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Analysis of Digital Transformation in Ecuadorian companies

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Abstract

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The continuing convergence of the real and the virtual worlds are becoming the main driver of innovation and change in all sectors of the economy. Digital transformation has high importance for contemporary organizations in order to survive and achieve competitive advantage in the digital economy. Companies that have implemented digital technologies across their business are achieving more efficiency and cost-effectiveness. However, some companies struggle achieving this transformation because they do not have the agility and flexibility required. Based on the resource-based view (RBV), this thesis adopts IT capabilities as an essential antecedent for digital transformation and firm performance. An online survey was performed among Ecuadorian companies located in the capital. Covariance-based structural equation modeling (SEM) with AMOS was applied to test the

relationships of the variables. The results showed a strong relationship between IT capabilities and digital transformation. IT capabilities also showed a strong influence on firm performance. And Digital transformation did not mediate the relationship between IT capabilities and firm performance. This study contributes to the existing literature by analyzing the relation between IT capabilities, digital transformation and firm performance in Ecuador, and provides input to design policies to promote digital transformation.

Keywords: Digital Transformation, IT Capabilities, Firm performance, SMEs

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Chapter 1. Introduction

1.1 Motivation and Background

The continuing convergence of the real and the virtual worlds will be the main driver of innovation and change in all sectors of the economy, adding also the growing amount of data and the convergence of different technologies (Kagermann, 2015), where digital transformation has high importance for contemporary organizations in order to survive and achieve competitive advantage and high performance in a digital economy (Liu, Chen, & Chou, 2011; Bharadwaj, 2000).

Companies that have implemented digital technologies across their business enhance revenue sources, and are able to compete against digital natives and peers (World Economic Forum, 2016). Companies with a strong vision and mature processes for digital transformation are more profitable than their average industry competitors, and generate more revenue from their existing physical capacity (Westerman, Bonnet, & McAfee, 2014). Efficiency in firm´s existing products and processes, and cost-effectiveness have also been increased by digital technologies by allowing companies to effectively manage supply chains and inventory in real time, and to make better decisions (WorldBank, 2016).

Digital technologies relevance is also reflected in countries' productivity growth where US, China, and UK have taken the lead, and from industries' perspective wholesale and retail trade, business services, insurance, finance, and some manufacturing sectors have presented the largest gains. (WorldBank, 2016)

Digital technologies are improving the prospects for small businesses in developing countries cutting costs, streamlining supply chains, and trading products and services worldwide with greater ease than before (UNCTAD, 2017).

Digital technologies such as cloud, social media, big data, analytics and mobile technologies, are characterized not only by their individual contributions but also by the business value generated through their synergy, their cost savings and process efficiencies for IT (López Lubían & Esteves, 2017). The massive volume of data is changing technology infrastructure and competences, where cloud technologies become ideal allowing elastic computing power and disk storage according to business needs, and reducing the necessity of large capital investments in IT resources. On the other hand, social media is generating huge amount of data which are used to develop new products and services, are increasing firm´s ability to effectively communicate with its customers, for recruiting and human resources management, and for collaboration and communication with employees, partners and suppliers. (DeLone, Migliorati, & Vaia, 2018)

1.2 Problem description

Digital technologies are becoming an integral part of individuals' everyday lives and organizations' work routines. During the recent years, the emergence of digital technologies has brought many challenges for companies which are experiencing quickly changing demands, and the necessity to innovate on business models and enhance customer experience.

Digital technologies are transforming the economy rapidly, but many businesses are unprepared. Despite all the opportunities digital technologies offer, their adoption, use and impact differ among countries, industries and firms' size (OECD, 2017). For example, comparing retail sector in Latin American countries and online sales, 52 percent of all firms in Bolivia sold their products online in 2010, while 18 percent of retail firms in Brazil, and around half of retail firms in Mexico and Uruguay sold their products online. As some firms are able to adopt new technology raising their productivity, other firms who are not able, run the risk of being left behind (WorldBank, 2016).

Contemporary organizations increasingly face the need to pursue digital transformation in order to survive and achieve competitive advantage. However, some companies struggle achieving this transformation because they do not have the agility and flexibility required (Horlach et al. 2016). Although digital transformation has become a relevant research issue evidenced in academic work focused on aspects such as digital business strategies (Bharadwaj et al. 2013) or case-based research (Gimpel, et al., 2018), critical factors for digital transformation requires more research (Kumar et al. 2016; Liu et al. 2011), in order to be understood by industry and government leaders to leverage the benefits digital technologies offer.

Furthermore, a sort of studies focused on IT Capabilities, digital transformation, business innovation and firm performance have been found in the context of developed countries, but no similar research has been found in the Ecuadorian context.

In recent years, although the number of Ecuadorian companies with Internet access and investment in ICT has increased significantly, partly due to the policies promoted by the

Ecuadorian government (MINTEL, 2018), the use of more advanced digital tools and applications is necessary to make companies able to access new markets, to spur innovation, and enhance productivity. (MINTEL, 2018; OECD, 2017).

Even though, there are some studies analyzing the factors affecting digital technologies adoption, little or nothing has been mentioned regarding the use and innovative changes digital technologies are generating on organizations and the mechanisms under which contribute to firm performance.

1.3 Research objective and Research Questions

Due to the importance of companies' digital transformation, this research seeks to identify how IT Capabilities impact on firm performance considering digital transformation in Ecuador. For this purpose, the following research questions are presented:

Do IT Capabilities have some effect on the performance of Ecuadorian companies?

How does Digital Transformation mediate the impact of IT Capabilities on Firm performance?

1.4 Methodology

To answer the research questions and fulfill the research objective, the methodology applied in this research is explained in detail, defining the method of data collection, sample size determination, and the description of the quantitative analysis:

1. In order to find the relevant academic literature, articles from highly ranked magazines in the field of information systems were reviewed on relevance to digital transformation, such as MISQ and ISJ.
2. To define the model, the resource based theory was analyzed, thus identifying firms' internal factors influencing on digital transformation.
3. To gather data and test the model an online survey was developed. The initial survey was reviewed by IT professionals, and doctoral students with knowledge in the area.
4. Performed an online survey. For this purpose, emails were sent to the companies explaining the objective of the survey and its link, accompanied by telephone reminders and follow-ups. The companies were selected from a database of 1655 Ecuadorian companies located in the capital "Quito". From the total dataset, 146 companies participated in the survey.
5. After performing the data screening, the final sample was 115 companies with useful answers.
6. The reliability and validity of the model were evaluated through the Exploratory factor analysis (EFA).
7. Executed Confirmatory factor analysis (CFA) and structural model analysis with AMOS to test the relationships of the variables and model validation.

1.5 Contributions

This study contributes to IT literature and strategic management literature by analyzing the relationship between IT Capabilities, digital transformation and firm performance, in developing countries, mainly considering Ecuadorian context.

It also contributes to literature by providing empirical support for the relationship between superior IT capability and firm performance, and providing insights about the set of IT capabilities that companies should develop to achieve higher performance and support digital transformation.

As practical contribution, this study provides a business - oriented comprehension about the factors that need to be improved in order to successfully proceed with digital transformation, and how its significance can vary among different contexts, such as country and industries.

1.6 Outline of research

This research is structured into five sections. Chapter 2 includes the theoretical background and concepts related to digital transformation. Chapter 3 explains the model applied for the research, and the main hypotheses. Chapter 4 describes the data and the methodology used for the analysis. Chapter 5 presents the implications, limitations, and recommendations for future research.

Chapter 2. Theoretical background

2.1 Digital transformation

The digital transformation as a general concept is defined as “the changes that the digital technology causes or influences in all aspects of human life” (Stolterman & Fors, 2004). The term of Digital Transformation has been used since 1960s and 1970s with basic transactional systems. Following the introduction of PCs, email, and online systems in 1980s and 1990s. And mobile phones, ubiquitous internet and cheap global communications in 2000s (Westerman, Bonnet, & McAfee, 2014, p. 69).

Different explanations or concepts are presented throughout the literature, sometimes confusing the term with digitization and digitalization, which differ from digital transformation in the context of its effect on society (Stolterman & Fors, 2004). Therefore, it is important to clarify the concept of digital transformation, for which, the following table compile some definitions found in the literature.

Table 1 Digital transformation Definition

Source	Definition
(Mićić , 2017)	The integration of digital technology into business that results in, sometimes fundamental, changes in business operation and delivery of value to customers. It is affecting not just operational work but also has influence on working culture, human relations and speed of change, on microeconomic as well as macroeconomics level.
(Liu, Chen , & Chou, 2011)	Organizational transformation that integrates digital technologies into business processes, enabling a firm to exploit firm resources, subsequently leading to a new business model that enhances the firm's competitive advantage.
(Heilig, Schwarze, & Voß , 2017)	Transformations in organizations that are driven by new enabling IT/IS solutions and trends. Currently, enablers of digital transformations include novel delivery models (e.g., cloud computing), pervasive computing (e.g., internet of things, cyber-physical systems), mobile computing, social media, as well as new tools and methods to exploit data (e.g., business analytics, machine learning).
(Henriette, Feki, & Boughzala, 2016)	The adoption and use of digital technologies which transform an organization or deliberate to pursue value creation.

According to the information mentioned in Table 1, Digital transformation is defined as the integration and convergence of Digital Technologies into business, which transform an organization, including the business operation (Mićić, 2017), customer experience, and leads to new business models (Liu, Chen, & Chou, 2011).

Some companies have already achieved IT-based innovations more focused on administrative areas. However, nowadays, digital technologies fundamentally question organizational structures, business models and management concepts (Hess & Barthel, 2017).

Different from the Third Industrial revolution, the Fourth Industrial Revolution is characterized by deep integration of intelligence and networking system (Zhang, 2014; Li, Hou, & Wu, 2017), as well as improved gathering, storing, processing, and analysis of large data sources (Heilig, Schwarze, & Voß, 2017). One of the fundamental technological drivers are digital technologies such as the Internet of Things, artificial intelligence, big data, cloud computing, and digital platforms (Li et al, 2017). Sedera, Lokuge, Grover, Sarker, and Sarker (2016) on their research define ‘‘Digital Platforms’’ as “a technology architecture that allows the integration of information, computing, and connectivity technology platforms available to an organization.”, referring to technologies such as Cloud Computing, Mobile, In-memory applications, and social media, which can be integrated with the enterprise systems (ES) improving the benefits of the organization (Sedera et al, 2016). Platforms are growing rapidly in the number of users and services. These are creating an unlimited number of personal connections and provide a variety of functional benefits or services for users, which contribute to their value creation. Enterprises, as

example, can obtain business services through service platforms such as Salesforce.com and Microsoft Dynamics CRM, or get more connections through social media (Haile & Altmann, 2016).

