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On the convergence between business and IT: The role of digital transformation

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이 논문을 공학석사 학위 논문으로 제출함

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Abstract

On the convergence between business and IT alignment: The role of digital transformation

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Digital transformation disrupts business models and economies in fast-changing environments. Also, alignment between business-IT became a top concern among researchers and managers. This process showed a contribution to firm performance. However, the link between this continuous process of alignment and the digital transformation was not sufficiently studied. This research analyzes the effects of digital transformation on business-IT alignment and firm performance. Partial least squares structural equation modeling technique is used to observe the path relationships between these three concepts. Results show that alignment is increased by the digital transformation and that there is an indirect effect between digital transformation to firm performance via business-IT alignment.

Keywords: Digital transformation, Alignment, Business, IT, Firm performance

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Chapter 1 – Introduction

1.1 Background

In this turbulent environment, characterised by rapid changes in technologies and processes (El Sawy, Malhotra, Park, Pavlou, 2010), organisations face misalignment between their strategy and operations (McAdam, Bititci, Galbraith, 2017). In order to cope with this divergence of objectives, firms have developed dynamic alignment capabilities to reach or sustain alignment to face environmental changes (McAdam, Bititci, Galbraith, 2017). Indeed, these turbulences occur in the area of Digital Transformation, also called the 4th industrial revolution.

The fusion between the physical and digital worlds creates major changes in our economies. Even if it is technology-driven change, this revolution impacts all individuals, organisations and sectors (World Economic Forum, 2016). Some firms have understood the benefits of this phenomenon and the impacts on their performance. In this way, their strategy has been adapted, processes changed, and people trained. The digital transformation is happening because of the speed of innovation of technologies. On the corporate scale, it is observable as a shift to big

data, analytics, cloud computing and mobile platforms (Nwankpa, Roumani, 2016). This has led to a rise of interest in understanding how companies can benefit from digital innovation. From a Forbes report, 42% of Chief Information Officers (CIOs) and Chief Executive Officers (CEOs) are conscious that their job will be impacted by digital technologies in the next 5 years, when 31% believe that the digital revolution will be spread across their value chain (Forbes Insights Report, 2016).

In this context, alignment became a strong concern among both researchers and practitioners from the 1970s (Luftman et al. 1993; McKeen and Smith, 2003). This alignment between business and IT activities has a dual role of emphasising the value of IT and helping business strategy to be achieved. However, even as this alignment process became important, IT strategy was still considered as a subset of the core business strategy. This trend was strongly demonstrated in multiple research studies like business processes reengineering, firms' systems, business value of IT, etc. (Bharadwaj, El Sawt, Pavlou, Venkatraman, 2013).

Taking into consideration that digital transformation enhances many changes in the economic environments, research practice should have focused on how firms can create value from this revolution and realise the business value of IT and alignment benefits.

The digital transformation research never reflected the effects of this phenomenon on business-IT alignment and firm performance. Indeed, research on the drivers of firm-level performance is quite prevalent in the strategic field, but research with an IT-specific context or theorising is extremely limited (Drnevich, Croson, 2013). Research on IT-performance linked to the strategic management literature has been limited (Drnevich, Croson, 2013). Many prior studies may be misleading because of measurement issues in quantifying the IT artifact as well as level-of-analysis problems that confound any direct IT/performance relationship (Drnevich, Croson, 2013). However, bridging the gap between business and IT has been regarded as difficult by all of these stakeholders for several reasons: a lack of descriptive and prescriptive methodologies to address it (until recently), differences in objectives, rigid organisational structure and culture, and a communication gap, among others. More specifically, it is exigent for IT to provide services to business organisations when they are rapidly moving towards new goals and objectives. As a result, this issue has become a top-level concern among business and IT professionals over the past thirty years (Ullah, Lai, 2013). Since the digital revolution shapes new business environments and the innovation rate is exponential, firms should constantly adapt their strategy to fit this paradigm and benefit as much as possible from it. One way to cope with this transformation would be through alignment with dynamic capabilities between IT and business objectives and skills. Since this

convergence already showed certain benefits for firm performance, would it be the same in the context of digital technologies? Since businesses keep stressing the benefits and potential of digital transformation, this research intends to quantify these effects on firm performance and on the alignment process. Because the digital revolution is a recent phenomenon that emerged strongly from 2015, not many academic insights have been published. In this way, this research fills a few research gaps such as: measuring the effects of digital transformation on firm performance and alignment processes; analysing the triangular relationship between alignment, digital revolution and firm performance; placing the established concept of alignment under a new perspective: the digital transformation.

The problem statement raised is how the emergence of digital transformation impacts the alignment process and firm performance. Indeed, the research gap includes the digital transformation phenomenon within the current model of alignment and firm performance.

The objective of this research is to study the role of digital transformation on alignment and firm performance and analyse if there is an indirect effect between these three concepts. Indeed, from this objective, emerge the following statements. Digital transformation is commonly cited nowadays as any technology used by companies. However, referring to researchers' and experts' definitions and understanding of it as a whole ecosystem, does it help organisations to

strive for their strategy by reducing the gap between the technology staff (IT teams) and business teams? Since alignment is supporting value creation in firms, what are the measured effects of the new technologies and techniques which have emerged in the last decade?

Indeed, there are only a very few papers that mention the effects of digital revolution on enterprises' operations. Moreover, it seems critical for researchers to produce such a study to respond to the increasing interest of managers, executives and business individuals regarding the impact of digital transformation on their organisations. Providing evidence with a quantitative methodology about the benefits of digital disruption on the performance of firms should help decision makers to first understand the opportunities and then search how to apply new management techniques to fit this changing environment. Because the gap between IT and business is still a crucial issue in organisations, the whole strategy suffers. Thus, this research would point to the measurement of the effect if alignment on firm performance simply demonstrates that working together to the same objectives might lead to stronger common performance. Many studies have been done about alignment theories but most of them are qualitative studies with case studies specifically designed for some industries. The aim of conducting quantitative research would be to demonstrate how the alignment impacts firm performance.

Because no studies have previously covered the inter-relationship between technology alignment, digital transformation and firm performance, it would be interesting to study if there is any indirect effect emerging between these measures. For example, it is possible to imagine a causal effect of the digital technologies that enables a real-time communication between the IT and business teams which results in better alignment and then in better performance. On the other hand, the alignment policy engaged by the company could increase the use of digital tools because they respond well to this need, for example, a mobile CRM managed by the IT team but mainly used by the business and sales teams. Here, the first aim was to merge the technological and business skills, but the intermediate use of a digital platform was essential to achieve superior performance.

