hypotheses is supported by statistical significance displayed in the first row of technological factors in table 25.

IT Complexity and information sharing arrangements correlation

Just as IT compatibilities, the statistical fit of the model that states the relation of system complexity and typology as well as its relation with IT governance, are higher than 0.05 so the hypothesis H10a and H10b, as shown in table 24, are rejected due to the lack of evidence to reject the null hypotheses of both tests. The rejection of the hypotheses is supported by statistical significance displayed on the second row of the technological factors in table 25.

Table 24: Hypothesis summary

Hypothesis	
H9a: IT compatibilities positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H9b: IT compatibilities positively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected
H10a: IT complexity negatively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies.	Rejected
H10b: IT complexity negatively influences the implementation of highly decentralized IT governance between private companies and their banking allies.	Rejected

Table 25: Multiple Discriminant Analysis and Pearson's Chi-Square for firm's size

Factors	Information Sharing Arrangements (Dependent variables)	% of variance	Canonical correlation	Squared value or Cramer's V (Weight)	Wilk´s lambda	X^2	df	Significance
Inter-organizational factors								
Trust	IOS Typology	84.70	0.678	0.459	0.468	26.96	8	0.001
	IOS IT Governance	74.20	0.275	0.075	0.899	3.78	8	0.876
Pressure	IOS Typology	54.10	0.319	0.102	0.820	7.26	4	0.123
	IOS IT Governance	96.90	0.422	0.178	0.817	7.39	4	0.117
Power	IOS Typology	58.10	0.311	0.097	0.838	6.27	8	0.617
	IOS IT Governance	98.00	0.427	0.182	0.814	7.33	8	0.502
Shared objectives towards IOS implementation	IOS Typology	76.30	0.446	0.199	0.744	10.65	6	0.100
	IOS IT Governance	89.00	0.465	0.216	0.758	10.00	6	0.125
Organizational factors								
Firm's size (Using Chi-Square)	IOS Typology			0.340		9.274	8	0.428
	IOS IT Governance			0.336		9.026	8	0.120
Perceived benefits	IOS Typology	61.00	0.544	0.296	0.788	7.87	8	0.446
	IOS IT Governance	82.00	0.637	0.406	0.876	4.36	8	0.823
Organizational compatibility	IOS Typology	97.90	0.338	0.114	0.883	4.26	4	0.339
	IOS IT Governance	91.40	0.490	0.240	0.738	4.36	4	0.026
Hierarchical Organizational Structure	IOS Typology	100.00	0.283	0.080	0.920	3.04	4	0.552
	IOS IT Governance	93.10	0.330	0.109	0.883	4.55	4	0.337
Formalized Organizational Structure	IOS Typology	67.90	0.215	0.046	0.932	2.53	6	0.865
	IOS IT Governance	84.00	0.210	0.044	0.948	1.94	6	0.925
Technological factors								
IT Compatibilities	IOS Typology	83.90	0.289	0.114	0.901	3.76	6	0.709
	IOS IT Governance	69.90	0.338	0.240	0.839	6.33	6	0.387
IT Complexity	IOS Typology	88.80	0.104	0.011	0.901	0.44	4	0.979
	IOS IT Governance	82.40	0.150	0.022	0.839	1.00	4	0.909

5.5 Discussions

In this section, the discussion concerning the results of the data analysis is stated. This discussion is made taking into account the different contexts based on the TOE framework.

Initially twenty-two hypotheses were drawn from the different identified factors that affect the information sharing arrangements. Since the information sharing arrangements, as defined in chapter 2 and chapter 3, are defined as the agreements in terms of the information exchange systems implemented between two or more companies and the IT government design implemented to govern the adopted system between the parts.

From those twenty-two hypotheses three of them were statistically significant, meaning that with the available evidence, the other nineteen hypotheses could not be validated.

The validated hypotheses are H1a: High levels of trust positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies, and H7b: Organizational compatibilities positively influences implementation of highly decentralized IT governance between private companies and their banking allies. There is a special case that even though it is not significant for an alpha < 0.05, it is significant for an alpha≤0.1 which are taken into special account for the stated theoretical framework. That hypothesis is H4a: Shared objectives positively influences the implementation of highly multilateral information exchange system typologies between private companies and their banking allies. It is imperative to bear in mind that none of the tested hypotheses presented a complete influence but partial, meaning that two of them influence typology of the IS adoption which are H1 and H4 (this last one with a significance of 0.1) and one influences the IT government design adoption which is H7.

The final outcome of the analysis answers the main research question and third and last research question of this study, which are "*Which factors influence the information sharing arrangements between private organizations and their banking allies, and to what extent do those factors influence on the arrangements*?" and "*What is the effect of each factor on the information sharing arrangements?*" respectively. The answer to these questions are delivered by the data analysis and is presented in table 26.

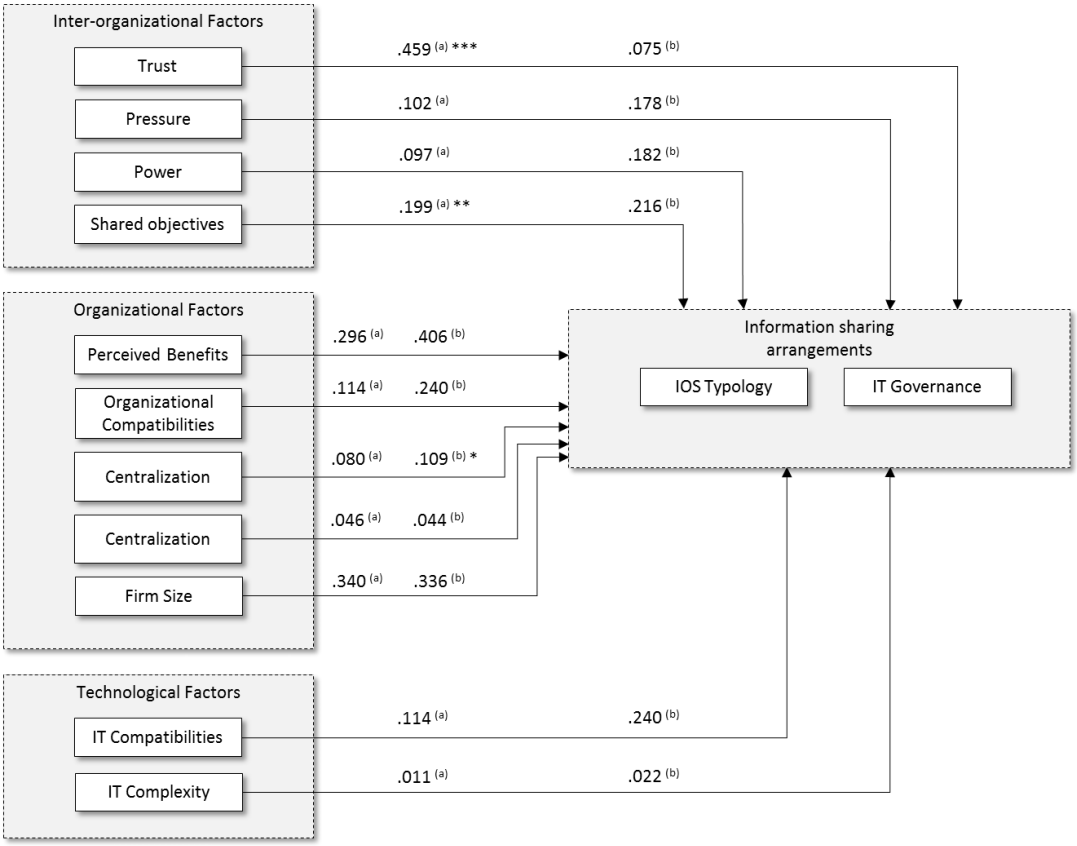
Table 26: Which factors affect the information sharing arrangements and to what extent?