According to Heilig, Schwarze, & Voß (2017), cloud computing, internet of things, cyber-physical systems, mobile computing, social media, business analytics, and machine learning are current enablers of Digital transformation. However, in the context of this research, only digital technologies such as big data, analytics, cloud, mobile and social media platform are analyzed, which are already in widespread use (Gimpel, et al., 2018).

The massive volume of data is changing technology infrastructure and competences, where cloud technologies become ideal allowing elastic computing power and disk storage that can inexpensively grow, and ease the use of data to effectively execute and automate real time decisions (DeLone, Migliorati, & Vaia, 2018). Social media does not refer only to the common use of Facebook in a company, but to its use as a corporate platform. For instance, airlines' reservations process with its clients (Sedera et al, 2016).

On the other hand, even though technology is an enabler of this transformation, there are other aspects that should be considered on digital transformation such as top management commitment, development of organizational capabilities and employee skills, which contribute to a successful transformation. Leadership is one of the main drivers of digital tranformation and innovation among companies. Due to digital transformation impact on company strategy, CEO should provide the vision, guidelines, and necessary means for businesses transformation (Henriette, Feki, & Boughzala, 2016). For this purpose, CEOs also need to develop new skills and knowledge related to Digital Technologies (Fridén &

Karlsson, 2017) and promote an “effective communication and governance to ensure that the firm is moving in the right direction” (Zhu, 2014). Firm’s culture has strong influence on transformation process, often reflected in the resistance to change by employees. All these aspects have been explained by DeLone, Migliorati, & Vaia (2018) in the context of Digital Governance, emphasizing the need of changing the way people contribute to the creation of value, and a company organises its business, quickly adapting their models to satisfy the market’s requests and continuing to be profitable.

Some digital transformation challengues can also be explained by characteristics properly related to firm’s technology adoption barriers and innovation, such as lack of financial resources in SMEs, knowledge and skills (Karltorp & Lörde, 2017; Stankovska, Josimovski, & Edwards, 2016). However, despite these mentions from relevant literature, Stankovska et al. (2016) mention a high level of usage of digital technologies, due to the decreasing cost of the technology, the standardisation of digital tools and the ubiquity of digital devices.

The speed of digital transformation and its impact varies between industries and countries. Newspaper and music industry have been disrupted the most, by redefining their traditional products and services toward digital content provided through digital platforms, thus connecting to customers and businesses, and creating new revenue streams (Karimi & Walter, 2015).

2.2 Resource-based view theory

"The resource-based view of the firm is a useful tool for researchers to understand if, and how, particular parts of the firm affect the firm at large" (Wade & Hulland, 2004). The RBV affirms that enterprises are composed by a bundle of resources, processes, knowledge (Rivard, Raymond, & Verreault, 2006) and capabilities distributed heterogeneously among organizations (Barney, 1991), allowing firms to achieve competitive advantage. The resources can be classified in physical capital resources (technologies, assets and raw materials), human capital resources (intelligence, experience and relationships), and organizational capital resources (formal reporting structures, controlling and coordinating systems) (Jurisch, Cuno, Palka, Wolf, & Krcmar, 2012). On the other hand, capabilities are the result of the combination of resources, and the combination of these capabilities generate essential skills to achieve a competitive advantage, which are difficult to replicate since they have distinctive components of each organization.

From IT perspective, several researchers have used the resource-based view to analyse the contribution of IT to business value (Wade and Hulland, 2004; Melville et al., 2004), some adopting a process-oriented perspective such as process innovation and business process engineering to link the variables to firm performance. Furthermore, extending the concept of organizational capabilities to IT, the theory includes IT capability as an organization's ability to mobilize and deploy IT-based resources (IT infrastructure, IT human resources, and IT intangibles) in combination with other resources and capabilities (Bharadwaj A., 2000), which are valuable, rare, inimitable, and non-substitutable (Rivard, Raymond, &

Verreault, 2006). Thus, evidencing success firms differ from their counterparts by the effective and efficient use of IT (Bharadwaj A. , 2000).

2.3 Organizational capabilities

There are many definitions of organizational capabilities, which have been applied according to the static or dynamic context of firm´s activities (Collis, 1994). These are defined as a firm`s capacity to deploy its resources, tangible or intangible, and to perform a task or activity to improve performance. (Helfat & Winter, 2011; Helfat & Peteraf, 2003). The development of these capabilities provide companies a valuable source of competitive advantage, and the ability to leverage new opportunities. In times of continuous technological changes driven by digital technologies, established firms can be threatened, however, companies can confront these disruptive changes by developing suitable organizational capabilities allowing them to perceive and react effectively to changes.

As it is mentioned by Li, Su, Zhang, & Mao, 2017, the organizations need to develop the right capabilities to transform their business taking advantage of digital technologies, which allow companies mainly SMEs to maintain durable relations with customers, and sustain their business. (Li, Su, Zhang, & Mao, 2017)

2.4 Small and Medium Enterprises

2.4.1 IT in Organisational Context

In an increasingly fluctuating business environment, companies need to be able to effectively respond to changes, where Information Technologies take a strategic role by

providing companies the agility and flexibility required. IT has become a main facilitator of business activities by supporting companies in the increase of productivity and quality, communication and collaboration improvement, enabling business process restructuring and changing firms' relationships with their customers, among other business objectives (Turban & Volonino, 2010).

IT has significant impact on the organizational structures, changing from hierarchical and vertical into horizontal structure, so facilitating the dissemination of information throughout all units of the firm. Aligment of business and IT Strategies is essential in order to make adequate investment, otherwise it might result in low payoff. To facilitate IT-business alignment, the governance structure within the organization should be desgined in such a way CIO, and other IT staff closely interact with the CEO, and other senior officers of different areas. (Turban & Volonino, 2010)

During the last years many improvements in information technology have emerged creating new business opportunities and supporting business in an efficient way. Some of these technologies are comprised of social media, mobile, analytics and cloud technologies which are characterized not only by their individual contributions but also by the business value generated through their synergy, their cost savings and process efficiencies for IT (López Lubián & Esteves, 2017).

The growing amount of data generated by mobile devices, social media, browsers, and other sources, are helping companies to innovate and create business models (López Lubián & Esteves, 2017). From an empirical perspective, organisations usually face many challenges to access, process, and analyze such massive quantities of data (Bharadwaj et

al., 2013), and just companies able to properly process this information achieve success. Cloud technology is driving business agility, cost effectiveness, and flexibility by providing companies elastic computing power and disk storage that can inexpensively grow, and ease the use of data to effectively execute and automate real time decisions (DeLone, Migliorati, & Vaia, 2018), by supporting all relevant applications for specific business needs, and reducing the necessity of large capital investments in IT resources. It also represents a platform to effectively coordinate and collaborate among partners, in order to achieve better resources utilization and lower inventory. Moreover, as part of emerging trends for maximizing IT resource utilization, cloud Federation described as a strategic alliance between cloud providers, make providers able to acquire additional capacity, more resources in case of more demand, and improve accessibility of services (Haile & Altmann, 2015), which in turn benefit end users in terms of cost.

On the other hand, social media is generating huge amount of data which are used to develop new products and services, and are increasing firm´s ability to effectively communicate with its customers. However, beyond digital marketing strategies, organizations are also using social media for recruiting and human resources management, and for collaboration and communication with employees, partners and suppliers (DeLone, Migliorati, & Vaia, 2018).

2.4.2 Importance and Benefits of IT in SME

As in large companies, information technologies play an important role in the competitiveness of SMEs, which can be manifested through efficiency gains, increased management effectiveness, and improved business performance.

IT has provided many opportunities to SMEs by enabling to expand their market across national boundaries and survive in the long term. In terms of firm´s operation IT has reduced costs while improving market responsiveness. Nowadays, the consumer experience is one of the most important aspects in digital transformation, therefore, companies require the capabilities or necessary means to be able to communicate effectively with customers, and create stronger links (Lester & Tran, 2008). Moreover, information and knowledge has become a valuable resource in companies, supported by information technologies, which can be leveraged by SMEs for appropriate managers´decision making, planning and control, in order to meet company's objectives.

With the continual improvements in Internet technology and breakthroughs in cloud computing and mobile connectivity, SMEs are able to access to IT services without the need of large investment in IT resources, thus being able to compete successfully with larger and longer established firms (Passerini, El Tarabishy, & Patten, 2012). In the case of big data, it is not just for large enterprises anymore. SMEs can also benefit from big data improvements jointly with the use of cloud technologies to scale effectively and to access on-demand services. “Even small companies can rent cloud-based, pay-per-use data services, instead of having to buy expensive hardware and software systems and hiring in-house data analysts” (UNCTAD, 2017).

2.4.3 SMEs Challenges and IT

Despite the essential IT role supporting companies, SMEs face different challenges which can be evidenced in the low adoption and usage of IT. Unlike larger companies, it is mentioned that SMEs lack resources mainly money, and technical IT experience for

championing and coordinating strategic IT investments, affecting the adoption of IT in the firms (Ray & Ray, 2006)

Financial aspect has been considered one of the essential elements for digital transformation (Matt, Hess, & Benlian, 2015), since often most investments in data integration, new information and communication systems (Stief, Eidhoff, & Voeth, 2016), and process is required (Westerman, at al. 2011). In literature concerning to IT adoption in SMEs, financial resources or financial constraints are constantly mentioned as the main factor affecting the companies. SMEs face challenges such as difficulty to secure loans from the banks, or even limited loans. Therefore, these companies depend heavily on the savings they generate during their operations or investment gains (Fong ,2011).

Neirotti & Raguseo (2016) mention that a limited internal staff of IT specialist is a typical feature in SMEs, which do not have CIOs or managers for IT-related strategic decisions, so related decisions are concentrated in the CEO or owner. Moreover, for SME hiring qualified IS/IT experts can be a challenge due to the scarce financial resources (Caldeira & Ward, 2003), different from large companies which have been characterized by investing in human talent with higher education (Lin B. W., 2007). Even though some IT skills and activities can be outsourced by SME, Yang, Xun, & He (2015) found that core IT skills are often kept in-house to address immediate problems and anticipate future opportunities, since external consultants could even imply greater costs than the benefits generated for the firm. (Yang, Xun, & He, 2015)

2.5 IT in developing and developed countries

IT contributes to countries' productivity. However, in developing countries this effect is moderated by some factors such as human resources, openness to foreign investment, the quality and cost of the telecommunications infrastructure, and favorable policies to support IT use (Dedrick, Shih, & Kraemer, 2013). Beyond these factors, Dewan & Kraemer (2000) underline business models which yet need to change from the industrial to the information age, or digital age (López Lubían & Esteves, 2017).