Because of the existence of qualitative literature regarding alignment studies and digital transformation, this research objective will be analysed through a quantitative method to propose a way to measure the relationships between those variables.

1.2 Methodology

Since qualitative research is abundant in both alignment and digital studies, quantitative work is needed to create a replicable methodology that will answer the previous research objective. Indeed,

most of the studies oriented towards alignment and digital transformation are survey-based and created specifically for the required research objective. However, there is still not much general research that provide insights about the quantitative effects of the digital transformation phenomenon on the concept of alignment and firm performance. To empirically respond to the research objective, data are collected from the statistical office of the European Union (Eurostat) in 2016. The partial least squares structural equation modeling methodology will be used with the software SmartPLS.

1.3 Contributions

Using such a quantitative methodology could contribute to scholarship on the issue such that this study can be replicated by using other latent variables (concepts) and/or other constructs to analyse causal relationships between the latent variables. This research might contribute to strategic management, information systems literature. The main contribution is to demonstrate the role/impact of digital transformation on technology alignment and firm performance. Since this phenomenon is quite recent, there are not many studies about the effects of digital transformation on a firm's operations. Indeed, this research aims to give an additional observation of the effects of the digital transformation on other concepts such as technology alignment and firm performance. In

this way, this study might help academics understand this new phenomenon more fully and allow them to take the results of this research into consideration while working on new papers.

In terms of managerial contribution, this study might impact decision makers in small- and medium-sized enterprises (SMEs) that still do not perceive the benefits and changes that the digital transformation paradigm brings to companies and business environments. Moreover, another implication would be to shrink to gap between IT and business objectives in order to perform better and create a sustainable competitive advantage by following a common strategy. Moreover, observing the positive relationship between alignment and/or digital transformation on firm performance would either raise the awareness of managers on the potential of digital transformation and alignment processes or comfort them if they were pessimists regarding the usage of these new technologies and new ways to manage business capabilities.

In general, this research might make the most contributions at the early stage of digital transformation for firms that have just heard about this new phenomenon but have not measured the concrete benefits yet. Thus, it may guide decision-makers to read papers, expert blogs and professional reports such as on how to apply digital transformation to their own enterprise, need etc.

1.4 Overview

This study attempts to answer the research objective by empirically testing a research model through quantitative data collected from Eurostat. Indeed, the aim of this paper is to analyse the relationships between technology alignment, digital transformation and firm performance, especially the effect of digital transformation on business-IT alignment, and the presence of an indirect effect among the three concepts. Chapter 2 will introduce the theoretical background with the literature review. Chapter 3 will present the research model that was developed for this study, presenting all constructs and latent variables used. Then, Chapter 4 will present and describe the analysis and results that were made from the partial least squares (PLS) method. Finally, Chapter 5 will present the discussion and conclusion.

Chapter 2 – Literature Review

2.1 Alignment

2.1.1 History

Before hearing about the concept of alignment, scholars started to focus on the use of hardware and software to manage customer data, with the key terms ‘Information technology’ and ‘Information systems’ (Ullah, Lai, 2013). The main purpose here was scientific. But more and more businesses got interested in these technological tools to analyse their data and create applications to manage this data. Naturally, a new research area was emerging to link the computers, developers and businesspeople.

The very first origin of alignment was pointed to in the early 1970s (McLean, Soden, 1977). Then, the emergence of the alignment literature can be attributed to the late 1980s during a project called ‘MIT90s’, which was managed by Michael Scottmorton at the Center for Information Systems Research at MIT (Coltman, Tallon, Sharma, Queiroz, 2015). This study was done from 1984 to 1992 and gathered data from the most important users of IT in Europe and the US at that time (Arthur Young & Co., British Petroleum, BellSouth, Cigna, Digital

Equipment Corp., Kodak, General Motors, ICL, MCI, US IRS, and the US Army). Thus, this project resulted in the creation of a new framework that lists and show links between critical success factors which are strategy, individuals & roles, structure, management process and technology (**Figure 1**). The overall aim of this framework was to show how organisations are changing with IT. This framework is indeed the origin of the alignment models. This framework and research also infer several findings (Rockart, Short, 1989). First, technology impacts on an organisation are not only changing how tasks are done, but how the whole firm organises the flow of goods and services through the value chain. Second, interdependence will become more and more important and technology will be a key tool to manage this transformation. Then, line managers and IT managers are more than ever mutually dependent. Thus, there is a double goal emerging for organisations that would like to benefit from the IT transformation; first with the necessity to learn about any technology to integrate it into business capabilities and second, the necessity to choose the most effective IT staff. At the same time, other researchers have published works related to the relationships between IT and business partnerships, IT planning and strategic planning (Henderson, Thomas, Venkatraman, 1992).

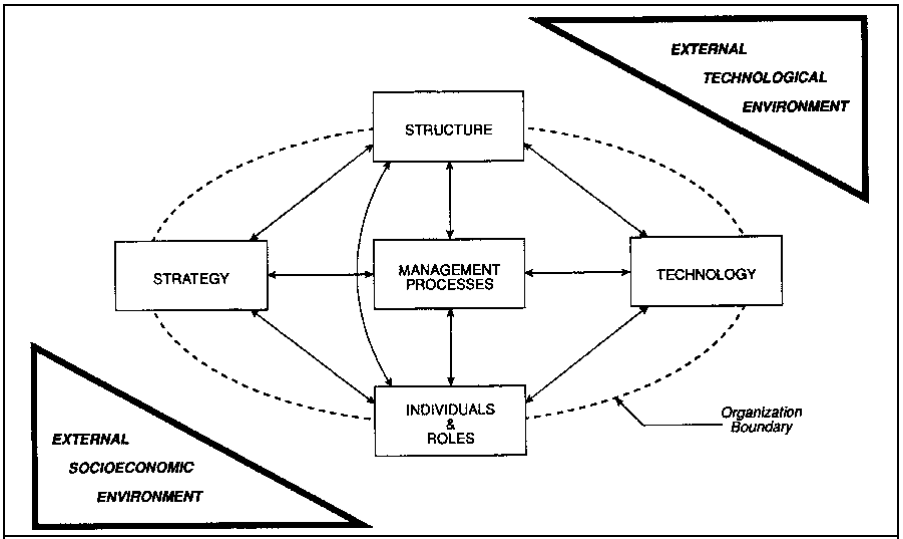

Figure 1. MIT90s framework showing the links between the critical success factors of an organisation under the IT transformation (Scott Morton, 1991)

After a few years, the researcher Luftman was hired to conduct a study on the IBM Systems Journal with a few other scholars and practitioners (Coltman, Tallon, Sharma, Queiroz, 2015). From this research, he then published a book named "Strategic Alignment in Practice" (Luftman, 1996). Resulting from several studies on alignment, IT moved from the perception of a tactical tool to a strategic resource for the firm (Sauer, Yetton, 1997), thus leading to a change in the literature focus from questioning whether IT creates value to what are the reasons why IT creates value (Brynjolfsson, Hitt, 1995).