Factors	Influence on information sharing arrangements
Trust [a] ***	Partially supported: Partially since it explains IOS typology with and influence of .459 (45.9%) on it.
Pressure	Not supported
Power	Not supported
Shared objectives towards IOS implementation [a] *	Partially supported: Partially since it explains IOS typology with and influence of .199 (19.9%) on it.

Firm's size	Not supported
Perceived benefits	Not supported
Organizational compatibility (b) **	Partially supported: Partially since it explains IOS IT Governance with and influence of .240 (24%) on it.
Organizational structure	Not supported
IT Compatibilities	Not supported
IT Complexity	Not supported

Levels of significance: *p≤0.1, **p<0.05, ***p≤0.01
(a) Partial influence (IOS typology adoption), (b) Partial influence (IOS IT governance design)

Based on the findings, the final model is presented in figure 18, which shows the level to which each factor explains the variance of either the IOS typology or IOS IT governance.



Levels of significance: *p≤.1, **p<.05, ***p≤.01
(a) Influence on IOS typology adoption
(b) Influence on IOS IT governance design

Figure 18: Tested model

Chapter 6: Conclusions

In this chapter of the report, the conclusions of the research are stated, based on the first assumptions that were used to build the theoretical framework and the data analysis performed. It will be stated in this chapter, the outcomes, and contributions of this research, the limitations in conducting the study; and finally, the future research proposes and reflections of the conducted research.

6.1 Findings and contributions of the research

This section states the findings that can be proposed from the results of this research, as well as its contributions to both academic and practical area.

This research's purpose was stated as providing an explanation about the factors that influence the information sharing arrangements and to what extent. And its research relevance was described as bringing new knowledge to decision makers when planning the implementation and governance of inter-organizational information systems.

Even though the evidence did not support the correlation of all factors, important insights can be inferred from the statistical analysis. In terms of organizational internal capabilities, it is important to notice that the extent of how the organization's values, strategy, mission, and vision is compatible with the system, the more prone the arrangements will be more decentralized in terms of governance of the inter-organizational information system.

Concerning the inter-organizational (external or environment) context of the factors that affect the information sharing arrangements, they could be categorized into two groups namely, collaboration and cooperation factors like trust and shared objectives, and coercive factors like power and pressure. The study provided statistical significance on how those factors, towards cooperation and collaboration, positively influence the adoption of multilaterally of inter-organizational information systems; while the coercive factors did not display statistical significance influence on the arrangements. This leads to infer that trust and shared objectives, provide high security to the companies that share their information in a common system, where other companies also share their information in a commonplace.

The so-called coercive factors, do not show statistical significance. Even though no conclusion can be made regarding those factors, which are pressure and power, due to lacking statistical evidence; it can be said that for the specific sample on which the study is based, the factors that do not directly

support cooperation; specifically, in this case between the companies and their banks, with mutual benefits for both parts; are not relevant in the relation of sharing technical resources.

6.1.1 Summary of research findings

The outcomes of the research, based on the research questions, that serve to provide a solution structure for the research problem and objective, are as follows. The research sub-question: *Which types of inter-organizational information systems can be identified?* provided the identified IOS typologies that built part of the dependent variable. All he typologies were gathered from the academic literature. Nevertheless, for this research, an adaptation from the types of IOS defined by Choudhury (1997) was used.

The research sub-question: "*Which factors, that influence information sharing arrangements, can be identified in the literature?*" brought different factors that were used to formulate the independent variables and the operationalization of them. As the question states the factors were found in the literature, particularly from innovation and information systems acceptance and adoption (See section 3.4).

The research question: "*What is the influence of each factor on the information sharing arrangements?*" was based on the empirical evidence, which was the analysis of the data gathered from the survey.

The research sub-questions, supported the solution of the main research question of this study: "*Which factors influence the information sharing arrangements between private organizations and their banking allies?*". The factors that affect the information sharing arrangements, based on the empirical evidence collected, showed that higher trust and shared objectives, based on the assumption that lower multi-laterality of systems means dyadic systems, positively influences on the adoption of multilinear systems between private companies and their allied banks. On the other hand, higher compatibility between the information exchange system and the organizational characteristics, particularly concerning the values of the firm, influences decentralized governance agreements between the firm and its banking allies based on the positive correlation as summarized in figure 19.

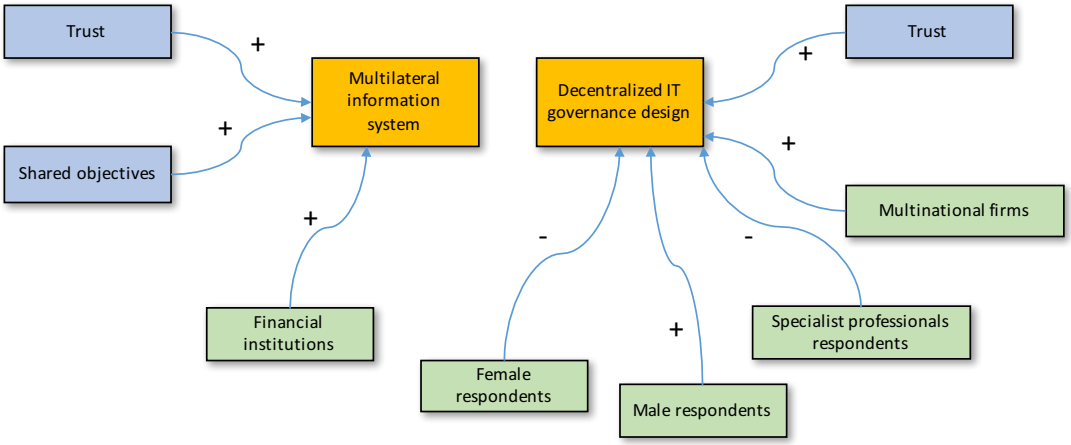


Figure 19: Influence on independent and demographic variables on dependent variables

6.1.2 Contributions

This study describes a theoretical framework to describe and understand what variables can predict which type of inter-organizational systems that the companies use with their allies. As stated in the domain section (see chapter 2), information as a concept is a part, according to several researchers, of what is called: "the wisdom pyramid", where other concepts as data, knowledge and even wisdom, besides information, are related (Ackoff, 1989). This framework, thus, can be escalated to factors related to value chain generation, based on information exchange of the firms, impacting areas of knowledge such as business modeling, inter-firm collaboration, knowledge management and, as has been said in the domain sector, information sciences.

For practitioners in Colombia the contributions are focus on the awareness for developers and implementers of the systems for information exchange, whether they are outsourced or in-house parties. Contracts or agreements between companies in Colombia, specially between private firms and banking institutions, must provide an extent of security and trust, in order to keep improving the collaboration between the different stakeholders of the system and attract new allies to the network.

The capabilities of the system, in terms of architecture, infrastructure, and business requirements must be open to a federal or decentralized governance for firms. Especially in the architecture sphere, systems should focus on modularity and flexibility, in order to make it adaptable to the different organization's capabilities, and not the other way around; this last statement is stated since the empirical evidence provides insights about the correlation between organizational compatibilities and the decentralized IT governance (Tiwana & Konsynski, 2010).