Several indices are used to explain the differences among countries in IT development. One of the most known indices are networked readiness index (NRI), the ITU ICT development index (IDI), the UNCTAD ICT development index, among others (Altmann, Heshmati, & Al-Athwari, 2017).

According to Altmann, Heshmati, & Al-Athwari (2017) which measures e-infrastructure in different countries from OECD and Middle East and North Africa (MENA), including electricity, telecommunication, Internet, processing power, broadcasting, and human capital as main components of their indices. They explain there is a close relationship between e-infrastructure levels and GDP, therefore the low rank of countries is linked to their economic conditions and their inability to address these issues effectively.

The Global Information Technology Report developed by the World Economic Forum, presents the Networked Readiness Index (NRI) which measures how well an economy exploits the opportunities offered by IT. When looking at the report from 2016, it shows Taiwan, Norway, Finland, Sweden, South Korea and United States stand out in the pillar

of Infrastructure. In the pillar of Economic impact, Finland, Switzerland, Sweden, Israel, Singapore, the Netherlands, and the United States are in the top ranks. These countries are characterized by intensive use of digital technologies in business, creating new business models, services and products in each country, in addition to new organizational models. In contrast, countries from Latin America shows different patterns. Argentina and Bolivia are under the mean in the indicators "Impact of ICTs on business models" and "Impact of ICTs on organizational models", while Colombia, Ecuador and Peru are around the mean. However, Chile, Uruguay and Costa Rica are far above the average not only in these indicators, but ranking at 38th, 43th and 44th place in NRI out of 139 countries. In the pillar of infrastructure Ecuador has markedly increased, and Chile and Uruguay continue leading.

Moreover, considering the publication "Digital Transformation Scoreboard 2017" (European Union, 2017), factors previously mentioned as Infrastructure, skills, and access to finance are some of the potential drivers for innovation success in the digital era. In this context, we can see Finland, Sweden, The Netherlands and Germany presents solid performance in the integration of digital technology and infrastructure, and are already working on policy initiatives related to digital transformation.

Digital transformation varies among countries depending on their degree of digitalization and the structure of the economy. In low and middle-income developing economies the pace of transformation and the impact may take longer because the economies present less pressure to introduce automation due to relatively lower labour costs and lower rate of technology adoption that is starting from a lower level and at a slower pace (UNCTAD, 2017).

2.6 Productivity Paradox of the New Digital Economy

Over the last years, business spending on digital services including cloud computing, data analysis, and other information services has notably increased in advanced economies such as the United States, the United Kingdom, and Germany, while prices of digital assets have declined rapidly, allowing companies to get higher efficiency and lower cost operations. However, some evidence shows that just a limited number of companies have made a full transition to the New Digital Economy, and only some companies, sectors and industries have already seen the benefits of higher revenue and productivity. Some explanations mention that we are in an installation phase of the New digital economy, therefore, the productivity gains may not become visible until the deployment phase when the new technology have been widely spread and have become common practice across organizations. Since the mid-2000s, a declined trend of the productivity growth has been observed, some of the reasons include the possible impact of the recessions, and the weaker result of technology and innovation into productivity. Other aspects affecting the trend are related to internal factors of the firm. Using big data analytics as example, the factors affecting its impact are IT capabilities, data privacy issues, analytical skills, and companies' organizational adaptability. In addition, there are some challenges that firms can face for digital transformation. These includes unfavorable regulatory policies, no skilled workers, or lack of financing to startups who develop the new innovations, as well as the lack of ability to combine the new technologies with the human capital and knowledge-based assests (Van Ark, 2016).

Chapter 3. Research Model and Hypotheses

3.1 Previous Models

Considering digital transformation definition as the integration of digital technologies into business, which transform an organization, the business operation and customer experience, leading to new business models. Nwankpa & Roumani (2016) analyze the impact of integrating digital technologies such as cloud computing, big data, analytics, mobile and social media platforms into business operations and organizational changes, to improve firm performance and innovation. Considering 167 US firms, the mentioned study analyzes IT Capabilities as an antecedent of digital transformation, which contributes to increased firm performance.

Likewise, other researches have assessed the link of IT Capabilities on business process improvements or business process innovations and superior performance. Some authors have found various organizational capabilities as important intermediates between IT and firm performance. Innovativeness as example, refers to "a firm´s ability to develop new elements or a new combination of already known elements in products, processes, technologies, or management" (Turulja & Bajgorić, 2016), or "the capacity to introduce some new or significantly improved process, product, or idea in the organization" (Hult, Hurley, & Knight, 2004). Oliveira, Macada, & Oliveira (2016) used data collected from 150 large Brazilian companies and observed that the inclusion of business processes as a mediating construct was effective for capturing IT value indirectly in firm performance measures. Turulja & Bajgorić (2016) explored this relationship, using data from 444

companies located in Bosnia and Herzegovina, in the period of March-July of 2015. The study showed IT capability facilitates innovativeness and indirectly affects firms' performance. On the other hand, a study performed by Kmieciak, Michna, & Meczynska (2012) in 109 Polish SMEs examined the relationship between firm performance and dimensions of innovativeness, employee empowerment and IT capability. As a result, there was found no significant effect of innovativeness on firm performance.

The relationship among IT capabilities and firm performance has been widely studied. However, mixed results have been reported. Some of them indicating a direct and indirect (Kim, Shin, Kim, & Lee, 2011) relation. Several literatures explain the positive impact of Information Technology Capability to improve operational efficiency, continuous change and innovation of internal business processes (Wu, Wang, & Wang, 2017). Moreover, it is mentioned that the difference between firm's business performance could be determined by the effective and efficient use of IT capabilities (Bharadwaj A., 2000).

Table 2 Summary of previous literature

Independent		Mediation	Dependent	Author
Second order	**First Order**			
IT capability	IT infrastructure IT business spanning IT proactive stance	Digital transformation	Firm performance	(Nwankpa & Roumani, 2016)
IT capabilities	IT infrastructure IT human capabilities IT management capabilities IT reconfiguration capabilities	Performance at the process level	Performance at the firm level	(Oliveira, Macada, & Oliveira, 2016)
IT capability	IT Knowledge IT Operations IT Infrastructure	Innovation	Business performance	(Turulja & Bajgorić, 2016)
IT capability	IT knowledge Integration of IT with business strategy IT in internal communications	Innovativeness	Firm performance	(Kmieciak, Michna, & Meczynska, 2012)
IT capability	IT Management Capability IT Personnel Expertise IT Infrastructure Flexibility	Performance Improvement at the Process Level	Performance Improvement at the Organisational Level	(Anand, Wamba, & Sharma, 2013)
IT capability	IT object IT knowledge IT operations	Innovativeness	Firm's performance	(Li, Chen , & Huang , 2006)

3.2 Hypothesis development

3.2.1 IT Capabilities and its relationship to Firm Performance

Several studies have considered the relationship among IT capabilities and firm performance. Some studies indicate a direct relation while others demonstrate and indirect relation due to intermediate measures such as organizational processes, but in both cases highlighting the role of IT capabilities to improve companies' performance. Indeed, Mata et al. (1995) suggest that IT capability is considered one of the critical firm capabilities that contribute to superior performance.

The positive relationship between IT capability and firm performance is frequently reported in the literature. Several empirical studies have found that firms with superior IT capability exhibits superior and sustained performance (Lin, 2007; Santhanam & Hartono, 2003; Bharadwaj, 2000). However, other studies suggest contrary effects and mention the need to assess if the relation is still significant over time considering technological changes (Chae, Koh, & Prybutok, 2014; Chae, Koh, & Park, 2018). Considering IT infrastructure as one of the dimensions of IT capabilities as mentioned before. Chae et al. (2014), Hendricks et al. (2007) and Oh, Baek, & Lee (2016) found that unlike the era of proprietary information systems in the 1990s, standardized Enterprise systems (ES) such as ERP, SCM, and CRM in the 2000s, do not significantly affect firm productivity.

H1*: IT Capability has a positive relationship with firm performance*

3.2.2 IT capabilities and its relationship to Digital transformation

IT capabilities is defined as the ability to control acquire, deploy and leverage physical or intangible IT resources (Ross, Beath, & Goodhue, 1996; Sandberg, Mathiassen, & Napier, 2014) in combination with other resources and capabilities to support and enhance business strategies and processes (Sambamurthy & Zmud 1997; Bharadwaj, 2000; Kmieciak, Michna, & Meczynska, 2012), as for example, technology, knowledge, relationships, management skills, business process and human resources. (Sandberg, Mathiassen, & Napier, 2014).

Even though IT capability has been considered critical for a firm to realize business value and sustain competitive advantage, some research suggest a contradictory effect of IT on business agility, which could occur due to the limitations of inflexible legacy IT systems, rigid IT architectures, or technology silos. In a volatile business environment, where firms must deal extreme changes, and leverage emerging business opportunities, superior firm-wide IT capability are required (Lu & Ramamurthy, 2011). In this context, Lu & Ramamurthy (2011) has proposed IT capability as a latent construct reflected in three dimensions: IT Infrastructure, IT business spanning, and IT proactive stance.

As much as people, process and different assets are important in a business, IT infrastructure such as information systems are of high importance for digital business development (Stief, Eidhoff, & Voeth, 2016). Although some companies have made significant investments in implementing ERP, CRM, or technologies, some of them have not gained substantial value, what demonstrates companies need to develop new capabilities and process changes in order to obtain benefits.

IT Business spanning refers to firm´s ability to exploit its IT resources to support and enhance business objectives, through business and IT department joint planning, coordination and investment decision-making. In addition, it represents a relevant aspect to increase knowledge sharing between IT and business, and leads to superior customer service (Lu & Ramamurthy, 2011). Companies with suitable IT management tend to have better internal processes which allows them to be more prepared for changes unlike the competitors of the company (Kim, Shin, Kim, & Lee, 2011). This synergy between business and IT is increasingly important for Digital transformation, which requires close collaboration and frequent communication between IT professionals and business department to work on innovations, referring to it as innovation in processes, products or business models (Ahlemann, 2016).

IT proactive stance is related to firms that search for new ways to exploit its IT resources to create and leverage business opportunities. It also provides the ability to identify opportunities generated by IT innovations, as well as enables continual learning to quickly reconfigure processes, explore and experiment with new technologies to effectively and efficiently respond to changes in the market (Lu & Ramamurthy, 2011).