2.1.2 The Need for Business-IT Alignment

Because of alignment's origin and potential effects, scholars and practitioners consider alignment as a priority for organisations (Kappelman, McLean, Luftman, Johnson, 2013). Indeed, from a questionnaire conducted by the Society for Information Management (SIM) in 291 enterprises, it was found that alignment was ranked as the first concern of business organisations for 5 consecutive years, 2003, 2004, 2005, 2006, 2007; and then ranked as the second concern in 1985, 2008 while it was, for example, ranked number 9 in 1980 and 1984 (Luftman, Kempaiah, Rigoni, 2009). IT's role moved from back-office support to a strategic tool in order to create new business strategies and not only support them (Henderson, Venkatraman, 1999). Also, publications from professional blogs, for example, are flourishing on the Internet to provide insights about alignment (Moore, 2012). There is clearly a motivation from the practical side to demonstrate that alignment is beneficial to enterprises (Gerow, Grover, Thatcher, Roth, 2014). As both practitioners and academics demonstrated an increased interest in alignment studies, as a spillover effect, consulting firms such as Gartner and technology blogs are evaluating companies about their alignment (Gerow, Grover, Thatcher, 2015). Indeed, the main objective of IT investments in a company is to support business strategies. Logically, companies are looking for a consensus between business and IT departments (Chan, Reich, 2007). Moreover, lack of alignment is seen

as one of the most important challenges for a firm (Kearns, Sabherwal, 2007). This challenge occurs because of the phenomenon of globalisation, more business risks because of volatility in financial markets and reduced product lifecycles (Luftman, Ben-Zvi, 2010). Alignment is necessary to enable firms to capitalise on their IT investments and derive value (Chan, Huff, Barclay, Copeland, 1997). Alignment becomes more and more important since firms face turbulent business environments and fast changing technologies (Papp, 1995).

Furthermore, a misalignment, could lead to an unsuccessful business strategy since firms are now strongly dependent on IT services (Gartlan, Shanks, 2007).

Importantly, the alignment process is useful for organisations for several reasons: first, because alignment could simplify the firm's strategic goals; second, because alignment helps organisations to improve their infrastructure (Ullah, Lai, 2013). In other words, alignment became an important issue in both managerial and academic fields because of the development of new technologies that changed the role of IT from a technical tool to support the strategy of the organisation to a key resource that could become a strong business capability to sustain competitive advantages. In addition, alignment is seen as an important process because of the rapid changes and uncertainty in the business environments and the strong innovation level in markets that became a clearly competitive advantage.

Indeed, alignment first emerged with the introduction of the information systems variable as the key success factor for an organisation. Now, alignment attracts several technologies and concepts and captures multiple definitions.

2.1.3 Definitions

First, alignment can also be referred to as ‘fit’, ‘congruence’ or ‘coalignment’ which blurs the concept (Venkatraman, 1989). Indeed, different terminologies are used for alignment such as ‘synchronisation’, ‘‘fit’, ‘linkage’, ‘harmony’, ‘integration’ and ‘bridge’ (Reich, Benbasat, 1996; Teo, King, 1996). Thus, this section will show the evolution of the alignment definitions before selecting one of those for this research and explaining this choice.

The first definition referring to alignment was given in the main founding paper of this concept, which was written by Henderson and Venkatraman in 1993, as “This model, termed the Strategic Alignment Model, is defined in terms of four fundamental domains of strategic choice: business strategy, information technology strategy, organizational infrastructure and processes, and information technology infrastructure and processes” (Henderson, Venkatraman, 1993, p. 472). During the same year, author researchers cited this process as: “alignment of business and information strategies referred to the extent

to which business strategies were enabled, supported, and stimulated by information strategies" (Broadbent, Weill, 1993, p. 164).

Then, King and Teo in 1996 went further by insisting on the need to have a synergy between business and IT: "BP-ISP integration can be defined as the alignment of IS strategies with business goals and business strategies gained through coordination between the business and IS planning functions and activities" (Teo, King, 1996, p. 309). IS refers to information systems, BP refers to business planning and ISP refers to integration of IS planning. The next year, research stated that IT should be a critical support at any level of the business strategy: The basic fundamental principle of alignment is that IT should reflect the way management is conducted through business strategy (Sauer, Yetton, 1997).

Moreover, one of the key authors of this research area, Luftman, provided two definitions of alignment in 1999: First, alignment is the extent to which IT and business cooperate when establishing their missions, objectives, and strategic plans, and whether they are endorsed by the IT strategy (Luftman, Papp, Bier, 1999). This implies that both IT and business objectives must be established at the same time in order to reach the best alignment (Ullah, Lai, 2013). The other interpretation of alignment according to Luftman is the following: Alignment is about different business activities, which implies that the activities need to be performed first to achieve the goals of the organization (Luftman, Brier,

1999). Furthermore, still under the idea that IT is an effective way of supporting thus business strategy, this definition was given: “Strategic alignment exists when the goals and activities of a business are in harmony with the information systems that support them” (McKeen, Smith, 2003, p. 94).

In the same way, a few scholars gave similar definitions of alignment at the beginning of the 21st century: Alignment is the process where business and IT cooperate and align their activities to achieve a common business goal (Campbell, 2005). “Business & IT Alignment is the degree to which the IT applications, infrastructure and organization, the business strategy and processes enables and shapes, as well as the process to realize this.” (Silvius, 2007, p. 23).

To sum up these definitions’ differences, there are two schools of thoughts regarding how to describe alignment. The first one states that alignment is just a process of using IT technologies to reach business objectives. Here, IT is an efficient tool but still subordinate to business strategy.

The second one, which was especially developed back in 1993 by Henderson and Venkatraman stipulates that alignment is a complete fusion between IT and business strategies and infrastructures. This vision was, for example, embodied in a recent publication of Luftman: “Alignment activities, in turn, are defined as IT-business and business-IT related managerial behaviors that can enable and promote the

coordination and ‘harmonization’ of activities across the business and the IT domain in ways that add business value” (Luftman, Lyytinen, Zvi, 2017, p. 27). Indeed, this dimension emphasises that greater alignment from business and IT activities would benefit the firm by creating value.