In general terms, practitioners in Colombia, specially IT consultants who bring new practices and processes improvements to the companies in this country, should focus on inter-organizational relations and factors external to the company, as well as their internal values and culture, to provide accurate recommendations toward implementations of systems for information exchange with their partners, collaborators and in the allies involved in the value chain.

6.2 Limitations

In this section, the different limitations while conducting the research and the limitations of the research itself are mentioned.

Regarding the literature, it is easy to verify by checking the publication date of the journals and papers used as a basis for this study, that the concept of inter-organizational information systems, in which the information exchange systems concept is based, are outdated. Other possibility to base the concept based on the literature, is by using the approach of platforms as has been stated in the literature review; Nevertheless, the literature on platforms focus on competition, economies of scale, collaboration, network externalities and value chains, which brings new insights for the conduction

of this research (Gawer & Cusumano, 2008; Hilkert, Benlian, Sarstedt, & Hess, 2011; Rochet & Tirole, 2003; Tiwana et al., 2010).

The conceptual model, used in the theoretical framework of this research, take the factors that apply the most to the relationship among the firms and their banking allies in Colombia. Nevertheless, there a chance, and not minor, that those factors are selected with a component of bias. The list of factors that can affect the adoption of innovation, based on different theories, is larger than the selected set and not all those factors were used in this study. There might be another set of factors that, based on the provided evidence, could display statistical significance for the relation between bank and private companies.

The respondents from the private companies in Colombia, which were representatives of the unit of analysis of this study, might have had lack of knowledge regarding the typology of the system for information exchange that is used with their allied banks. This behavior implies a possible bias in the responses of the sample that might not be close to reality.

One of the limitations was the low rate of response (18.8%), this follows the strategy of e-mail electronic questionnaires. Since it is hard to clarify questions when using electronic questionnaires this might also bias the answers of the respondents when facing questions that are not understood to them.

6.3 Future Research

In this section, the future research that can be derived from this study are stated. The conduction and results of this research, bring opportunities to new studies in different academic areas. At least three different future research can be proposed.

In the area of knowledge management, it would be of great interest to apply the used or similar approach and framework, to study the factors that affect knowledge sharing in a collaboration network, which could bring insights regarding high collaboration related factors.

Inter-organizational factors that affect the value chain would also be academically appealing. Taking as an insight that the environment (TOE) is the context where the majority of factors that influence the information sharing arrangements, based on the provided evidence of this research.

xFinally, it would also be interesting to study how information sharing arrangements affect the firm's business models, which is the design of all the value generation of a company.

6.4 Reflections

In this section, the reflections of the conduction and results of the research are stated. Nevertheless, it is important to notice that each section of this conclusions displays a particular reflection according to the findings, contribution limitations.

The results from the research show that two of the inter-organizational selected factors had a statistically significant influence on the information sharing arrangements, specifically on the

adoption of a typology of information system. This motivates the conclusion that further analysis is needed regarding the correlations with other external factors the organizations. Out of four different studied factors, those that present a correlation are trusted and shared objectives toward the implementation or use of the information system.

Without the initial intention to do so, the external or inter-organizational factors could be grouped into two categories namely, coercive factors, in this case, power and pressure; and collaborative factors namely trust and shared objectives. The factors that presented statistical significance, supported by the evidence gathered from Colombia, are the collaborative factors.

The last factor to have a statistically significant relation with the information sharing arrangements is organizational compatibility, which measures how prepared the organization is to accept an exchange arrangement with their banking partners.

This study, despite using insights from different adoption models, was mainly based on the TOE framework presented by (Tornatzky et al., 1990). The use of the TOE framework provided an accurate blueprint to analyze the factors using each of the three environments. Even though the TOE framework is flexible enough to allow the researcher to analyze different theories regarding innovation and innovation adoption; it provides several factors that had to be dismissed for the current research, for time and scope constraints.

The influence of organizational compatibilities towards a decentralized governance design, might show correlation with inter-organizational IT governance due to the fact that the extent to which the organization is more adapted to a sharing information initiative, which does not require strategical changes to be adopted, is more motivated to participate in the decision-making of the uses and implementation of that initiative.

6.4.1 Reflection on the process

Conducting this research, some obstacles that made the process more interesting arose. The first pitfall was the use of a concept that has not been widely used yet, namely information sharing arrangements. This made it hard to target a specific literature review strategy to form a theoretical background for this thesis. Nevertheless, this did not pose a great barrier, and it is interesting for me to be part of the creation of new knowledge from a starting point such as this.

The selection of the factors represented a great pitfall in the conduction of this research. There is a comprehensive literature related to the factors that influence the adoption of inter-organizational information systems and technical innovations. However, finding enough literature that fit in the Colombian context was a difficult task. However, it improved my creativity in terms of research strategies and in terms of inter-personal relations to gather the needed literature from my country of origin.

The number of factors was an extensive one, that had a repercussion on the size of the questionnaire which in turn had an impact on the sample size. Some respondents notified that the questionnaire was too long (ten to fifteen minutes), and they were not willing to spend that time answering it.

6.4.2 Reflection on the sample

The sample was a small one, the expected response rate was 30% against the real response rate (18%). A sample of 60 respondents would have provided an accurate generalization on the findings, or at the very least a validation on the exploratory factor analysis. 2.A larger sample size (a response rate of 30%) would have also brought a possibility to use a different analysis which could fit the amount of hypothetically gathered data.

Regarding the initial assumptions, the research challenged the idea that the banks were not willing to use information sharing systems with other banks. From the collected sample, all the banking institutions and non-banking financial institutions pinpointed that the information system for information exchanged they used with their partners, were also used by other banks. Giving a new knowledge that was not expected.

Other assumptions were confirmed such as the number of female and male respondents, the education level of the respondents with on technologist as an exception, the region from in which the respondents work (most of the respondents were from Bogotá).

What would I have done different?

I would have focus on one of the context of the TOE framework to reduce the length of the questionnaire and achieve more respondents. But even more important than that, to design a more parsimonious framework than the one that was used for this research.

As closing remark, it would be valuable to perform an explorative research in this field, in a qualitative design, to gather more information regarding the factors that are relevant for different countries; as the results portrayed, from the ten studied factors three displayed significance, and it must be highlighted that from those two (and as have been stated several times, ***with the gathered evidence***), organizational compatibilities displayed a low statistical significance.

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Appendix A. Research questionnaire

Introduction

Acuerdos de Intercambio de Información inter-organizacional

Estimado/Estimada, mi nombre es Humberto Ortiz López. La siguiente encuesta hace parte de un proyecto de investigación, en el que se estudian los factores que influyen en los diferentes tipos de sistemas de intercambio de información inter-organizacionales, y las formas de gobierno de estos. Dicho proyecto, hace parte de mi tesis de grado de maestría en Management of Technology de la Universidad Tecnológica de Delft.

Esta encuesta toma entre diez y quince minutos para ser respondida en su totalidad, y constituirá la base para futuras investigaciones acerca de intercambio de conocimiento, innovación y colaboración entre empresas.

La información que usted entregue es totalmente anónima y confidencial, y será usada únicamente para propósitos académicos.