"Developing the right technological capabilities is just the first step in a company's digital transformation" (World Economic Forum, 2016). Westerman, Bonnet, & McAfee, 2014 has mentioned that companies which already have ERP and CRM systems have an advantage over the other companies. Similarly, companies with a solid IT/ business relationship are in a solid position to begin digital transformation. In contrast to traditional

companies, which require to integrate data and processes across the enterprise as a first step (Westerman, Calméjane, Bonnet, Ferraris , & McAfee, 2011).

H2: *IT Capability has a significant positive impact on digital transformation*

3.2.3 Digital Transformation and its relationship to Firm Performance

Studies confirm that the relation between IT and firm's performance are mediated by organizational competences or capabilities such as innovativiness (Turulja & Bajgorić, 2016) and knowledge processes (Pérez-López & Alegre, 2012). In the context of this research, Nwankpa & Rouman (2016) suggest that Digital Transformation has a mediating effect between IT capability and firm performance. The positive influence of Digital transformation on Firm performance has also been mentioned by Chen, Jaw, & Wu (2016) where SMEs' performance is explained in terms of Finance, Customer, Process, and Learning, in the context of the Taiwanese textile industry.

Digital technologies not only benefit in terms of efficiency, it also provides a better understanding of the customer, transform operational processes (Westerman, Calméjane, Bonnet, Ferraris , & McAfee, 2011), and reduce the cost of selling. This reduction of cost is also observed in the integration among suppliers and value chain partners, reducing cost of coordination and transaction (Nwankpa & Roumani, 2016). A study performed by Westerman, Bonnet, & McAfee, (2014) found that companies using new digital technologies are more profitable than their average industry competitors, and generate more revenue from their existing physical capacity.

It is also mentioned that investments in the organizational processes to drive business from the access to data and information, generates increased value to the business due to faster and more effective decisions. For example, information related to customers which can come from Social Media platforms (Facebook, Twitter) and mobile phones enables companies to define actions and personalize offers based on customer preferences (Bharadwaj, Sawy, Pavlou, & Venkatraman, 2013).

H3*: Digital Transformation has a significant impact on Firm performance*

3.3 Research model

According to the literature the proposed research model suggests that Digital Transformation has a significant impact on the performance of Ecuadorian companies. Furthermore, it analyses IT capabilities as an important antecedent of Digital Transformation. It means that IT capabilities have a greater effect on firm performance via its impact on Digital Transformation.

IT Capabilities is considered a multidimensional factor. Different studies have assessed it from different perspectives, some considering IT architecture, IT infrastructure, IT business experience, IT relationship resources (Zhang & Tansuhaj, 2007), IT human resources, and other IT-related resources, skills, and knowledge (Oh, Yang, & Kim, 2014; Dale Stoel & Muhanna, 2009). Nevertheless, this research uses the dimensions proposed by Lu & Ramamurthy (2011) and Nwankpa & Roumani (2016) since IT Infrastructure, IT business spanning, and IT proactive stance embrace the characteristics companies need to support Digital Tranformation and superior firm performance. The construct of Digital

Transformation includes the use and convergence of current digital technologies comprised of social media, big data, analytics, mobile, and cloud technologies, in order to know how Ecuadorian companies are driving changes based on these technologies.

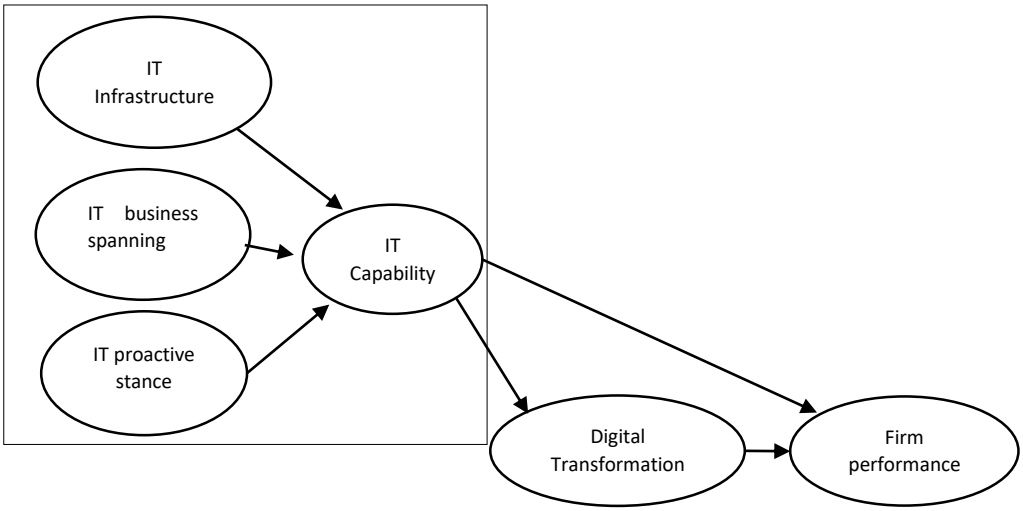

Figure 1 Research model

Chapter 4. Data Analysis

4.1 Data Collection

Data was collected using a structured questionnaire survey. As recommended by Churchill (1979), the study adopted the measurements from previous studies to fit the constructs of the model. This is described on Appendix 1. All the variables were measured on seven-point Likert scales ranging from 1 – strongly disagree to 7 – strongly agree. The questions were evaluated through experts' review, thus meeting content, cognitive and usability standards of the survey questions. (Groves, et al., 2009)

A pre-test survey was realized to check the clarity of the questions, response time and other aspects. For this purpose, 2 companies and 3 IS/IT researchers participated.

E-mail method and Online Survey Tools were used for data collection. The questionnaire was created on Google survey and sent by Mailrelay to 1655 email addresses from an available database, accompanied by telephone reminders and follow-ups. The email was comprised of a letter explaining the purpose of the survey and the link to the questionnaire. Finally, 145 responses were received, and 115 usable questionnaires were achieved, which represent a response rate of 6.9%. The responses were collected from Ecuadorian companies located in the capital. Companies classification by size has been determined according to The Andean Community's (Comunidad Andina (CAN)) definition and the Superintendence of Companies and Insurance of Ecuador. The classification of industries was defined according to (INEC, 2012; Galindo-Rueda & Verger, 2016). The questionnaire items used for the survey are presented in the Appendix 1.

Furthermore, to determine the minimum sample size, this research considered the function of the ratio of indicator variables to latent variables ($r = \frac{p}{k}$), thus resulting in a required sample size of at least 100 for adequate analysis. As it was mentioned above the number of usable responses was 115, thus the research fulfills the minimum sample size suggested. (Westland, 2015, pp. 97-98; Tripathy, Aich, Chakraborty, & Lee, 2016, pp. 276)

4.2 Descriptive Data Analysis

4.2.1 Respondents Profile

Out of all the firms surveyed, most of them were SMEs. The companies that participated are classified by Human health care and social assistance activities (4%), Accommodation and meal service activities (7%), Financial and insurance activities (10%), Information and communication (20%), Manufacture (31%), Wholesale and Retail (17%), and other industries (11%).

From the number of respondents, the average age of the participants was between 30 and 39 years' old, with undergraduate (64 %) and postgraduate (32%) education. Considering the background, 60% of the respondents appertained to IT profiles, and 71% of the total respondents were from high positions who can provide accurate information, which evidence the quality of the data (Table 3 and Table 4).

Table 3 Composition of the sample by firm size

Personnel employed	Gross Value of Annual Sales (US $)	Firm size (*)	Number	%
1 - 9	≤ 100.000	Micro	23	20
10 – 49	100.001 – 1.000.000	Small	43	37
50 – 199	1.000.001 – 5.000.000	Medium	27	24
≥ 200	≥ 5.000.001	Large	22	19
		Total	**115**	

Table 4 Characteristics of the respondents

Respondent characteristics	Number	%
Gender		
Male	84	73
Female	31	27
Age		
18 - 29	12	10
30 - 39	50	44
40 - 49	32	28
50 o mayor	21	18
Education		
Highschool	1	1
Technical	4	3
University	73	64
Postgraduate	37	32
Position		
Chief Digital Officer	8	7
Chief Information Officer	21	18
IT/IS director/manager	28	25
Other IT/IS	13	11
Manager or owner	24	21
Other administrative	21	18
Total	**115**	

4.2.2 Normality

One of the assumptions for multivariate analysis is the presence of normality, otherwise failure to comply with this assumption may affect the reliability and validity of the results. For this reason, the normality of the data was evaluated by observing the skewness and kurtosis statistics. These values were below -1 and -1.2 respectively (Appendix 4). Negative skew indicates that the distribution is shifted to the righ, while negative kurtosis value indicates a flatter distribution. For moderate non-normal data (skewnesses < 2 and

kurtosis < 7) the Maximum Likelihood Estimation is recommended (Khine, 2013, p. 36; Curran, West, & Finch, 1996; Weston & Gore, 2006, p. 738).

4.2.3 Non response

Non-response bias was evaluated by splitting dataset in two groups: early respondents and late respondents, used as a proxy for non-responses in order to assess any significant difference between the groups. For this purpose, Independent Samples t-Test was applied (Appendix 5) which indicated the sample groups did not differ in their responses, mainly in those variables related to Information technology capabilities, digital transformation and firm performance (Lindner, Murphy, & Briers, 2001; Yetter & Capaccioli, 2010).

4.3 Model Testing

Given the complexity of the model applied for the analysis, structural equation modelling has been employed. Its usefulness has been frequently mentioned, for its flexibility and use of several equations simultaneously, allowing to analyze the influence that one variable can have on different variables, directly or indirectly, considering moderators and mediators (Nachtigall, Kroehne, Funke, & Steyer, 2003). For testing the model IBM SPSS Statistics and IBM SPSS Amos software package was used (Bowen & Guo, 2012).

4.3.1 Exploratory Factor Analysis

An Exploratory factor analysis (EFA) has been performed using statistical software SPSS. Kaiser-Meyer-Olkin (KMO) test returned a value of 0.8 showing sampling adequacy for Factor Analysis (Kaiser, 1974). Bartlett‘s test was significant ($p < .05$), confirming the

existence of some relationship between the variables and factor analysis is appropriate (Tobias & Carlson, 1969). The extraction method used in factor analysis was Maximum likelihood and oblique rotation (Promax), which have been commonly applied in cases of moderate non-normal data (Khine, 2013; Costello & Osborne, 2005). The pattern matrix was examined for factor-item loadings, showing correlations between factors and variables. Discriminant validity was observed in the factor correlation matrix. Correlations between factors did not exceed 0.7 which represents the minimum to prove discriminant validity. The reliability test evidenced Cronbach's $\alpha > 0.7$ (see Table 5) , representing an acceptable indication of the internal consistency of constructs (Hee, 2014).