Therefore, it is important to select one definition of alignment from the myriad of interpretations that have been given in the past three decades. The original definition from Henderson and Venkatraman in 1993 is chosen to embody the concept of alignment in this research: “This model, termed the Strategic Alignment Model, is defined in terms of four fundamental domains of strategic choice: business strategy, information technology strategy, organizational infrastructure and processes, and information technology infrastructure and processes” (Henderson, Venkatraman, 1993, p. 472). This definition is the best one to represent all the aspects of alignment from strategy to use of resources and architecture shape.

2..1.4 Classifications of Alignment

Like the definitions, the types of alignment differ depending on the scholars. On the one hand, alignment can be divided into 6 classifications according to Gerow, Thatcher and Grover. This classification also combines the thoughts of other researchers (Gerow, Grover, Thatcher, 2015).

Strategic Alignment

First, alignment can be analysed from an intellectual perspective. Also called strategic alignment, it is categorised as "The first termed *strategic integration,* is the link between business strategy and I/T strategy reflecting the external components" (Henderson, Venkatraman, 1999, p. 476).

Operational Alignment

Second, alignment can be understood at the operational level. Indeed, it means that this category takes into consideration policies, processes, staff, systems, structure and departments (Henderson, Venkatraman, 1999).

This type of alignment is related to the management's capacity to incorporate the processes and infrastructures of business and IT rather than purely aligning several strategies.

It can be described as: "The second type, termed *operational integration,* deals with the corresponding internal domains, namely, the link between organizational infrastructure and processes and I/S infrastructure and processes" (Henderson, Venkatraman, 1999, p. 476).

Cross-domain Alignment (4 Subsets)

Then, this next category considers several levels of alignment because it considers both strategy and infrastructure elements at the same time (Henderson, Venkatraman, 1999). This category is composed of 4

subsets: strategy execution, technology transformation, competitive potential and service level (Henderson, Venkatraman, 1993).

Strategy execution is about the effects of business strategy on IT infrastructure but constrained by the business infrastructure. It is then a business alignment (Gerow, Grover, Thatcher, 2015).

Technology transformation refers to the impacts of business strategy on IT but constrained by the IT infrastructure. Here it is an IT alignment.

Competitive potential refers to the effects of IT strategy on the business infrastructure but constrained by the business strategy. Therefore, it is considered as a business alignment.

Service level is classified as the IT strategy impacting on the business infrastructure but constrained by the latter. Indeed, it is another IT alignment.

Thus, from the cross-domain dimension emerge two business alignments and two IT alignments. In this way, cross-domain alignment can be referred to as the following: The extent to which business strategy, business infrastructure, and IT infrastructure cooperate. (Henderson, Venkatraman, 1999).

This generalisation of the classifications previously described for alignment was established in the most famous model created for alignment theories. This representation is called the Strategic Alignment

Model (SAM) which was designed by Henderson and Venkatraman at the end of the 20th century (**Figure 2**). The following graph is the original model by Henderson and Venkatraman with classification headings added by Gerow, Grover and Thatcher in their paper published in 2015.

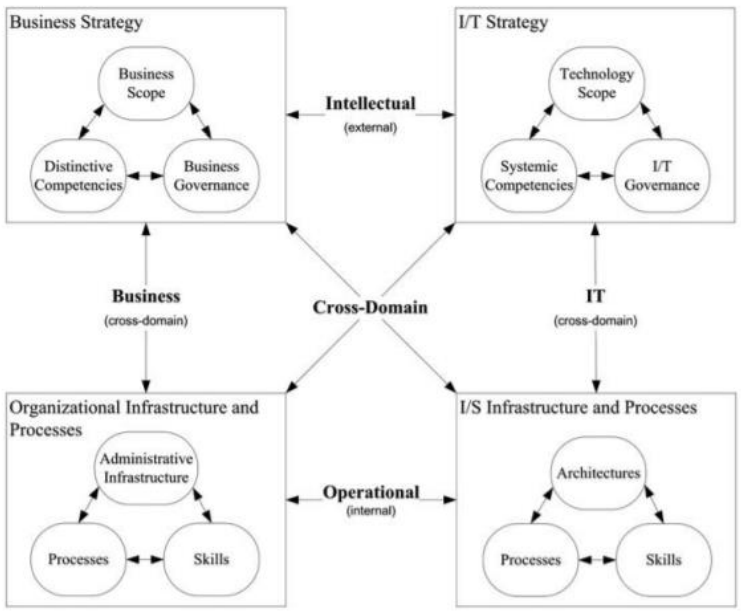

Figure 2. Strategic alignment model demonstrating the types of business-IT alignments (Henderson & Venkatraman, 1993)

In fact, SAM shows how firms can benefit from the different types of alignment to maximise the full potential of IT (Gerow, Grover, Thatcher, 2015). Thus, business and IT can be aligned in three dimensions, strategies, infrastructures or strategies and infrastructures. SAM was the core foundation of most of studies on alignment theories and publications.

On the other hand, alignment can be viewed from a different angle. Some scholars indeed clarified the concept of alignment into four categories (Ullah, Lai, 2013).

Strategic Alignment

Again, like in the previous classification of alignment, the first category is strategic alignment which represents the level where IT helps goals and objectives to be achieved and is also supported by the business goals and objectives (Ullah, Lai, 2013). Here the major factors affecting this kind of alignment are IT investments, IT strategy, business strategy and IT involvement (Shwarz, Kalika, Hajer, Schwarz, 2010; Khanfar, Zualkernan, 2010; King, 1978).

Structural Alignment

A structure is obviously important for any organisation so that it does not waste money on administration and control expenses. This structure is in fact a method to link the different departments, people and skills of an organisation to reach the same business strategy (Ullah, Lai, 2013). For example, the structure of an organisation can be either a proprietorship, a partnership, a limited liability company or a corporation (Ullah, Lai, 2013). Moreover, the most common factors of structural alignment are the choices between centralized or decentralised business units (Earl, 1989; Pollalis, 2003).

Cultural Alignment

Then, the next classification of alignment is related to the business culture of the organisation. Since every worker in the company has different values, emotional drives and behaviours, it is critical for the whole organisation to have an aligned cultural strategy in order to get overall better performance (Ullah, Lai, 2013). Regarding the cultural dimension, the most important factors are communication, governance, and relationships (Luftman, Papp, Bier, 1999; Chen, 2010).