Este estudio es supervisado por Marijn Janssen (PhD, Profesor in ICT and Governances, Head of ICT section of the Faculty of Technology, Policy and Management at Delft University of Technology), a quien podrá contactar directamente por medio del correo electrónico M.F.W.H.A.Janssen@tudelft.nl

Muchas gracias por su tiempo y cooperación; si tiene preguntas acerca de este proyecto de investigación, puede contactarme por medio del correo electrónico H.J.OrtizLopez@student.tudelft.nl

Measurement Items

Demographic Data

Table 27: Questionnaire structure

Respond to the next demographic data
1. Age
a. Younger than 25 years old b. Between 25 and 34 years old c. Between 35 and 34 years old d. Between 45 and 34 years old e. Older than 55 years old
2. Highest level of studies
a. Primary school b. Secondary school c. Technician d. Technologist e. Bachelor degree f. Specialist diploma g. Master Degree h. PhD. Degree
3. Gender
a. Male b. Female c. My gender is not represented by the previous options
4. Region of Colombia where you actually work
[Regions of Colombia = Amazonas, Antioquia, Arauca, Atlántico, Bogotá, Bolívar, Boyacá, Caldas, Caquetá, Casanare, Cauca, Cesar, Chocó, Córdoba, Cundinamarca, Guainía, Guaviare, Huila, La Guajira, Magdalena, Meta, Nariño, Norte de Santander, Putumayo, Quindío, Risaralda, San Andrés y Providencia, Santander, Sucre, Tolima, Valle del Cauca, Vaupés, Vichada]
5. Type of organization that better represents the company

a. Non-banking private company b. Bank c. Non-banking private mixed company d. Non-banking financial institution e. Public organization f. Non-government organization (NGO)
6. Approximate number of employees of the firm you work for
a. Less than 11 people b. Between 11 and 50 people c. Between 51 and 250 people d. Between 251 and 1000 people e. More than 1000 people
7. Sector in which the firm performs (in case the type of organization is different to [Bank, Non-banking financial institution, public organization and NGO)
[Sectors = Airlines, Advertising agencies, Food and beverage, Construction, Consultancy, Cosmetics, Publishing companies, Education, Radio stations, Energy, Industrial equipment and machinery, Hotels, Logistics, Construction materials, Telecommunications, Paper and plastics, Clothing, footwear and textiles, Restaurants, Health and pharmaceutics, Public services and infrastructure, Other]
8. Coverage of the company
a. Local b. National c. Global

Information Sharing Arrangements

Indicate how often the following media are used to share information between your employer and its allied bank					
	Never	Rarely	Sometimes	Often	Always

9. E-mail					
10. Web portals					
11. Desktop applications					
12. Services integrated to the existing applications in the company					
Regarding the system for information exchange implemented between your employer and its allied bank, indicate the extent to which you agree or disagree with the following statements					
	Totally disagree				Totally agree
13. The system is requested by the allied bank					
14. My employer's allied bank recommends the use of the system					
15. The use of the system implies benefits promised by the allied bank					
16. Companies in the industry implement the system (Or similar systems) with their allied banks					
17. My employer's allied bank exerts its power to decide on the different politics of the system					
18. My employer's allied bank exerts its power to define the format and standards of the data which will be transferred through the system					
19. The data is transferred through an automated process, with no human intervention					
Besides your employer and its allied bank, which other companies implement the system for information exchange					
	Yes		No		
20. Other banks					
21. Other companies					
22. One or more public organizations					

Indicate the extent to which you agree with the following statements regarding the companies that have implemented the system for information exchange					
	Totally disagree				Totally agree
23. The companies have shared objectives concerning the use of the system					
24. In the company I worked for, we understand the shared objectives with respect to the use of the system					
25. The shared objectives are understood by other companies involved in the use of the system. (Other companies might be just the allied bank, or other companies that implement the system)					
Indicate which companies are involved in the following responsibilities regarding the system for information exchange					
	Allied bank	My employer	Public organizations	Other banks	Other companies
26. Definition of the usage rules of the system c					
27. Data management c					
28. Data storage d					
29. IT policies d					
30. IT investment c					
Indicate the extent to which you agree with the following statements, concerning the implementation and use of the system for information exchange within the company you work for					

	Totally disagree				Totally agree
31. In the company, we believe that the system is a useful tool					
32. The company, easily adapts itself to the required changes demanded by the implementation of the system					
33. The changes, required by the implementation of the system, are aligned with my employer organizational values					
34. The system is considered a burden to the employees of the firm I work for					
35. In the firm I work for, we think that the system is efficient					
36. In the firm I work for, we believe that the system supports the performance improvement					
37. The system is compatible with the existing applications implemented in the firm I work for					
38. The system is compatible with the databases implemented in the firm I work for					
39. The system is compatible with the workflows of the firm I work for					
40. The use of the system requires skills that are hard to obtain by the employees of the firm I work for					
41. To train the employees, in the use of the system, took more time than expected					
42. The system is easy to use					

Indicate the extent to which you agree the following statements with respect to the relationship between your employer and its allied bank

	Totally disagree				Totally agree
43. My employer considers its allied bank a trustful partner					

44. The allied bank of my employer, keeps an open and honest communication with my employer					
45. In the firm I work for, we believe that our allied bank carries out all its pledged tasks					
46. In the firm I work for, we have confidence that the allied bank keeps its obligations					
Indicate the extent to which you agree the following statements in relation to the information exchange between your employer and its allied bank					
	Totally disagree				Totally agree
47. In the firm I work for, we find it hard to refuse requests from the allied bank					
48. The allied bank has a higher power position than my employer					
49. Thanks to the information exchange, the employees of the firm I work for, have developed new skills					
50. Due to the information exchange, the firm I work for have improve its product and services					
51. The information exchange has favored the organizational effectiveness of my employer					
52. It is expected that the information exchange foments process innovation within the firm I work for					
53. It is expected that the information exchange promotes the innovation of the products and services developed by the firm I work for					
54. It is expected that the information exchange favors the boost of the competitive advantage of the firm I work for					
55. It is expected that the information exchange foments the process efficiency in the firm I work for					
Indicate the extent to which you agree the following statements related to the hierarchy, standardization and formalization within the firm you work for					

	Totally disagree				Totally agree
56. The employees of the firm I work for actively participate in strategic decisions related to the area in which they perform					
57. The employees of the firm I work for take decisions related to their position, without the approval of a supervisor					
58. Only the high management of the firm take strategic decisions					
59. The roles and functions of the employees are defined in detail according to their position					
60. The employees follow strict procedures with respect to solving issues related to their position					
61. The employees follow strict procedures with respect to risk mitigation related to their position					
62. The employees follow strict procedures with respect to the functions related to their position					

Appendix B. E-mail invitation to participate in the survey

Acuerdos de Intercambio de Información Empresarial

Buen día,

Soy Humberto Ortiz López, estudiante de Maestría en Delft University of Technology en Holanda. Lo contacto para invitarlo a participar de una encuesta, que hace parte de un proyecto de investigación acerca de la identificación de factores que influyen en tipologías y formas de gobierno de sistemas de información inter-organizacionales entre empresas privadas y sus aliados bancarios en Colombia.

Link de la encuesta: https://siio.typeform.com/to/TYBuI5

Su participación es muy importante para este proyecto, ya que su perfil es idóneo para dar respuestas apropiadas en cuanto a los requerimientos de esta investigación.

Si desea saber más acerca de este estudio, me puede contactar por este medio, o al correo: h.j.ortizlopez@student.tudelft.nl

Gracias por considerar esta solicitud,

Humberto Ortiz López

E-mail invitation translation:

Enterprise Information Sharing Arrangements

Dear Sr. or Madam,

I am Humberto Ortiz López, Master's student at Delft University of Technology in the Netherlands. This is an invitation to participate in a survey, which is part of a research project on the identification of factors that influence typologies and designs of governance of inter-organizational information systems between private companies and their banking allies in Colombia.