Table 5 Cronbach's alpha coefficients

Variable	**Cronbach´s Alpha > 0.7**
IT Infrastructure (ITI)	0.881
IT Business spanning (ITB)	0.937
IT Proactive stance (ITP)	0.940
Digital Transformation (DT)	0.954
Firm performance (FP)	0.912

Furthermore, to detect the presence of Common Method Bias, Harman's single factor test was performed in the Exploratory Factor Analysis (EFA). According to this test, all the variables of the study must be loaded onto a single factor and constrained so that there is no rotation. The test evidenced common method bias, with a single factor accounting for 53% of the covariance.

4.3.2 Measurement model analysis

The validity of the measurement model and evaluation of the structural model was executed using AMOS software. To identify the internal consistency of the model, the convergent validity was analyzed, including factor loadings of construct, composite reliability (CR), and average variance extracted (AVE). The factor loadings show standardized values over the minimum required of 0.7, see Table 6.

Table 6 Structural reliability and Validity results

Construct	Item	Standardized factor loadings	CR	AVE
IT Capabilities	ITI1	.930	0.869	0.689
	ITI2	.783		
	ITI3	.842		
	ITB1	.934		
	ITB3	.861		
	ITB4	.940		
	ITP1	.933		
	ITP2	.943		
	ITP3	.871		
Digital Transformation	DT1	.939	0.956	0.879
	DT2	.964		
	DT3	.909		
Firm Performance	FP1	.926	0.913	0.726
	FP2	.715		
	FP3	.899		
	FP4	.853		

* Regression weight 1

The results of the study showed values over the minimum AVE of 0.5, and the composite reliability for all the factors were greater than the minimum acceptable level of 0.7 (Fornell & Larcker, 1981; Hair, Black, Balin, & Anderson, 2010), thus supporting convergent

validity. Moreover, the AVE root of each variable was larger than the correlation among variables, thereby confirming discriminant validity as detailed in the Table 7.

Table 7 Correlations Matrix

	CR	AVE	MSV	MaxR(H)	FP	DT	ITC
FP	0.913	0.726	0.305	0.933	**0.852**		
DT	0.956	0.879	0.640	0.962	0.513	**0.938**	
ITC	0.869	0.689	0.640	0.885	0.552	0.800	**0.830**

Note: Diagonal values are AVE root

4.3.3 Structural Model Analysis

The indices used to determine the model fit can be classified in absolute, incremental and parsimony fit indices. Even though Chi-square/df, comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) are frequently used, it is mentioned the importance of reporting as many indices as possible in order to evaluate different aspects of the model (Hooper, Coughlan, & Mullen, 2008, p.56; Molwus, Erdogan, & Ogunlana, 2013, p. 344), since some indices are sensitive to sample size and model complexity. Absolute fit indices evaluate the fit of the models with the sample data. This category includes X2 and GFI which are very sensitive to sample size, RMSEA, SRMR, and AGFI. Within Incremental fit indices, there are comparative fit index (CFI), normed fit index (NFI), and Non-Normed Fit Index (NNFI) also denoted as Tucker–Lewis Index (TLI). These indices indicate how good is the model in comparison to the worst possible model or baseline model (Cheung, 2015, p. 35). Parsimony fit indices consider the fit of the model and the number of estimated parameters.

These include the parsimony goodness-of-fit index (PGFI), parsimonious normal fit index (PNFI), and Akaike information criteria (AIC) (Hooper, et al. 2008; Molwus, et al. 2013; Xiong, Skitmore, & Xia, 2015).

The indices considered in this research are described in the table 8. Considering the acceptable level for each Index (Hu & Bentler, 1999; Hooper, et al. 2008; Meyers, Gamst, & Guarino, 2006, p. 559), the results of RMSEA less than 0.08 indicate a reasonable fit. The value of CFI greater than 0.95 indicate a very good fit, an indication that the proposed model fits the data well. Also IFI and TLI values very close to 1 indicate an acceptable fit for the proposed model, which provides greater confidence to continue with the interpretation of the hypotheses.

Table 8 Model Fit Criteria and Acceptable Fit Interpretation

Measure	Estimate	Acceptable level
CMIN	157.131	
DF	98	
CMIN/DF	1.603	Between 1 and 3
CFI	0.968	>0.95
SRMR	0.055	<0.08
RMSEA	0.073	<0.08
PClose	0.045	>0.01
IFI	0.968	>0.90
TLI	0.960	≥0.95
NFI	0.919	>0.90
GFI	0.862	> 0.90
PNFI	0.751	>0.50
PCFI	0.790	>0.50

As can be seen from Table 9, the value of the Squared Multiple correlation (R^2) shows that 32% percent of the total variance in firm performance is explained by the predictor variables, and 64% of the total variance in DT is explained by IT Capability. Rules of thumb

for acceptable R^2 depends on the model complexity and the research discipline. However, according to Cohen (1988) a R^2 value over 0.26 can be considered substantial.

Table 9 Squared multiple correlations

	Estimate
DT	.641
ITB	.712
ITI	.558
ITP	.797
FP	.319
ITB4	.884
ITB3	.742
ITB1	.873
ITI3	.710
ITI2	.614
ITI1	.864
DT3	.826
DT2	.930
DT1	.881
ITP3	.758
ITP2	.890
ITP1	.870
FP4	.727
FP3	.808
FP2	.511
FP1	.858

4.4 Hypotheses results

According to the results, IT Capabilities has a significant influence on Firm performance which supports the ***hypothesis 1.*** The results reveal a standardized regression weight of

0.396, and critical ratio of 2.247 (p=**). Thus, confirming the results reported by (Bharadwaj, 2000; Hitt et al., 2002; Santhanam and Hartono, 2003) that explain firms with the ability to effectively leverage their IT investments by generating a strong IT capability can achieve improved firm performance.

On the other hand, the ***hypothesis 2*** regarding the relation of IT Capabilities and Digital Transformation was also significant. This statement can be evidenced by the standardized regression weight of 0.80 and critical ratio of 7.398 (p=***). This result is fully consistent with previous studies (Nwankpa & Roumani, 2016), and reconfirm that IT infrastructure, the firm´s ability to exploit existing IT resources, IT-business partnership and synergy, and the firm´s ability to embrace IT innovations, are necessary to quickly implement innovative and radical organizational changes.

The ***hypothesis 3*** which suggested a strong relation between Digital Tranformation and Firm performance was not supported. The value of the standardized regression weight was 0.196, and CR was 1.190. This result is different from Nwankpa & Roumani´s (2016) who reported significant positive effects of Digital Transformation on Firm Performance. An explanation for the difference can be related to country's context, due to the research has been performed in US companies. Considering the economic circunstances of each country, United States stands out in terms of its favorable business and innovation environment, and having one of the most agile and digitized business sectors globally. Indeed, comparing the economic impacts pillar of the Networked Readiness Index, which shows "the effect of ICT on competitiveness thanks to the generation of technological and non technological innovations in the shape of patents, new products or processes or organisational practices"

(World Economic Forum, 2016), we can see Ecuador does not present a significant variation of the pillar during the last years. In 2014, Ecuador achieved a value of 2.98 and United States of 5.20, while in 2016, Ecuador reached a value of 3.01and United States had a value of 5.8.

In addition, the capital or labor intensive in the industry can influence the performance of firms within an industry (National Research Council (U.S.), 1994). United States is characterized by being capital abundant while Ecuador is characterized by being more labor abundant. For example, labor-intensive manufacturing industries such as textiles, clothing, footwear, furniture, plastic products and others, predominate in the Ecuadorian economy (INEC, 2017), what indicates, besides investing in technological capability, there are other factors that might have more influence on lower technological intensive firms' performance, such as financing, human capital, top management quality or expertise (Brenes, Haar, & Requena, 2008), regulatory obstacles (IDB, 2016), among others.

Moreover, firm performance might be also affected by external factors, such as macroeconomic conditions (Kmieciak, Michna, & Meczynska, 2012). In this context, it is important to consider the national economic slowdown in 2016. The sectors of mail and communications, accommodation and food services, and commerce, decreased during 2015 and 2016, while financial services and manufacturing sectors remained practically stagnant during the same period (INEC, 2017).

Another explanation could be that Digital transformation imply organizational changes such as process innovations which take long to generate positive returns, due to process innovations have to be routinized, thus the returns can not be observed in the dataset of this

research (Koellinger, 2008). On the other hand, it is mentioned that achieving the full productivity benefits and impacts of new technology and its complementary new business practices can take long time to be fully realized (National Academies of Sciences, Engineering, and Medicine, 2017).

Table 10 Path coefficients and hypothesis testing

	Path from	Path to	Significant level	C.R.	SRW	Inference drawn
Hypothesis						
H1	IT Capabilities	Firm performance	0.025**	2.247	0.396	Supported
H2	IT Capabilities	Digital Transformation	0.001***	7.398	0.800	Supported
H3	Digital Tranformation	Firm Performance	0.234	1.190	0.196	Not supported

*** Significance at P-Value <0.001; ** Significance at P-Value <0.05

Mediation Test

According to the theory, digital transformation has been proposed as a mediator between IT Capabilities and Firm performance, due to its potential to change business process, operations and business models through the use of digital technologies, to achieve a better performance. The mediation effect was analyzed using the resampling procedure called Bootstrapping, a method recommended in the case of small and moderate samples (Mackinnon, Lockwood, & Williams, 2004). The number of re-sampling used for testing mediation was 1000 bootstrap sample and bias corrected confidence interval of 95% (Cheung & Lau, 2008). With a parameter estimate of .157, and 95% confidence interval

(CI), the lower and upper bounds of the interval were -.098 to .568. This interval contains 0, so the null hypothesis of no indirect effect is accepted.

In addition, the single direct effect of IT capability on financial performance (0.552) is higher than the total effect of the complete model (0.396), thus it also confirms no mediation.

Table 11 Mediation

Hypothesis	**Direct without Mediator**	**Direct with Mediator**	**Indirect effect (Bootstrap)**	**Mediation type observed**
ITC-DT-FP	0.552***	0.396 **	.157 (ns)	No mediation

*** Significance at P-Value <0.001; ** Significance at P-Value <0.05

Chapter 5. Discussion and Conclusions

5.1 Summary

This study has applied the research based view theory (Barney, 1991) to analyze how IT Capabilities and Digital Transformation affect firm perfomance. The results show that IT Capabilities influence on Digital Transformation that is consistent with previous studies (Nwankpa & Roumani, 2016). It suggests that IT contributes by improving the work between the members of a company and business innovation. (Brynjolfsson & Hitt, 1996), and support companies to build the internal capabilities, and the necessary agility to react to market changes.