Social Alignment

Finally, a firm needs to create a homogeneous social strategy to maintain strong human relationships and to maintain performance in the long run. Under the idea of 'business-IT alignment', social alignment is described as the extent to which executives and decision makers are realising and motivated to establish business and IT goals and projects (Ullah, Lai, 2013). Furthermore, the social factors of this type of alignment can be summarised as knowledge sharing and communication (Reich, Benbasat, 2000; Johnson, Lederer, 2010).

Most research has been dedicated to strategic and structural alignment rather than social and cultural alignment (Ullah, Lai, 2013).

Out of these two possibilities for choosing an alignment classification, this research will be oriented towards the original SAM dimensions. Indeed, it offers a very general classification of alignment possibilities and is strongly recommended in this research area. Moreover, it looks easier to measure these dimensions compared to the

social or cultural ones, for example. Indeed, the SAM framework provides a cross-dimensional perspective where elements such as processes or skills, for example, are quantifiable.

Then, the SAM framework has largely been used as an alignment base for research, but other studies have published new ways of articulating alignment in an organisation. For example, the strategic grid framework developed by McFarlan during the MIT90s period, failed to gain the same popularity as Henderson and Venkatraman's model (Coltman, Tallon, Sharma, Queiroz, 2015). Since SAM has remained the most well-known way to frame alignment, it has been adapted several times during the last three decades. Indeed, Luftman extended SAM into eight relationships that would explain alignment (Luftman, 1996). Moreover, a group of researchers wanted to unify the vision of alignment from a three-dimensional perspective making a complex cross-functional system between management practices, the design of alignment and areas of concern (Maes, Rijsenbrij, Truijens, Goedvolk, 2000). See **Figure 3**.

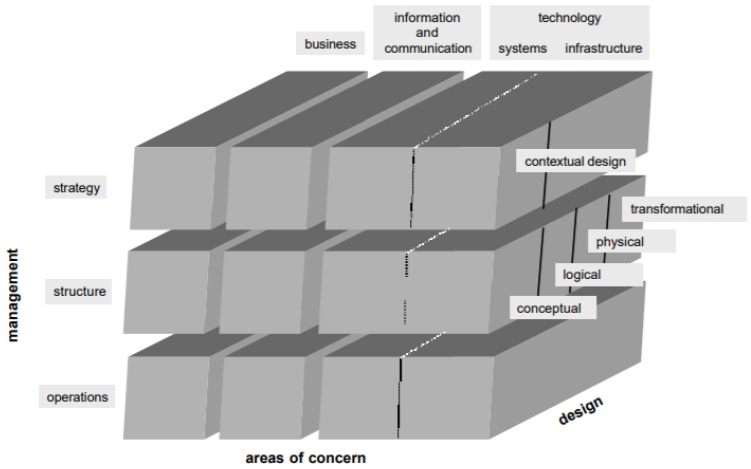

Figure 3. Unified framework of alignment between management practices, areas of concern and the design of alignment (Maes et al., 2000)

However, the model that gained the most researchers' attention apart from the original SAM, is the Strategic Alignment Maturity Model (SAMM) developed by Luftman in 2004. Indeed, it involved six important management domains which are: communication, competency/value, governance, partnership, scope/architecture and skills. It also considers five steps to reaching strategic alignment maturity which are: initial/ad-hoc process, committed process, established focus process, improved/managed process and optimised process (Luftman, 2004). This revolutionised alignment theories since this model displays a measurable step-growth approach. Indeed, this idea was inspired by the Software Engineering Institute's Capability Maturity model (Luftman,

2004). What is interesting is this SAMM model is used to visualise the steps to reach alignment maturity (**Figure 4**).

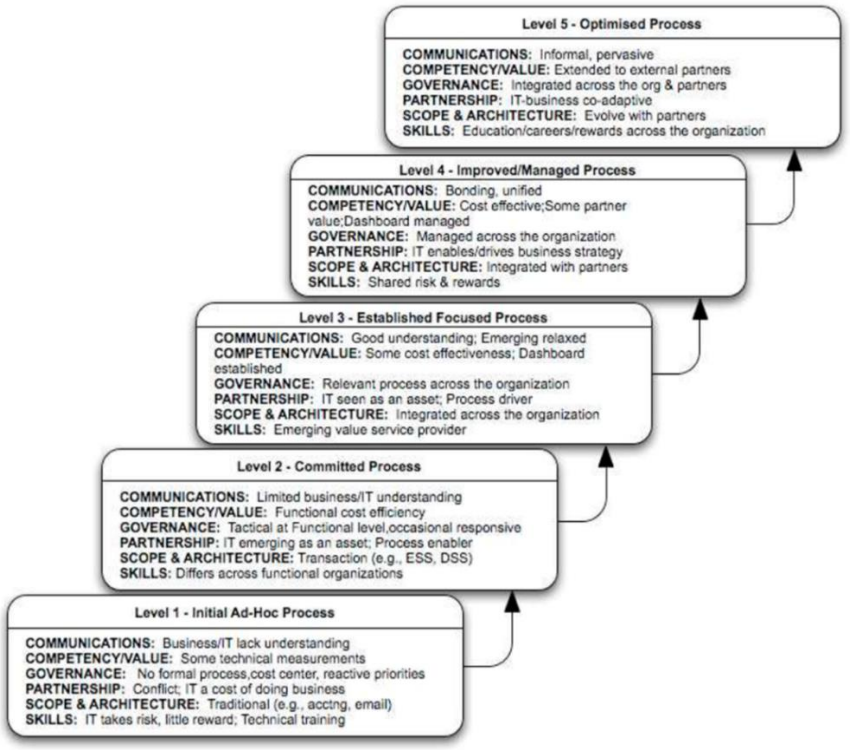

Figure 4. Strategic Alignment Maturity model showing the five steps to reach alignment maturity and the six management activities (Luftman, 2004)

Facing the rising interest towards the benefits of the synergy between business and IT functions, strategic technology alignment has been defined and classified in several ways (Coltman, Tallon, Sharma, Queiroz, 2015). Therefore, business-IT alignment constructs are

numerous in this research area. In this way, the combination of the rich variety of classifications and definitions of alignment makes for unclear constructs of measurements. Indeed, there are still no concrete guidelines on how to measure alignment in a replicable way (Coltman, Tallon, Sharma, Queiroz, 2015).

2.1.5 Measures of Alignment

Measurement can be essential to the alignment process to verify if business objectives have been reached and observe misalignment situations from a methodological perspective (Ullah, Lai, 2013). Most of the measurement studies regarding alignment have been driven by a qualitative approach by using case studies, surveys and fit models.