Survey link: https://siio.typeform.com/to/TYBuI5

Your participation is very important for this project, as your profile is ideal for providing appropriate responses to the requirements of this research.

If you would like to know more about this study, you can contact me by email: h.j.ortizlopez@student.tudelft.nl

Thank you for your consideration,

Humberto Ortiz López

Appendix C. Correlation analysis between independent and dependent variables

In the following figures, it is stated the correlations between the individual variables among each other, and among the dependent variables.

Correlations of the different dimensions of pressure, IOS typology and IOS IT Governance, using Pearson coefficient

Correlations

		Pressure_3TR	Pressure_4TR	IOS Typology	IT Governance
Pressure_3TR	Pearson Correlation	1	.672**	.240	.337*
	Sig. (2-tailed)		.000	.136	.033
	N	40	40	40	40
Pressure_4TR	Pearson Correlation	.672**	1	.313*	.266
	Sig. (2-tailed)	.000		.049	.096
	N	40	40	40	40
IOS Typology	Pearson Correlation	.240	.313*	1	.283
	Sig. (2-tailed)	.136	.049		.077
	N	40	40	40	40
IT Governance	Pearson Correlation	.337*	.266	.283	1
	Sig. (2-tailed)	.033	.096	.077	
	N	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 20: Correlation between pressure variables, IOS Typologies and IT governance designs

Correlations of the different dimensions of trust, IOS typology and IOS IT Governance, using Pearson coefficient

Correlations

		Trust_1TR	Trust_2TR	Trust_3TR	Trust_4TR	IOS Typology	IT Governance
Trust_1TR	Pearson Correlation	1	.604**	.575**	.599**	.466**	.181
	Sig. (2-tailed)		.000	.000	.000	.002	.263
	N	40	40	40	40	40	40
Trust_2TR	Pearson Correlation	.604**	1	.712**	.579**	.433**	.000
	Sig. (2-tailed)	.000		.000	.000	.005	.998
	N	40	40	40	40	40	40
Trust_3TR	Pearson Correlation	.575**	.712**	1	.748**	.159	.131
	Sig. (2-tailed)	.000	.000		.000	.328	.419
	N	40	40	40	40	40	40
Trust_4TR	Pearson Correlation	.599**	.579**	.748**	1	.226	.105
	Sig. (2-tailed)	.000	.000	.000		.160	.517
	N	40	40	40	40	40	40
IOS Typology	Pearson Correlation	.466**	.433**	.159	.226	1	.283
	Sig. (2-tailed)	.002	.005	.328	.160		.077
	N	40	40	40	40	40	40
IT Governance	Pearson Correlation	.181	.000	.131	.105	.283	1
	Sig. (2-tailed)	.263	.998	.419	.517	.077	
	N	40	40	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 21: Correlation between trust variables, IOS Typologies and IT governance designs

Correlations of the different dimensions of power, IOS typology and IOS IT Governance, using Pearson coefficient

Correlations

		Power_1TR	Power_2TR	Power_3TR	Power_4TR	IOS Typology	IT Governance
Power_1TR	Pearson Correlation	1	.615**	.080	.494**	.279	.303
	Sig. (2-tailed)		.000	.622	.001	.082	.057
	N	40	40	40	40	40	40
Power_2TR	Pearson Correlation	.615**	1	.200	.325*	.164	.267
	Sig. (2-tailed)	.000		.215	.041	.311	.096
	N	40	40	40	40	40	40
Power_3TR	Pearson Correlation	.080	.200	1	.291	.037	-.035
	Sig. (2-tailed)	.622	.215		.069	.822	.829
	N	40	40	40	40	40	40
Power_4TR	Pearson Correlation	.494**	.325*	.291	1	.252	.075
	Sig. (2-tailed)	.001	.041	.069		.116	.648
	N	40	40	40	40	40	40
IOS Typology	Pearson Correlation	.279	.164	.037	.252	1	.283
	Sig. (2-tailed)	.082	.311	.822	.116		.077
	N	40	40	40	40	40	40
IT Governance	Pearson Correlation	.303	.267	-.035	.075	.283	1
	Sig. (2-tailed)	.057	.096	.829	.648	.077	
	N	40	40	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 22: Correlation between power variables, IOS Typologies and IT governance designs

Correlations of the different dimensions of shared objectives, IOS typology and IOS IT governances, using Pearson coefficient

Correlations

		ShareObjectives_1TR	ShareObjectives_2TR	ShareObjectives_3TR	IOS Typology	IT Governance
ShareObjectives_1TR	Pearson Correlation	1	.385*	.368*	.053	.425**
	Sig. (2-tailed)		.014	.020	.746	.006
	N	40	40	40	40	40
ShareObjectives_2TR	Pearson Correlation	.385*	1	.605**	.329*	.151
	Sig. (2-tailed)	.014		.000	.038	.352
	N	40	40	40	40	40
ShareObjectives_3TR	Pearson Correlation	.368*	.605**	1	.105	.294
	Sig. (2-tailed)	.020	.000		.521	.066
	N	40	40	40	40	40
IOS Typology	Pearson Correlation	.053	.329*	.105	1	.283
	Sig. (2-tailed)	.746	.038	.521		.077
	N	40	40	40	40	40
IT Governance	Pearson Correlation	.425**	.151	.294	.283	1
	Sig. (2-tailed)	.006	.352	.066	.077	
	N	40	40	40	40	40

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 23: Correlation between shared objectives variables, IOS Typologies and IT governance designs

Correlations of the different dimensions of perceived system benefits, IOS typology and IT governance