Despite several studies have presented different results regarding the relationship between IT capabilities on Firm performance. This study found a significant relationship between both variables which corroborates the findings of Mata et al. (1995), Bharadwaj, (2000), Santhanam & Hartono (2003) and Lin (2007). Therefore, a strong partnering relationship between IT and business improves a firm's ability to deploy IT for strategic goals. In the same way, the IT skills and knowledge contributes to the sustainability of a firm's competitive advantage.

The mediating effect of Digital Tranformation was not supported. Different from the results reported by Nwankpa & Roumani (2016), digital tranformation did not evidence significant effect on Ecuadorian firm performace. For interpretation, it is essential to consider the country's context and the level of adoption of new technology in companies and their effect

on competitiveness which have presented no significant variation on the economy of Ecuador during the last years, unlike the United States whose economy is characterized by having one of the most agile and digitized business sectors globally.

Another explanation for the lack of significance have been suggested according to the several findings. For example, macroeconomic conditions since Ecuador has presented economic slowdown in the last years, and decreased in the sectors to which the companies considered in the survey belong. The lack of significance, can be explained also by the long time that takes process innovations to show positive returns, since these process innovations have to be routinized. Dedrick, Shih, & Kraemer, 2013 also mention that the effects associated with organizational change and creation of IT-enabled organizational capabilities can be demonstrated only after significant periods of learning and adjustment. Furthermore, the country concentrates its efforts on no capital intensive industries but labor intensive industries which demonstrates companies' performance can be influenced by other factors besides the use of digital technologies and organizational changes implications. As Oliveira, et al. (2016) manifested, and countering with our results, differences in the stage of economic development, organizational structures, and culture between developed and developing nations may have an impact on the business value of IT.

5.2 Implications

This investigation depends on the national context of our study, the structural peculiarities of the Ecuadorian economy, such as the large percentage of small businesses and lower

capital intensive industries, which must be taken into consideration before generalizing the outcomes.

Although, IT capabilities have influence on firms in terms of their financial performance, it is important to consider other performance measures (accounting-and market-based), as well as firm value which represent a long-term measure. Indeed, Ong & Chen (2013), mention long-term influences are more significant than the short-term influences (firm performance). Furthermore, managers should pay attention to strategic positioning that IT provides besides improvements in operational effectiveness, and should continuously monitor their IT capabilities in order to keep sustained effects and do not have the risk of being overtaken by the competitors. Moreover, firms need to consider that digital transformation might not necessarily demonstrate significant returns, at least not in the short term as it might be expected, due to it implies organizational changes that require long time to be performed, therefore, the benefits or returns could be perceived at the long term.

As managerial implications, this research provides organizations some immediate insights about the development of IT capabilities that companies might transform into improved performance and digital transformation. In this regard, companies should build a strong set of internal IT capabilities by hiring qualified human resources with good IT skills, training the existing workforce, promote an innovative culture, and organizational structure that allows a coordinated and flourishing partnership between IT and business management.

To maximize the payoff from digital transformation in SMEs, governments must work in coordination with the private sector and ensure access to skilled workers. Governments

also play an important role promoting acceptance of new technologies and ease of digital adoption by population and companies, articulating with training to achieve greater effect.

Business executives should assess the various business capabilities, organizational changes and developing a strategy to improve their capabilities with the use of digital technologies such as cloud, mobile, social media, analytics development, and the firm's ability to effectively combine new technologies with human capital and critical knowledge-based assets. The firms that take advantage of the new capabilities will not only transform themselves but also achieve success in the digital era.

5.3 Limitations

This study is limited in the sample size. Although the number of companies´ data used is adequate to test the model. Larger sample would allow better comparison of subgroups, considering firm size and industries.

Another limitation for the study is the measure of firm performance considering only financial perspective, and variables as profitability, return on investment and sales growth as performance measures.

Furthermore, the current study was performed using data of companies located only in Ecuador, and it faced a low response rate, which limits the capacity to generalize the research findings.

The use of the same respondent for the independent and dependent variables can be another limitation, which can cause common-method bias. Companies IT employees do not usually know about the financial performance of the company, and are the managers of the

company or financial department who have this information. Therefore, future studies should use multiple methods of measurement to alleviate any potential bias.

Our research does not consider the years or moment when the process of digital transformation started within companies, and the firm performance measures are focused on the last three years, therefore our data cannot reveal anything about potential longer-term effects beyond then.

5.4 Future Research

There are many further research opportunities that might be performed based on the present research.

The effect of IT Capabilities and Digital Transformation on firm performance should not be considered only from financial perspective, since this measure could provide an incomplete representation of the company performance, therefore, extend the research using other performance evaluation criteria such as balanced scorecard (BSC) by Kaplan & Norton (1992) could provide further analysis about the influence of Digital Transformation on firm performance.

In addition, future studies might consider external aspects such as partnership or strategic alliances which are also relevant for companies to achieve digital transformation, mainly focusing in the cooperation between university, government and companies, or the way companies collaborate among them. Considering aspects related to environmental context such as competitive pressure, can provide more insights regarding market disruption and companies' neccesity to digitally transform their business. Even further analysis regarding

customers can provide more information about their major shifts and consumer behavior driven by technology.

Since the research demonstrates the companies´situation during the last three years regarding their performance and Digital Transformation in the country, considering the concept based on the use of cloud computing, bid data, analytics, mobile and social media platforms into business operations and organizational changes, further research using longitudinal data is suggested in order to uncover additional insights regarding the effect on firm performance in the long term.

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Appendix

Appendix 1: Measurement item

Constructs	Sub-Construct	Measurement item	Source
IT Capabilities	IT Infrastructure	Relative to other firms in your industry, please evaluate your firm's IT infrastructure capability in the following area on a scale of 1 - 7 (1 = poorer than most; 7 = superior to most). ITI1: Data management services & architectures (e.g., databases, data warehousing, data availability, storage, accessibility, sharing etc.) ITI2: Network communication services Quality (e.g., connectivity, reliability, availability, etc.) ITI3: Application portfolio & services (e.g., ERP, ASP, reusable software modules/components, emerging technologies, etc.) ITI4: IT facilities' operations/services (e.g., servers, large-scale processors, performance monitors, etc.)	(Lu & Ramamurthy, 2011; Nwankpa & Roumani, 2016)
	IT business spanning	Relative to other firms in your industry, please evaluate your organization's IT management capability in responding to the following on a 1 to 7 scale (1 = poorer than most, 7 = superior to most). ITB1: Developing a clear vision regarding how IT contributes to business value ITB2: Integrating business strategic planning and IT planning ITB3: Enabling functional area and general management's ability to understand value of IT investments ITB4: Establishing an effective and flexible IT planning process and developing a robust IT plan	(Lu & Ramamurthy, 2011; Nwankpa & Roumani, 2016)
	IT proactive Stance	Relative to other firms in your industry, please evaluate your capability in acquiring, assimilating,	(Lu & Ramamurthy 2011; Weill et

		transforming, and exploiting IT knowledge in the following areas on a 1 to 7 scale (1 = strongly disagree, 7 = strongly agree). ITP1: The firm closely follow the trends in current technologies ITP2: The firm is capable of and continue to experiment with new IT as necessary ITP3: The firm have a climate that is supportive of trying out new ways of using IT ITP4: The firm constantly seek new ways to enhance the effectiveness of IT use	al. 2002; Nwankpa & Roumani, 2016)
Digital Transformation	Digital Transformation	Relative to other firms in your industry, please identify the degree to which your company uses digital technologies on a 1 to 7 scale (1 = strongly disagree, 7 = strongly agree). DT1: The firm is driving new business processes built on technologies such as big data, analytics, cloud, mobile and social media platform. DT2: The firm is integrating digital technologies such as social media, big data, analytics, cloud and mobile technologies to drive change. DT3: The business operations is shifting toward making use of digital technologies such as big data, analytics, cloud, mobile and social media platform.	(Aral & Weill 2007; Nwankpa & Roumani, 2016)
Firm Performance	Firm Performance	Please rank your organization's financial performance relative to your closest competitors (1 = low, 7 = high) FP1: Profitability FP2: Customer retention FP3: Return on Investment FP4: Sales growth	(Tippins & Sohi, 2003; Nwankpa & Roumani, 2016)

Appendix 2: Survey – English version

PART 1 DEMOGRAPHIC INFORMATION

1. **What is your Gender?**
   ☐ Male ☐Female

2. **What is your Age?**
   ☐ 18 - 29 years ☐30 - 39 years ☐ 40-49 years ☐ more than 50 years

3. **What is your Education Level?**

   ☐ Highschool ☐ Technical ☐ University
   ☐Postgraduate ☐ Certificate or similar

4. **What is your position in the company?**

   ☐ CDO (Chief Digital Officer)
   ☐ CIO (Chief Information Officer)
   ☐ IT/IS director/manager
   ☐ Others (please specify):

5. **How many years have you been working in the institution?**
   ☐ Less than 1 year ☐ 2 - 4 years ☐ 5 - 7 years ☐ more than 8 years

PART 2 FIRM´S INFORMATION

6. **According to the following classification, please indicate to which industry your organization belongs?**

   ☐ Accommodation and meal service activities
   ☐ Financial and insurance activities
   ☐ Human health care and social assistance activities
   ☐ Wholesale and retail trade
   ☐ Information and communication
   ☐ Manufacturing
   ☐ Other

7. **What is the level of sales of the company in the last fiscal year?**
   ☐ Less than 100.000
   ☐ 100.001$ – 1.000.000
   ☐ 1.000.001 – 2.000.000
   ☐ 2.000.001 – 5.000.000
   ☐ more than 5.000.001

8. **What is the number of full-time employees of the company?**
   ☐ Less than 9 ☐ 10 – 49 ☐ 50 – 99 ☐ 100 – 199
   ☐ more than 200

9. **What is the estimated number of IT professionals in the organization?** (Business Editors, 2003)
   ☐Less than 2 ☐3 – 5 ☐6 – 8 ☐9 – 11
   ☐More than 12

PART 3 IT CAPABILITIES

IT Infrastructure Capabilities: The ability of a company to implement sharable platforms.

10. Relative to similar firms in your industry, please evaluate your organization's IT infrastructure capability in the in the following area on a scale of 1 - 7 (1 = poorer than most; 7 = superior to most).

	1	2	3	4	5	6	7
Data management services & architectures (e.g., databases, data warehousing, data availability, storage, accessibility, sharing etc.)							
Network communication services Quality (e.g., connectivity, reliability, availability, etc.)							
Application portfolio & services (e.g., ERP, ASP, reusable software modules/components, emerging technologies, etc.)							
IT facilities' operations/services (e.g., servers, large-scale processors, performance monitors, etc.)							