First, regarding the core research paper and original study of alignment, which introduces the SAM framework, the antecedents of alignment are: communications, value analytics, IT governance, partnering, IT scope and IT skills development (Henderson & Venkatraman, 1993). Visible from the SAMM model, these dimensions can be explained. First, communications are about the frequency and quality of information exchanged between IT and business departments. Second, value analytics represents the use of measures to analyse IT performance and the added value to the business. Third, IT governance refers to the allocation of credibility of IT decisions regarding the

strategy and operations of the firm. Fourth, partnering can be described as the level of cooperation between IT and business. Fifth, dynamic IT scope is both the ability to provide a flexible infrastructure and introduce new technologies to all stakeholders. Sixth, and finally, the skills variable refers to the human resource activities engaged in to improve IT and business skills (Luftman, Lyytinen, Zvi, 2017).

Moreover, the business and IT culture were analysed through the following constructs: culture of the firm, business and IT external/internal strategy, and the links between these measures (Burn, Colonel, 2000). Then, different factors explaining business-IT alignment were studied: business strategy and structure of the firm, and IT strategy and structure of the firm (Bergeron, Raymond, Rivard, 2004). In addition, more variables were analysed in a questionnaire survey, such as link, long-term focus, meeting of minds, clarity and consistency, culture, communication, skills, processes, and IT as a tool (Gartlan, Shanks, 2007). Also, alignment has been reviewed under three other different elements which are better decision making, automation of business processes and better customer satisfaction (Margolies et al. 2013). Besides, McAdam, Bititci and Galbraith in 2017 summarised another way to measure alignment in organisations. First, they suggest analysing the manager's capacity to understand the need for alignment (Ambrosini, Bowman, Collier, 2009). Second, they propose effective environment analysis (Danneels, 2011). Third, they focus on the capacity to face changes in technology strategy (Fearon, Manship, McLaughlin,

Jackson, 2013). Fourth and lastly, they identify strong communications and capacity to quickly make changes (Monahan, Nardone, 2007; Johnston, Pongatichat, 2008). Finally, there was a summarised list provided by Charoensuk, Wongsurawat and Khang in 2014 in order to help alignment measurements for future research (Charoensuk, Wongsurawat, Khang, 2014). Indeed, this list consists of fourteen antecedents that explain business-IT alignment: shared domain knowledge, communication, planning processes, IT governance, IT management sophistication, IT service management, IT infrastructure flexibility (in terms of connectivity, modularity and IT personal competency), IT success, business orientation, business support in IT, firm size, organisational structure, technological structure and external environment uncertainty (Charoensuk, Wongsurawat, Khang, 2014). Moreover, the study from Margolies et al. focuses on different aspects of the causes of alignment, by introducing customer satisfaction and effective decision making, for example. In the same way, alignment research should be oriented towards measurable objectives such as business value or customer satisfaction contrary to the traditional firm's performance constructs (Preston, 2014).

To sum up this section, the most recurrent measures for alignment from previous studies, are communication, IT governance, skills, organisational structure and business support to IT. Also, measuring alignment is critical for both academics and practitioners.

On the one hand, there is still a gap between managerial understanding and the way to measure alignment, according to *InformationWeek*, which calls for better alignment procedures (Preston, 2014). In the same way, the more reliable business-IT alignment measures, the more alignment will be studied (Ullah, Lai, 2013).

On the other hand, concerning the practical perspective, organisations need to know what constitutes alignment in order to implement new tools or procedures (Ullah, Lai, 2013). In particular, if they are convinced that the alignment process can add value to their business, they would certainly like to understand the mechanism quickly. This section addresses the 'what' question that arises logically after the 'why' question regarding alignment.

2.1.6 Enablers and Inhibitors of Alignment

After describing alignment, it is necessary to introduce the failure and success factors of this process. This research topic was indeed analysed during a six-years study in the US from 1992 where executives from more than 500 *Fortune 1,000* US firms were participating in seminars about alignment as part of IBM's Advanced Business Institute in New York (Luftman, Brier, 1999). Then, Luftman and Brier developed an assessment tool that aimed to identify the key success and failure factors about alignment with SAM as its basis and taking into account its

elements such as processes, skills, IT governance etc. In fact, the study from Luftman and Brier identified several enablers and inhibitors of alignment from 1992 to 1997.

On the one hand, the enablers or success factors of the alignment process were ranked in the left column in order of importance according to the study conducted according to IBM's Advanced Business Institute. On the other hand, the inhibitors or failure factors of alignment were identified in the right column (**Figure 5**).

Table 2. Enabler Categories

Senior executive support
IT involved in strategy development
IT understands business
IT, non-IT have close relationship
IT shows strong leadership
IT efforts are well prioritized
IT meets commitments
IT plans linked to business plans
IT achieves its strategic goals
IT resources shared
Goals/vision are defined
IT applied for competitive advantage
Good IT/business communication
Partnerships/alliances
Other

Table 3. Inhibitor Categories

IT/non-IT lack close relationship
IT does not prioritize well
IT fails to meet its commitments
IT does not understand business
Senior executives do not support IT
IT management lacks leadership
IT fails to meet strategic goals
Budget and staffing problems
Antiquated IT infrastructure
Goals/vision are vague
IT does not communicate well
Resistance from senior executives
IT, non-It plans are not linked
Other

Figure 5. Enablers and inhibitors of alignment ranked from most important to least important according to executives (Luftman, Papp, Brier, 1999)

From these results, emerge the most important factors that enable alignment. First, the support from non-IT executives can be explained as the understanding of IT benefits to the organisation by spreading a concrete IT strategy and sponsoring IT projects (Luftman, Papp, Brier, 1999). Second, the involvement of IT in business strategies refers to the support for IT governance and creating strong business-IT trust for example (Luftman, Papp, Brier, 1999). Third, the understanding of IT in terms of business functions can be described as business communication from IT staff resulting in a comprehensive and effective dialogue across departments and using IT skills to find new business opportunities (Luftman, Papp, Brier, 1999). Fourth, partnership between IT and business is essential by having a budget and human resources dedicated to the process, or a specific committee that meets to develop alignment (Luftman, Papp, Brier, 1999). Fifth, it refers to the ability of companies to introduce new technologies to the organisation in a limited time so that they sustain their competitive advantage (Luftman, Papp, Brier, 1999). Sixth, leadership is also an important enabler of alignment because it is embodied by IT when applied effectively to an innovative solution (Luftman, Papp, Brier, 1999).