Correlations

		PSbenefits_2TR	PSbenefits_3TR	PSbenefits_4TR	Pebenefits_1TR	Pebenefits_2TR	Pebenefits_3TR	Pibenefits_1TR	Pibenefits_2TR	Pibenefits_3TR	IOS Typology	IT Governance
PSbenefits_2TR	Pearson Correlation	1	.125	.043	-.116	-.257	-.195	-.127	-.304	-.146	.079	.088
	Sig. (2-tailed)		.440	.790	.478	.110	.229	.436	.057	.368	.627	.591
	N	40	40	40	40	40	40	40	40	40	40	40
PSbenefits_3TR	Pearson Correlation	.125	1	.645**	.248	.363*	.374*	.514**	.273	.371*	-.271	.079
	Sig. (2-tailed)	.440		.000	.123	.021	.017	.001	.089	.018	.091	.628
	N	40	40	40	40	40	40	40	40	40	40	40
PSbenefits_4TR	Pearson Correlation	.043	.645**	1	.109	.256	.401*	.395*	.293	.501**	-.173	-.103
	Sig. (2-tailed)	.790	.000		.501	.111	.010	.012	.067	.001	.285	.527
	N	40	40	40	40	40	40	40	40	40	40	40
Pebenefits_1TR	Pearson Correlation	-.116	.248	.109	1	.621**	.597**	.391*	.348*	.336*	-.234	-.028
	Sig. (2-tailed)	.478	.123	.501		.000	.000	.013	.028	.034	.146	.864
	N	40	40	40	40	40	40	40	40	40	40	40
Pebenefits_2TR	Pearson Correlation	-.257	.363*	.256	.621**	1	.778**	.671**	.684**	.568**	-.239	-.140
	Sig. (2-tailed)	.110	.021	.111	.000		.000	.000	.000	.000	.138	.389
	N	40	40	40	40	40	40	40	40	40	40	40
Pebenefits_3TR	Pearson Correlation	-.195	.374*	.401*	.597**	.778**	1	.583**	.547**	.611**	-.206	-.316*
	Sig. (2-tailed)	.229	.017	.010	.000	.000		.000	.000	.000	.202	.047
	N	40	40	40	40	40	40	40	40	40	40	40
Pibenefits_1TR	Pearson Correlation	-.127	.514**	.395*	.391*	.671**	.583**	1	.842**	.864**	-.377*	-.347*
	Sig. (2-tailed)	.436	.001	.012	.013	.000	.000		.000	.000	.017	.028
	N	40	40	40	40	40	40	40	40	40	40	40
Pibenefits_2TR	Pearson Correlation	-.304	.273	.293	.348*	.684**	.547**	.842**	1	.778**	-.226	-.358*
	Sig. (2-tailed)	.057	.089	.067	.028	.000	.000	.000		.000	.161	.023
	N	40	40	40	40	40	40	40	40	40	40	40
Pibenefits_3TR	Pearson Correlation	-.146	.371*	.501**	.336*	.568**	.611**	.864**	.778**	1	-.179	-.320*
	Sig. (2-tailed)	.368	.018	.001	.034	.000	.000	.000	.000		.269	.044
	N	40	40	40	40	40	40	40	40	40	40	40
IOS Typology	Pearson Correlation	.079	-.271	-.173	-.234	-.239	-.206	-.377*	-.226	-.179	1	.283
	Sig. (2-tailed)	.627	.091	.285	.146	.138	.202	.017	.161	.269		.077
	N	40	40	40	40	40	40	40	40	40	40	40
IT Governance	Pearson Correlation	.088	.079	-.103	-.028	-.140	-.316*	-.347*	-.358*	-.320*	.283	1
	Sig. (2-tailed)	.591	.628	.527	.864	.389	.047	.028	.023	.044	.077	
	N	40	40	40	40	40	40	40	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 24: Correlation between perceived benefits variables, IOS Typologies and IT governance designs

Correlations of the dimensions of organizational compatibility, IOS typology and IT governance

Correlations

		Compatibility _1TR	Compatibility _2TR	IOS Typology	IT Governance
Compatibility_1TR	Pearson Correlation	1	.621**	.259	-.167
	Sig. (2-tailed)		.000	.107	.303
	N	40	40	40	40
Compatibility_2TR	Pearson Correlation	.621**	1	.321*	.202
	Sig. (2-tailed)	.000		.043	.211
	N	40	40	40	40
IOS Typology	Pearson Correlation	.259	.321*	1	.283
	Sig. (2-tailed)	.107	.043		.077
	N	40	40	40	40
IT Governance	Pearson Correlation	-.167	.202	.283	1
	Sig. (2-tailed)	.303	.211	.077	
	N	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 25: Correlation between organizational compatibility, IOS Typologies and IT governance designs

Correlations of the dimensions of hierarchical centralization structure of the organization, IOS typology and IT governance

Correlations

		Porgstructure _2TR	Porgstructure _3TR	IOS Typology	IT Governance
Porgstructure_2TR	Pearson Correlation	1	.182	.116	.239
	Sig. (2-tailed)		.261	.476	.138
	N	40	40	40	40
Porgstructure_3TR	Pearson Correlation	.182	1	.016	.263
	Sig. (2-tailed)	.261		.920	.100
	N	40	40	40	40
IOS Typology	Pearson Correlation	.116	.016	1	.283
	Sig. (2-tailed)	.476	.920		.077
	N	40	40	40	40
IT Governance	Pearson Correlation	.239	.263	.283	1
	Sig. (2-tailed)	.138	.100	.077	
	N	40	40	40	40

Figure 26: Correlation between hierarchical organizational structure, IOS Typologies and IT governance designs

Correlations of the dimensions of formalization, IOS typology and IT governance

Correlations

		Porgstructure_4TR	Porgstructure_5TR	Porgstructure_6TR	IOS Typology	IT Governance
Porgstructure_4TR	Pearson Correlation	1	.192	.435**	.134	.062
	Sig. (2-tailed)		.236	.005	.409	.704
	N	40	40	40	40	40
Porgstructure_5TR	Pearson Correlation	.192	1	.489**	.067	.080
	Sig. (2-tailed)	.236		.001	.682	.623
	N	40	40	40	40	40
Porgstructure_6TR	Pearson Correlation	.435**	.489**	1	-.054	.022
	Sig. (2-tailed)	.005	.001		.742	.892
	N	40	40	40	40	40
IOS Typology	Pearson Correlation	.134	.067	-.054	1	.283
	Sig. (2-tailed)	.409	.682	.742		.077
	N	40	40	40	40	40
IT Governance	Pearson Correlation	.062	.080	.022	.283	1
	Sig. (2-tailed)	.704	.623	.892	.077	
	N	40	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 27: Correlation between formalization variables, IOS Typologies and IT governance designs

Correlations of the dimensions of system compatibility over IOS typology and IT governance

Correlations

		SCompatibility_1TR	SCompatibility_2TR	SCompatibility_3TR	IOS Typology	IT Governance
SCompatibility_1TR	Pearson Correlation	1	.724**	.735**	.217	.153
	Sig. (2-tailed)		.000	.000	.179	.347
	N	40	40	40	40	40
SCompatibility_2TR	Pearson Correlation	.724**	1	.704**	.148	.223
	Sig. (2-tailed)	.000		.000	.360	.167
	N	40	40	40	40	40
SCompatibility_3TR	Pearson Correlation	.735**	.704**	1	.121	.253
	Sig. (2-tailed)	.000	.000		.456	.115
	N	40	40	40	40	40
IOS Typology	Pearson Correlation	.217	.148	.121	1	.283
	Sig. (2-tailed)	.179	.360	.456		.077
	N	40	40	40	40	40
IT Governance	Pearson Correlation	.153	.223	.253	.283	1
	Sig. (2-tailed)	.347	.167	.115	.077	
	N	40	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 28: Correlation between system compatibility variables, IOS Typologies and IT governance designs

Correlations of the dimensions of system complexity over IOS typology and IT governance

Correlations

		SComplexity_1TR	SComplexity_2TR	IOS Typology	IT Governance
SComplexity_1TR	Pearson Correlation	1	.511**	-.066	.129
	Sig. (2-tailed)		.001	.684	.427
	N	40	40	40	40
SComplexity_2TR	Pearson Correlation	.511**	1	-.034	.014
	Sig. (2-tailed)	.001		.837	.932
	N	40	40	40	40
IOS Typology	Pearson Correlation	-.066	-.034	1	.283
	Sig. (2-tailed)	.684	.837		.077
	N	40	40	40	40
IT Governance	Pearson Correlation	.129	.014	.283	1
	Sig. (2-tailed)	.427	.932	.077	
	N	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 29: Correlation between system complexity, IOS Typologies and IT governance designs