IT business spanning: The ability of a firm's management to envision and exploit its IT resources to support and enhance business objectives

11. Relative to similar firms in your industry, please evaluate your organization's IT management capability in responding to the following on a 1 to 7 scale (1 = poorer than most, 7 = superior to most).

	1	2	3	4	5	6	7
Developing a clear vision regarding how IT contributes to business value							
Integrating business strategic planning and IT planning							
Enabling functional area and general management's ability to understand value of IT investments							
Establishing an effective and flexible IT planning process and developing a robust IT plan							

IT proactive stance: Extent to which the firm proactively searches for ways to explore or exploit IT knowledge to address and create business opportunities.

12. Relative to similar firms in your industry, please evaluate your IT proactive stance in the following areas on a 1 to 7 scale (1 = strongly disagree; 7 = strongly agree).

	1	2	3	4	5	6	7
The firm closely follow the trends in current technologies							
The firm is capable of and continue to experiment with new IT as necessary							
The firm have a climate that is supportive of trying out new ways of using IT							
The firm constantly seek new ways to enhance the effectiveness of IT use							

PART 4 DIGITAL TRANSFORMATION: It refers to the transformation of the company's activities and working methods, through the integration and convergence of digital technologies.

13. Relative to similar firms in your industry, please identify the degree to which your company uses digital technologies on a 1 to 7 scale (1 = strongly disagree; 7 = strongly agree).

	1	2	3	4	5	6	7

The firm is driving new business processes built on technologies such as big data, analytics, cloud, mobile and social media platform.							
The firm is integrating digital technologies such as social media, big data, analytics, cloud and mobile technologies to drive change.							
The business operations are shifting toward making use of digital technologies such as big data, analytics, cloud, mobile and social media platform.							

PART 5 FIRM PERFORMANCE

14. Relative to other direct competitors, indicate how well your firm performed during the last 3 years (1 = low, 7 = high)

Firm Performance	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Profitability							
Customer retention							
Return on Investment							
Sales growth							

Appendix 3: Survey – Spanish version

ENCUESTA

Apreciado encuestado.

Mi nombre es Sandra Robles, estudiante de Maestría en el Programa Interdisciplinario de Políticas de IT en la Universidad Nacional de Seúl en la República de Corea. Actualmente, me encuentro en el proceso de recolección de datos para mi proyecto de investigación titulado: "Análisis de la Transformación Digital en empresas ecuatorianas", para lo cual sería importante contar con su participación.

La encuesta tiene como objetivo determinar los principales factores que influyen en la Transformación Digital de las empresas ecuatorianas y su desempeño. El tiempo que le tomará llenar la encuesta será 10 minutos aproximadamente.

Es importante recalcar que la información recolectada será manejada de manera absolutamente confidencial. En caso de existir preguntas respecto a la encuesta, o si se requiere información adicional, solicito de manera cordial contactarse conmigo a través del correo electrónico: sandra.robles@snu.ac.kr

Espero contar con su valiosa participación en esta encuesta.

Atentamente,

Sandra Robles
Candidato al título de Mágister.
International IT Policy Program.
Technology Management, Economics and Policy Program (TEMEP).
Universidad Nacional de Seúl, República de Corea.

PARTE 1 INFORMACIÓN DEMOGRÁFICA

1. **¿Cuál es su género?**
   ☐ Hombre ☐ Mujer

2. **¿Cuál es su edad?**
   ☐ 18 - 29 años ☐ 30 - 39 años ☐ 40-49 años ☐ 50 o mayor

3. **¿Cuál es su nivel académico de estudios?**

   ☐ Colegio, ☐ Técnico, ☐ Universidad, ☐ Postgrado,

   ☐ Certificado o similar

4. **Cuál es tu posición en la empresa?**

   ☐ CDO (Chief Digital Officer)
   ☐ CIO (Chief Information Officer)
   ☐ TI/IS director/manager
   ☐ Otros (Por favor especifique):

5. **¿Cuántos años has estado trabajando en la institución?**

   ☐Menos de 1 año ☐ 2 - 4 años ☐ 5 - 7 años ☐ más de 8 años

PARTE 2 INFORMACIÓN DE LA EMPRESA

6. **¿De acuerdo a la siguiente clasificación, por favor indique a qué industria pertenece su organización?**

   ☐ Actividades de alojamiento y de servicio de comidas
   ☐ Actividades financieras y de seguros
   ☐ Actividades de atención de la salud humana y de asistencia social
   ☐ Comercio al por mayor y al por menor
   ☐ Información y comunicación
   ☐ Manufactureras
   ☐ Otros

7. **¿En el último año fiscal, cuál fue el nivel de ventas de la compañía en USD?**

☐ Menos de 100.000
☐ Entre 100.001 y 1.000.000
☐ 1.000.001 – 2.000.000
☐ 2.000.001 – 5.000.000
☐ Más de 5.000.001

8. **¿Cuál es el número de empleados que trabajan a tiempo completo en la empresa?**

☐Menos de 9 ☐10 – 49 ☐50 – 99 ☐100 – 199
☐Más de 200

9. **¿Cuál es el número estimado de profesionales de TI en la organización?**

☐Menos de 2 ☐3 – 5 ☐6 – 8 ☐9 – 11 ☐Más de 12

PARTE 3 CAPACIDADES DE TI

Capacidad de infraestructura de ti: La capacidad de una empresa para implementar plataformas compartibles.

10. En comparación con otras empresas de su industria y en una escala de 1 a 7, siendo 1 peor que la mayoría y 7 superior a la mayoría, por favor evalúe la capacidad de infraestructura de TI de la empresa en las siguientes áreas:

Capacidad de infraestructura de ti	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Servicios y arquitectura de administración de datos (por ejemplo, bases de datos, almacenamiento de datos, disponibilidad de datos, almacenamiento, accesibilidad, intercambio, etc.)							
Servicios de comunicación de red (por ejemplo, conectividad, confiabilidad, disponibilidad, LAN, WAN, etc.)							
Portafolio y servicios de aplicaciones (por ejemplo, ERP, ASP, módulos / componentes de software reutilizable, tecnologías emergentes, etc.)							
Operaciones / servicios de las instalaciones de TI (por ejemplo,							

servidores, procesadores a gran escala, monitores de rendimiento, etc.)							

Capacidad de extensión de las TI sobre el negocio: Capacidad de gestión de TI de una empresa enfocado a respaldar y mejorar los objetivos del negocio.

11. En comparación con otras empresas de su industria y en una escala del 1 al 7, siendo 1 peor que la mayoría y 7 superior a la mayoría, por favor evalúe la capacidad de gestión de TI de la empresa:

La capacidad de gestión de ti:	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Desarrolla una visión clara sobre cómo las TI contribuyen al valor del negocio							
Integra la planificación estratégica empresarial y planificación de TI							
Habilita el área funcional y la capacidad de la gerencia general para comprender el valor de las inversiones en TI							
Establece un proceso de planificación de TI efectivo y flexible y desarrollando un plan de TI robusto							

Postura proactiva de TI: Capacidad para adquirir, asimilar, transformar y explotar el conocimiento de TI.

12. En comparación con otras empresas de su industria y en una escala del 1 al 7 siendo 1 totalmente en desacuerdo y 7 totalmente de acuerdo, por favor evalúe la postura proactiva de TI de la empresa:

	1	**2**	**3**	**4**	**5**	**6**	**7**
La empresa sigue de cerca las tendencias en la tecnología							
La empresa es capaz y continúa experimentando con nuevas TI según sea necesario							
La empresa tiene un clima que apoya el probar nuevas formas de usar TI							
La empresa busca constantemente nuevas formas de mejorar la efectividad del uso de TI							

PARTE 5 TRANSFORMACIÓN DIGITAL: *Se refiere a la transformación de las actividades de la empresa y métodos de trabajo, mediante la integración y convergencia de tecnologías digitales.*

13. En comparación con otras empresas de su industria y en una escala del 1 al 7, siendo 1 totalmente en desacuerdo y 7 totalmente de acuerdo, por favor identifique el grado en que la empresa utiliza tecnologías digitales:

	1	**2**	**3**	**4**	**5**	**6**	**7**
La empresa conduce nuevos procesos de negocio basados en tecnologías como big data, analítica, nube, móvil y plataforma de redes sociales.							
La empresa está integrando tecnologías digitales tales como redes sociales, big data, análica, tecnología en la nube y móvil para impulsar el cambio.							
Las operaciones comerciales están cambiando hacia el uso de tecnologías digitales tales como big data, analítica, nube, móvil y plataforma de redes sociales.							

PART 7 DESEMPEÑO DE LA EMPRESA

14. En comparación con otras empresas de su industria y en una escala del 1 al 7, siendo 1 bajo y 7 alto, por favor indique el nivel de desempeño de la empresa durante los últimos tres años en relación con:

	1	**2**	**3**	**4**	**5**	**6**	**7**
Rentabilidad							
Retención de clientes							
Retorno de la inversión							
Crecimiento de las ventas							

Appendix 4: Normality Test

Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
		Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
ITI1	115	1.0	7.0	4.809	1.6053	-.731	.226	-.093	.447
ITI2	115	1.0	7.0	5.374	1.4777	-1.102	.226	1.204	.447
ITI3	115	1.0	7.0	4.539	1.8271	-.503	.226	-.849	.447
ITI4	115	1.0	7.0	4.539	1.8175	-.457	.226	-.835	.447
ITB1	115	1.0	7.0	4.722	1.6678	-.679	.226	-.412	.447
ITB2	115	1.0	7.0	4.574	1.7069	-.635	.226	-.574	.447
ITB3	115	1.0	7.0	4.643	1.7330	-.627	.226	-.542	.447
ITB4	115	1.0	7.0	4.496	1.6982	-.594	.226	-.511	.447
ITP1	115	1.0	7.0	5.017	1.5838	-.824	.226	-.067	.447
ITP2	115	1.0	7.0	4.826	1.6182	-.572	.226	-.510	.447
ITP3	115	1.0	7.0	5.052	1.5438	-.729	.226	-.238	.447
ITP4	115	1.0	7.0	4.948	1.5886	-.621	.226	-.332	.447
DT1	115	1.0	7.0	4.226	1.9649	-.266	.226	-1.153	.447
DT2	115	1.0	7.0	4.365	1.9118	-.353	.226	-1.007	.447
DT3	115	1.0	7.0	4.461	1.7932	-.432	.226	-.858	.447
FP1	115	1.0	7.0	4.826	1.3908	-.539	.226	-.385	.447
FP2	115	2.0	7.0	5.165	1.2769	-.599	.226	-.246	.447
FP3	115	2.0	7.0	4.957	1.3790	-.370	.226	-.739	.447
FP4	115	1.0	7.0	4.852	1.4764	-.456	.226	-.533	.447
Valid N (listwise)	115								