2.1.7 Dynamic Capabilities

Alignment has been analysed through different definitions, classifications and measures. However, Henderson and Venkatraman, in their publications, generalised the alignment process in two major theories. First, the strategic fit of alignment has direct connections with the economic health of the organisation. Second, alignment is dynamic. Indeed, the decisions taken by a company will bring to mind imitation, which requires responses later. Then, alignment is a continuous process that adapts to changes in its environment (Henderson, Venkatraman, 1999).

In this way, alignment can be perceived as a dynamic capability. A dynamic capability is the capacity of an organisation to adapt to changes in the environment by modifying its set of resources (Teece, Pisano, Shuen, 1997; Eisenhardt, Martin, 2000). In other words, this capability is not a single set of selected technologies, but more the combination of the capacity of the firm to take advantage of IT functions in a continuous routine (Henderson, Venkatraman, 1999). Indeed, this dynamic capability perspective means that alignment can be built over time rather than just acquired (Baker, Jones, Cao, Song, 2011). Thus, the alignment process can be utilised to support flexibility in the organisation's strategy and processes in order to fit with the constantly changing environment (Baker, Jones, Cao, Song, 2011; Scharwz, Kalika, Kefi, Schwarz, 2010).

2.1.8 New Challenges for Alignment

Because of the hyperturbulent environment, the alignment process faces more and more challenges. First, alignment can be compromised by a blurred business strategy or even the absence of the latter. Indeed, it is harder for the operations to follow the organisation's guideline if the business strategy is not clear. Moreover, IT governance implementation is important in order to build credibility for IT functions and trust between business and IT departments (Kearns, Lederer, 2000; Khanfar, Zualkernan, 2010; Lederer, Mendelow 1989; Palmer, Markus, 2000; Saat, Franke, Lagerstrom, Ekstedt, 2010; Scharwz, Kalika, Kefi, Schwarz, 2010; Yetton, Johnston, 2001). Then, this process is threatened by the absence of business and IT skills. In fact, IT skills are essential to ensure and answer business cases. However, not every decision maker or manager is aware about the importance of IT skills. On the other hand, technical staff such as IT personnel need to get along with business vocabulary and theories in order to create successful alignment within the organisation (Chen, 2010; Hunt, 1993; Pyburn, 1983). Besides, the next challenge to aligning business and IT refers to authority. Indeed, business managers usually think from their own perspective to solve a company's issues and tend not to involve IT in these decisions (Van, Jong, 1999).

2.2 Digital Transformation

The digital transformation expression is commonly used by firms, scholars and the media to describe the phenomenon of moving from a traditional economy to a new paradigm where information must be transferred to a digital format (Freitas Junior, Maçada, Brinkhues, Montesdioca, 2016). Indeed, the digital transformation changes business models and our everyday lives. Because this new economy creates challenges and opportunities, it is critical for organisations to understand this phenomenon and maximise these opportunities. Thus, it has become an emerging research topic for study (Kahre, Hoffmann, Ahlemann, 2017).

2.2.1 History and Emergence

In fact, the digital transformation has already been discussed in the 1990s and 2000s. However, it was during the last decade that this phenomenon gained popularity, in particular from a dramatic increase that started in 2014 (Reis, Amorim, Melao, Matos, 2018). See **Figure 6**.

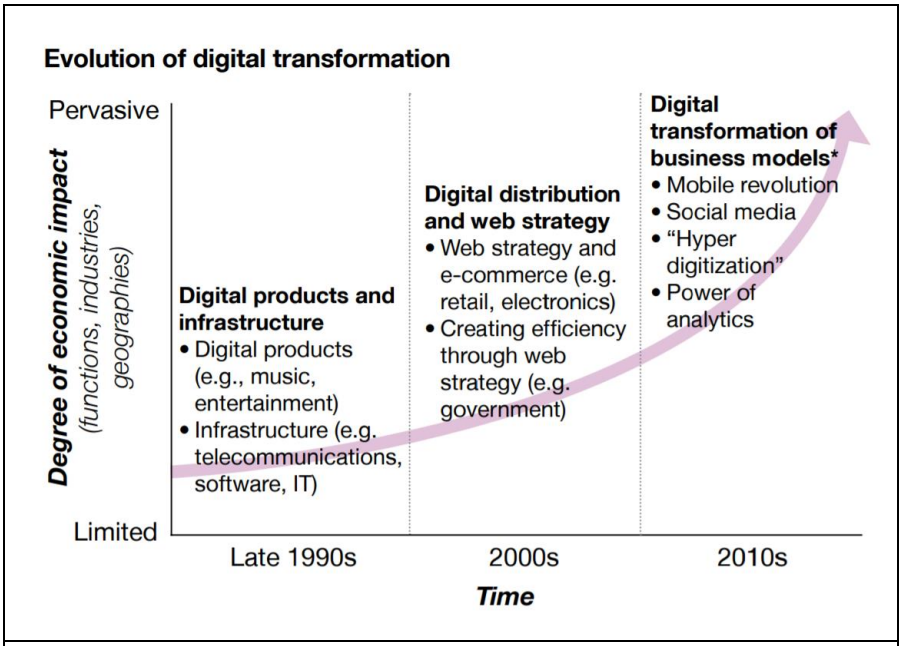

Figure 6. Historical evolution of the digital transformation through three major phases (Berman, Bell, 2011)

The increase of economic impact from the late 2000s is due to strong developments in information technology and communication in general (Bharadwaj, El Sawt, Pavlou, Venkatraman, 2013). It has led to a decrease in both software and hardware as well as standardisation in the business area to integrate these technologies. Moreover, products and services inset digital technologies. In this way, it is really hard nowadays to see the difference between these digital products or services in terms of their respective IT infrastructure (El Sawy, 2003; Orlikowksi, 2009). In addition, the strong improvements in the price/performance of computing, storage and applications has led to the increased use of digital technologies through cloud computing, for example (Bharadwaj, El

Sawt, Pavlou, Venkatraman, 2013). In this way, the economic impacts of the digital transformation began in the last decade to be understood by practitioners and researchers thanks to the level of information, digitalised data, and the performance of computers that allow more and more opportunities to benefit from IT.