Appendix D. Correlation among variables per group

Correlations among variables of inter-organizational context

	PR_3	PR_4	PW_1	PW_2	PW_3	PW_4	SO_1	SO_2	SO_3	TR_1	TR_2	TR_3	TR_4
PR_3		.672**	0.292	.355*	0.199	-0.051	0.192	0.228	.312*	0.203	0.182	0.267	0.148
PR_4	.672**		.398*	.491**	0.131	0.072	.367*	0.264	.386*	0.216	0.253	0.234	0.05
PW_1	0.292	.398*		.615**	0.08	.494**	.327*	0.158	.356*	.442**	0.101	0.087	-0.069
PW_2	.355*	.491**	.615**		0.2	.325*	.353*	0.185	.546**	.339*	0.041	0.14	0.211
PW_3	0.199	0.131	0.08	0.2		0.291	0.136	0.195	0.244	.342*	0.247	.489**	.460**
PW_4	-0.051	0.072	.494**	.325*	0.291		0.149	-0.056	-0.05	.430**	0.103	0.146	0.192
SO_1	0.192	.367*	.327*	.353*	0.136	0.149		.385*	.368*	0.101	-.322*	-0.026	0.065
SO_2	0.228	0.264	0.158	0.185	0.195	-0.056	.385*		.605**	0.3	0.262	0.188	0.266
SO_3	.312*	.386*	.356*	.546**	0.244	-0.05	.368*	.605**		.352*	0.137	.321*	0.256
TR_1	0.203	0.216	.442**	.339*	.342*	.430**	0.101	0.3	.352*		.604**	.575**	.599**
TR_2	0.182	0.253	0.101	0.041	0.247	0.103	-.322*	0.262	0.137	.604**		.712**	.579**
TR_3	0.267	0.234	0.087	0.14	.489**	0.146	-0.026	0.188	.321*	.575**	.712**		.748**
TR_4	0.148	0.05	-0.069	0.211	.460**	0.192	0.065	0.266	0.256	.599**	.579**	.748**	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations among variables of organizational context

	PB_2	PB_3	PB_4	PB_1	PB_2	PB_3	PB_1	PB_2	PB_3	CB_1	CB_2	CNT_1	CNT_2	FML_4	FML_5	FML_6
PB_2		0.125	0.043	-0.116	-0.257	-0.195	-0.127	-0.304	-0.146	0.153	0.182	-0.261	-0.28	-0.011	0.252	-0.062
PB_3	0.125		.645**	0.248	.363*	.374*	.514**	0.273	.371*	-.463**	-0.25	0.125	0.157	-0.298	0.026	-0.217
PB_4	0.043	.645**		0.109	0.256	.401*	.395*	0.293	.501**	-.321*	-0.161	-0.059	-0.134	-0.253	-0.098	-0.189
PB_1	-0.116	0.248	0.109		.621**	.597**	.391*	.348*	.336*	-0.103	-0.28	0.164	0.101	0.113	0.1	0.061
PB_2	-0.257	.363*	0.256	.621**		.778**	.671**	.684**	.568**	-0.29	-0.293	0.179	0.156	-0.242	0.048	-0.162
PB_3	-0.195	.374*	.401*	.597**	.778**		.583**	.547**	.611**	-0.115	-0.242	-0.065	-0.01	-0.163	0.088	0.113
PB_1	-0.127	.514**	.395*	.391*	.671**	.583**		.842**	.864**	-0.268	-.361*	-0.069	-0.114	-.318*	-0.063	-0.309
PB_2	-0.304	0.273	0.293	.348*	.684**	.547**	.842**		.778**	-0.171	-0.308	-0.114	-0.13	-.327*	-0.015	-0.278
PB_3	-0.146	.371*	.501**	.336*	.568**	.611**	.864**	.778**		-0.233	-0.308	-0.218	-0.221	-0.28	-0.123	-0.197
CB_1	0.153	-.463**	-.321*	-0.103	-0.29	-0.115	-0.268	-0.171	-0.233		.621**	-.339*	-.363*	0.166	0.136	0.246
CB_2	0.182	-0.25	-0.161	-0.28	-0.293	-0.242	-.361*	-0.308	-0.308	.621**		-0.071	-0.235	0.049	0.2	0.229
CNT_1	-0.261	0.125	-0.059	0.164	0.179	-0.065	-0.069	-0.114	-0.218	-.339*	-0.071		.557**	-0.25	-0.096	-0.168
CNT_2	-0.28	0.157	-0.134	0.101	0.156	-0.01	-0.114	-0.13	-0.221	-.363*	-0.235	.557**		-0.113	-0.038	-0.14
FML_4	-0.011	-0.298	-0.253	0.113	-0.242	-0.163	-.318*	-.327*	-0.28	0.166	0.049	-0.25	-0.113		0.192	.435**
FML_5	0.252	0.026	-0.098	0.1	0.048	0.088	-0.063	-0.015	-0.123	0.136	0.2	-0.096	-0.038	0.192		.489**
FML_6	-0.062	-0.217	-0.189	0.061	-0.162	0.113	-0.309	-0.278	-0.197	0.246	0.229	-0.168	-0.14	.435**	.489**	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations among variables of technological context

	SCompatibility_1TR	SCompatibility_2TR	SCompatibility_3TR	SComplexity_1TR	SComplexity_2TR
SCompatibility_1TR		.724**	.735**	0.156	0.091
SCompatibility_2TR	.724**		.704**	0.023	-0.055
SCompatibility_3TR	.735**	.704**		0.146	0.153
SComplexity_1TR	0.156	0.023	0.146		.511**
SComplexity_2TR	0.091	-0.055	0.153	.511**	

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix E. Pearson's chi square on demographic variables and dependent variables.

Coverage of the company

- **Typology**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.036[a]	1	.850	1.000	.568	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.035	1	.851	1.000	.568	
Fisher's Exact Test				1.000	.568	
Linear-by-Linear Association	.035[c]	1	.852	1.000	.568	.285
N of Valid Cases	40					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.75.

b. Computed only for a 2x2 table

c. The standardized statistic is -.186.

- **IT governance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.259[a]	1	.071	.104	.069	
Continuity Correction[b]	2.182	1	.140			
Likelihood Ratio	3.357	1	.067	.104	.069	
Fisher's Exact Test				.104	.069	
Linear-by-Linear Association	3.178[c]	1	.075	.104	.069	.054
N of Valid Cases	40					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.75.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.783.

Crosstab

			ReducedCoverage		Total
			National	Multinational	
RD_Governance	Centralized	Count	14	4	18
		Expected Count	11.3	6.8	18.0
		% of Total	35.0%	10.0%	45.0%
		Std. Residual	.8	-1.1	
		Adjusted Residual	1.8	-1.8	
	Federal and decentralized	Count	11	11	22
		Expected Count	13.8	8.3	22.0
		% of Total	27.5%	27.5%	55.0%
		Std. Residual	-.7	1.0	
		Adjusted Residual	-1.8	1.8	
Total		Count	25	15	40
		Expected Count	25.0	15.0	40.0
		% of Total	62.5%	37.5%	100.0%

Type of organization

- **Typology**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4.444[a]	1	.035	.085	.035	
Continuity Correction[b]	2.844	1	.092			
Likelihood Ratio	6.796	1	.009	.043	.035	
Fisher's Exact Test				.043	.035	
Linear-by-Linear Association	4.333[c]	1	.037	.085	.035	.035
N of Valid Cases	40					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.50.

b. Computed only for a 2x2 table

c. The standardized statistic is 2.082.