Appendix 5: Independent Samples Test

Independent Samples Test

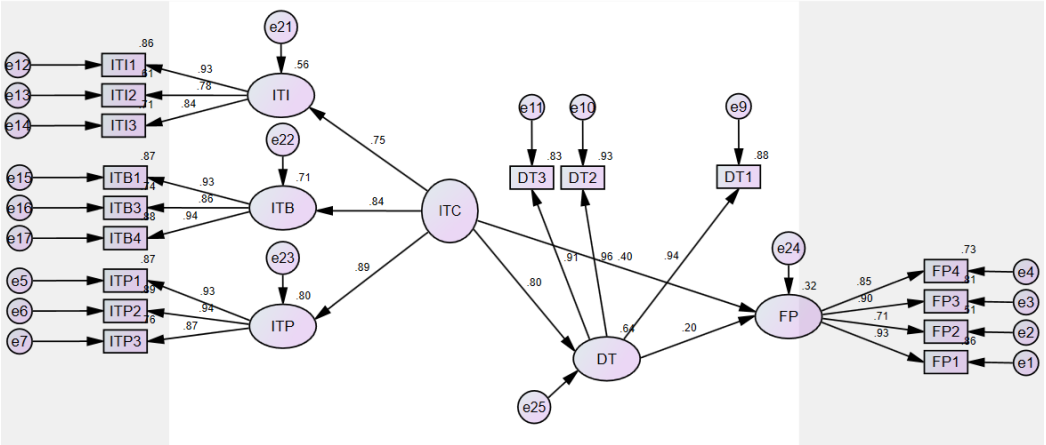
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Gender	Equal variances assumed	28.417	0.000	-2.714	56	0.009	-0.3103	0.1144	-0.5394	-0.0812
	Equal variances not assumed			-2.714	49.868	0.009	-0.3103	0.1144	-0.5401	-0.0806
Age	Equal variances assumed	0.080	0.778	0.131	56	0.896	0.0345	0.2631	-0.4926	0.5615
	Equal variances not assumed			0.131	55.939	0.896	0.0345	0.2631	-0.4926	0.5615
Studies	Equal variances assumed	7.286	0.009	2.686	56	0.009	0.3448	0.1284	0.0877	0.6020
	Equal variances not assumed			2.686	55.622	0.010	0.3448	0.1284	0.0876	0.6020
Position	Equal variances assumed	0.961	0.331	0.333	56	0.740	0.1379	0.4141	-0.6916	0.9675
	Equal variances not assumed			0.333	55.301	0.740	0.1379	0.4141	-0.6918	0.9677
Tenure	Equal variances assumed	1.068	0.306	0.367	56	0.715	0.1034	0.2823	-0.4620	0.6689
	Equal variances not assumed			0.367	55.854	0.715	0.1034	0.2823	-0.4620	0.6689
Industry	Equal variances assumed	0.631	0.430	-2.959	56	0.005	-0.7586	0.2564	-1.2722	-0.2450
	Equal variances not assumed			-2.959	55.044	0.005	-0.7586	0.2564	-1.2724	-0.2448
Sales	Equal variances assumed	6.488	0.014	1.099	56	0.276	0.4138	0.3765	-0.3404	1.1680
	Equal variances not assumed			1.099	51.837	0.277	0.4138	0.3765	-0.3418	1.1694

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Employees	Equal variances assumed	0.527	0.471	0.615	56	0.541	0.2414	0.3924	-0.5447	1.0275
	Equal variances not assumed			0.615	55.360	0.541	0.2414	0.3924	-0.5449	1.0277
IT Staff	Equal variances assumed	1.415	0.239	0.098	56	0.922	0.0345	0.3519	-0.6705	0.7394
	Equal variances not assumed			0.098	52.782	0.922	0.0345	0.3519	-0.6714	0.7404
ITI1	Equal variances assumed	4.671	0.035	-1.484	56	0.143	-0.6207	0.4183	-1.4586	0.2172
	Equal variances not assumed			-1.484	51.431	0.144	-0.6207	0.4183	-1.4603	0.2189
ITI2	Equal variances assumed	0.306	0.583	-1.411	56	0.164	-0.5517	0.3911	-1.3352	0.2318
	Equal variances not assumed			-1.411	54.338	0.164	-0.5517	0.3911	-1.3357	0.2323
ITI3	Equal variances assumed	0.467	0.497	-1.947	56	0.057	-0.8621	0.4428	-1.7492	0.0251
	Equal variances not assumed			-1.947	54.791	0.057	-0.8621	0.4428	-1.7496	0.0255
ITI4	Equal variances assumed	0.144	0.706	-1.066	56	0.291	-0.4828	0.4531	-1.3904	0.4249
	Equal variances not assumed			-1.066	55.076	0.291	-0.4828	0.4531	-1.3907	0.4252
ITB1	Equal variances assumed	3.912	0.053	-1.720	56	0.091	-0.7586	0.4411	-1.6423	0.1250
	Equal variances not assumed			-1.720	52.896	0.091	-0.7586	0.4411	-1.6434	0.1262

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ITB2	Equal variances assumed	4.519	0.038	-1.227	56	0.225	-0.5172	0.4214	-1.3614	0.3270
	Equal variances not assumed			-1.227	50.049	0.225	-0.5172	0.4214	-1.3637	0.3292
ITB3	Equal variances assumed	0.189	0.666	-0.228	56	0.821	-0.1034	0.4545	-1.0139	0.8070
	Equal variances not assumed			-0.228	55.825	0.821	-0.1034	0.4545	-1.0140	0.8071
ITB4	Equal variances assumed	1.177	0.283	-1.211	56	0.231	-0.5172	0.4271	-1.3729	0.3384
	Equal variances not assumed			-1.211	53.230	0.231	-0.5172	0.4271	-1.3739	0.3394
ITP1	Equal variances assumed	3.715	0.059	-1.625	56	0.110	-0.7241	0.4457	-1.6170	0.1687
	Equal variances not assumed			-1.625	53.196	0.110	-0.7241	0.4457	-1.6180	0.1698
ITP2	Equal variances assumed	2.153	0.148	-1.010	56	0.317	-0.4483	0.4437	-1.3371	0.4406
	Equal variances not assumed			-1.010	54.504	0.317	-0.4483	0.4437	-1.3377	0.4411
ITP3	Equal variances assumed	1.936	0.170	-0.825	56	0.413	-0.3448	0.4179	-1.1819	0.4923
	Equal variances not assumed			-0.825	55.611	0.413	-0.3448	0.4179	-1.1821	0.4924
ITP4	Equal variances assumed	1.680	0.200	-0.645	56	0.521	-0.2759	0.4276	-1.1325	0.5808
	Equal variances not assumed			-0.645	55.225	0.522	-0.2759	0.4276	-1.1328	0.5810

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
DT1	Equal variances assumed	0.183	0.670	-2.131	56	0.038	-1.0690	0.5017	-2.0741	-0.0639
	Equal variances not assumed			-2.131	55.994	0.038	-1.0690	0.5017	-2.0741	-0.0639
DT2	Equal variances assumed	0.645	0.425	-1.589	56	0.118	-0.8276	0.5209	-1.8711	0.2159
	Equal variances not assumed			-1.589	55.766	0.118	-0.8276	0.5209	-1.8712	0.2160
DT3	Equal variances assumed	1.745	0.192	-1.184	56	0.241	-0.5862	0.4951	-1.5780	0.4056
	Equal variances not assumed			-1.184	55.133	0.241	-0.5862	0.4951	-1.5783	0.4059
FP1	Equal variances assumed	0.175	0.678	-1.026	56	0.309	-0.3793	0.3698	-1.1201	0.3615
	Equal variances not assumed			-1.026	55.659	0.309	-0.3793	0.3698	-1.1202	0.3616
FP2	Equal variances assumed	0.332	0.567	-0.369	56	0.714	-0.1379	0.3738	-0.8867	0.6108
	Equal variances not assumed			-0.369	55.520	0.714	-0.1379	0.3738	-0.8869	0.6110
FP3	Equal variances assumed	0.166	0.685	-1.476	56	0.146	-0.5517	0.3739	-1.3007	0.1973
	Equal variances not assumed			-1.476	55.489	0.146	-0.5517	0.3739	-1.3009	0.1974
FP4	Equal variances assumed	0.933	0.338	-0.424	56	0.673	-0.1724	0.4070	-0.9877	0.6428
	Equal variances not assumed			-0.424	53.846	0.674	-0.1724	0.4070	-0.9884	0.6436

Appendix 6: Model



Abstract (Korean)

실제 세계와 가상 세계의 지속적인 융합은 현재 모든 경제영역에서 발생하는 혁신 및 변화의 핵심 동인이 되고 있다. 이처럼 디지털 전환은 현대 조직의 생존 및 디지털 경제에서의 경쟁 우위 확보에 있어 매우 중요한 역할을 수행한다. 실제로 자신의 비즈니스 영역 전반에 걸쳐 디지털 기술을 적용하는 기업들은 그렇지 못한 기업보다 효율성 및 비용 절감 측면에서 더욱 우위를 보이고 있다. 그러나 몇몇 기업들은 필요시 되는 민첩성 및 유연성을 갖추지 못하여 디지털 전환에 어려움을 겪고 있다. 자원기반이론(Resource-based View)을 기반으로, 본 논문에서는 IT 역량을 디지털 전환 및 기업 성과의 핵심 선행 조건으로 채택하여 그 역할을 분석하였다. 분석 데이터 수집을 위하여 에콰도르 기업을 대상으로 온라인 설문을 실시하였다. 또한, 변수 간의 관계 규명을 위해서 분석 방법론으로는 공분산 기반 구조방적식을 사용하였다. 분석 결과, IT 역량과 디지털 전환에는 강한 관계가 존재하는 것으로 나타났다. 또한, IT 역량은 기업의 성과에도 강한 영향을 주는 것으로 나타났다. 그러나 디지털 전환은 IT 역량이 기업 성과에 미치는 영향을 매개하지는 않는 것으로 나타났다. 본 연구는 에콰도르 기업의 IT 역량, 디지털 전환 및 기업 성과의 관계를 규명함으로써 기존 관련 연구의 발전에 기여를 한다. 또한, 본 연구의 결과는 디지털 전환을 장려하기 위한 정책 수립 방안에 기여한다.

주요어: 디지털 전환, IT 역량, 기업성과, 중소기업

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