Crosstab

			ReducedTypeOrganization		
			Non financial institution	Financial institution	Total
RD_Typology	dyadic and one-sed multilateral	Count	10	0	10
		Expected Count	7.5	2.5	10.0
		% of Total	25.0%	0.0%	25.0%
		Std. Residual	.9	-1.6	
		Adjusted Residual	2.1	-2.1	
	Multilateral	Count	20	10	30
		Expected Count	22.5	7.5	30.0
		% of Total	50.0%	25.0%	75.0%
		Std. Residual	-.5	.9	
		Adjusted Residual	-2.1	2.1	
Total		Count	30	10	40
		Expected Count	30.0	10.0	40.0
		% of Total	75.0%	25.0%	100.0%

- **IT Governance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.135[a]	1	.714	1.000	.503	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.135	1	.713	.734	.503	
Fisher's Exact Test				1.000	.503	
Linear-by-Linear Association	.131[c]	1	.717	1.000	.503	.269
N of Valid Cases	40					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.50.

b. Computed only for a 2x2 table

c. The standardized statistic is .362.

Region

- **Typology**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.853[a]	1	.356	.471	.293	
Continuity Correction[b]	.307	1	.580			
Likelihood Ratio	.876	1	.349	.471	.293	
Fisher's Exact Test				.471	.293	
Linear-by-Linear Association	.831[c]	1	.362	.471	.293	.197
N of Valid Cases	40					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.25.

b. Computed only for a 2x2 table

c. The standardized statistic is -.912.

- **IT Governance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.753[a]	1	.385	.523	.292	
Continuity Correction[b]	.299	1	.585			
Likelihood Ratio	.754	1	.385	.523	.292	
Fisher's Exact Test				.523	.292	
Linear-by-Linear Association	.734[c]	1	.391	.523	.292	.175
N of Valid Cases	40					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.65.

b. Computed only for a 2x2 table

c. The standardized statistic is .857.

Gender

- **Typology**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.762[a]	1	.097	.145	.096	
Continuity Correction[b]	1.671	1	.196			
Likelihood Ratio	2.951	1	.086	.145	.096	
Fisher's Exact Test				.145	.096	
Linear-by-Linear Association	2.693[c]	1	.101	.145	.096	.079
N of Valid Cases	40					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.25.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.641.

- **IT Governance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	5.507[a]	1	.019	.027	.020	
Continuity Correction[b]	4.101	1	.043			
Likelihood Ratio	5.712	1	.017	.027	.020	
Fisher's Exact Test				.027	.020	
Linear-by-Linear Association	5.369[c]	1	.020	.027	.020	.017
N of Valid Cases	40					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.65.

b. Computed only for a 2x2 table

c. The standardized statistic is -2.317.

Crosstab

			Gender		Total
			Male	Female	
RD_Governance	Centralized	Count	4	14	18
		Expected Count	7.7	10.4	18.0
		% within RD_Governance	22.2%	77.8%	100.0%
		Std. Residual	-1.3	1.1	
		Adjusted Residual	-2.3	2.3	
	Federal and decentralized	Count	13	9	22
		Expected Count	9.4	12.7	22.0
		% within RD_Governance	59.1%	40.9%	100.0%
		Std. Residual	1.2	-1.0	
		Adjusted Residual	2.3	-2.3	
Total		Count	17	23	40
		Expected Count	17.0	23.0	40.0
		% within RD_Governance	42.5%	57.5%	100.0%

Level of studies

- ### Typology

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.463[a]	2	.793	.898		
Likelihood Ratio	.484	2	.785	.898		
Fisher's Exact Test	.527			.898		
Linear-by-Linear Association	.040[b]	1	.841	1.000	.510	.168
N of Valid Cases	39					

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 2.82.

b. The standardized statistic is -.201.

- ### IT governance

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	8.015[a]	2	.018	.019		
Likelihood Ratio	8.438	2	.015	.019		
Fisher's Exact Test	7.782			.026		
Linear-by-Linear Association	.008[b]	1	.930	1.000	.541	.150
N of Valid Cases	39					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.08.

b. The standardized statistic is -.088.

Crosstab

			ReducedStudents			Total
			Bachelor	Specialist	Master	
RD_Governance	Centralized	Count	3	9	6	18
		% within RD_Governance	16.7%	50.0%	33.3%	100.0%
		Std. Residual	-.9	1.7	-.7	
		Adjusted Residual	-1.5	2.8	-1.2	
	Federal and decentralized	Count	8	2	11	21
		% within RD_Governance	38.1%	9.5%	52.4%	100.0%
		Std. Residual	.9	-1.6	.6	
		Adjusted Residual	1.5	-2.8	1.2	
Total		Count	11	11	17	39
		% within RD_Governance	28.2%	28.2%	43.6%	100.0%

Appendix F. Reliability tests

In table 28, the detail of the Cronbach's alpha test of reliability for the independent variables.

Table 28: Measures of reliability

Pressure reliability

Item Statistics

	Mean	Std. Deviation	N
Pressure_3TR	18.10	7.96	40
Pressure_4TR	16.45	7.82	40

Reliability Statistics

Cronbach's Alpha	N of Items
.803	2

Power reliability

Item Statistics

	Mean	Std. Deviation	N
Power_1TR	14.80	7.94	40
Power_2TR	15.75	8.60	40
Power_3TR	11.82	6.89	40
Power_4TR	13.62	8.86	40

Reliability Statistics

Cronbach's Alpha	N of Items
.677	4

Shared objectives reliability

Item Statistics

	Mean	Std. Deviation	N
ShareObjectives_1TR	15.62	7.13	40
ShareObjectives_2TR	16.85	6.92	40
ShareObjectives_3TR	13.65	7.06	40

Reliability Statistics

Cronbach's Alpha	N of Items
.712	3

Trust reliability

Item Statistics

	Mean	Std. Deviation	N
Trust_1TR	18.12	6.21	40
Trust_2TR	16.32	6.92	40
Trust_3TR	16.00	7.80	40
Trust_4TR	17.25	6.76	40

Reliability Statistics

Cronbach's Alpha	N of Items
.875	4

Perceived benefits reliability

Item Statistics

	Mean	Std. Deviation	N
PSbenefits_2TR	.29	.23	40
PSbenefits_3TR	.31	.21	40
PSbenefits_4TR	.26	.21	40
Pebenefits_1TR	.34	.20	40
Pebenefits_2TR	.32	.22	40
Pebenefits_3TR	.30	.22	40
Pibenefits_1TR	.26	.21	40
Pibenefits_2TR	.25	.23	40

Reliability Statistics

Cronbach's Alpha	N of Items
.791	8

Organizational compatibility reliability

Item Statistics

	Mean	Std. Deviation	N
Compatibility_1TR	16.52	7.54	40
Compatibility_2TR	16.75	7.41	40

Reliability Statistics

Cronbach's Alpha	N of Items
.766	2

Centralization reliability

Item Statistics

	Mean	Std. Deviation	N
Porgstructure_1TR	1.45	1.33	40
Porgstructure_2TR	2.42	1.31	40

Reliability Statistics

Cronbach's Alpha	N of Items
.716	2

Formalization reliability

Item Statistics

	Mean	Std. Deviation	N
Porgstructure_4TR	3.10	.98	40
Porgstructure_5TR	2.42	1.12	40
Porgstructure_6TR	2.75	1.08	40

Reliability Statistics

Cronbach's Alpha	N of Items
.641	3

System compatibility reliability

Item Statistics

	Mean	Std. Deviation	N
SCompatibility_1TR	14.07	6.43	40
SCompatibility_2TR	14.92	7.80	40
SCompatibility_3TR	15.42	7.32	40

Reliability Statistics

Cronbach's Alpha	N of Items
.882	3

System complexity reliability

Item Statistics

	Mean	Std. Deviation	N
SComplexity_1TR	1.42	1.19	40
SComplexity_2TR	1.50	1.15	40

Reliability Statistics

Cronbach's Alpha	N of Items
.676	2