2.2.2 Definitions

Since the digital transformation is a broad concept, is has been described in a variety of ways across industries and research areas. First, the digital transformation has been viewed as the use of digital technologies to improve the business performance such as making a better customer experience, or implementing new business models, for example (Fitzgerald, Kruschwitz, Bonnet, Welch, 2014). Second, this transformation not only consists of digitalising resources but also refers to the overall effects that occur from the value created by these technologies (McDonald, Rowsell-Jones, 2015). Then, Martin, defined the digital transformation as the usage of Information and Communication Technology (ICT) impacting on political, economic and social layers (Martin, 2008). Similarly, this phenomenon has been approached as referring to the changes in the technologies that affect all elements of human life (Stolerman, Fors, 2004). Furthermore, the digital transformation can refer to the use of digital technologies in order to

improve firms' performance (Westerman, Calméjane, Bonnet, Ferraris, McAfee, 2011). Also, digital transformation is also called digital business transformation (DBT). Moreover, digital transformation is the "process or reinventing a business to digitize operations and formulate extended supply chain relationships. The DBT leadership challenge is about re-energizing businesses that may already be successful to capture the full potential of information technology across the total supply chain." (Bowersox, Closs, Drayer, 2005, p. 1). Finally, "Digital transformation is the deliberate and ongoing digital evolution of a company business model, idea process, or methodology, both strategically and tactically." (Mazzone, 2014, p. 8).

In order to understand clearly what the digital transformation about, it is important to make a distinction between digital transformation, digitisation and digitalisation.

The digital transformation is also referred to in several expressions like digitisation and digitalisation. However, the meaning of each of these two terms is different. Indeed, digitisation is about the process to make any document or resource digital while digitalisation is actually the other term for digital transformation (Collin, Hiekkanen, Korhonen, Halen, Itala, Helenius, 2015).

In this research, the digital transformation concept will be narrowed to the use of digital technologies such as big data, cloud computing, social media and mobile internet. Indeed, digital

transformation here will be studied from the organisation's level as the capability to use the aforementioned new technologies.

2.2.3 Technologies of the Digital Transformation

The digital transformation refers to a specific technological revolution dominated by the emergence of big data, analytics, cloud computing and social media platforms, for example (Nwankpa, Roumani, 2016). Indeed, a few key technologies embody the phenomenon of digital transformation. These digital tools were listed in a report from the European Commission 'Digital Transformation Scoreboard 2018' (European commission, 2018).

First, social media platforms drive customer behaviour in terms of a new method of communication by sharing contents, status updates, and comments. They also allow employees within the firm to have real-time communication for short messages.

Then, mobile services enable communication outside the physical boundary of the company. Indeed, this tool is mostly used through the mobile internet which became accessible in the last decade.

Moreover, cloud computing has an important role in the digital transformation as it increases the accessibility of data. Thanks to the

cloud, any employee can access a file and data regarding a specific project from any connected device.

Furthermore, the Internet of Things (IoT) is changing business environments by allowing objects to communicate data through sensors. The main applications of these technologies relate to industrial and manufacturing organisations.

Besides, big data is regarded as one of the most important technologies regarding the digital transformation. Indeed, big data refers to "Unlike traditional data, the term Big Data refers to large growing data sets that include heterogeneous formats: structured, unstructured and semi-structured data. Big Data has a complex nature that require powerful technologies and advanced algorithms" (Oussous, Benjelloun, Lahcen, Belfkih, 2018, p. 433).

In addition, artificial intelligence and machine learning are also essential tools attached to the digital transformation. Artificial intelligence is the research area relating to how computers can think, do, communicate and act in many fields like humans (Rich, 1985). Machine learning is in fact a discipline of artificial intelligence whereby computers need to manage new situations. In this way, it is used in recommendation engines, recognition systems, and data mining (Bishop, 2006). Machine learning is generally divided into three areas which are supervised learning, unsupervised learning and reinforcement learning (Qiu, Wu, Ding, Feng, 2016).

2.2.4 Impact Dimensions of Digital Transformation

The digital transformation can change three levels: individuals, society and firms (Tolboom, 2016). However, this research will only focus on the firms' layer.

Indeed, transformation creates effects in seven dimensions: processes, new organisations, relationships, user experience, markets, customers, and disruptive impact (Lucas Jr, Agarwal, Clemons, El Sawy, Weber, 2013). In the same way, the MIT Sloan management review proposed another classification for the effects of digital transformation into three major categories (Westerman, Bonnet, McAfee, 2014). First, digital technologies change the customer experience. With the use of social media, for example, it is easier for firms to analyse whether their products or services are successful in the target markets and audiences (Westerman, Bonnet, McAfee, 2014). In the same way, the sales experience has changed since the use of tablets, software or mobile applications are frequently used during deals. Chatbots support customers' requests through online interfaces in order to save time for both sellers and customers. Second, the digital transformation also impacts processes. Automation of tasks allow staff to focus more on value creation (Westerman, Bonnet, McAfee, 2014). Also, performance management has changed through cloud computing which enables real-

time data that helps executives in their decision-making process. Third, digital technologies are affecting business models as well. Departments do not communicate in the same way, and firms' boundaries are blurred (Westerman, Bonnet, McAfee, 2014). For example, Customer Relationship Management (CRM) software allows different functions of the organisation to interact with each other by analysing at the same time the sales' status. In the same way, the e-commerce platforms change the way firms' approach and communicate with customers.

To sum up, the digital transformation impacts individuals, firms and the whole society. Regarding the corporate level, it is visible through changes in internal processes, where automation and the use of analytics help performance measurement and decision-making. The digital transformation also creates new customer experiences via the use of social media platforms, e-commerce websites, or chatbots. Finally, it also impacts business models by increasing communication through departments with CRM and the way data is shared via cloud computing.

2.2.5 Digital Capabilities

Furthermore, the dynamic capabilities can be analysed through the prism of digital transformation. To recap, here is the definition of dynamic capability: a dynamic capability is "the ability to integrate, build, and reconfigure internal and external competences to address

rapidly changing environments" (Teece, Pisano, Shuen, 1997, p. 516). Indeed, the expression 'digital capabilities' refers to the capabilities needed to go beyond traditional IT applications, by using, for example social media, mobile or analytics to create value from big data (Westerman, Bonnet, McAfee, 2014). In other words, digital capabilities are capabilities that enable the firm to react quickly by using internal and external resources, and using digital channels aimed at value creation (Freitas Junior, Maçada, Brinkhues, Montesdioca, 2016). Besides, these digital capabilities have been categorised into three major dimensions which are: agility and responsiveness, multi-channel communication, visualisation and governance (Freitas Junior, Maçada, Brinkhues, Montesdioca, 2016). Moreover, dynamic capabilities have emerged from a more generic theory which was developed in the strategic management literature. This theory is the resource-based view and is frequently linked to firm performance research.

2.3 Firm Performance

Because firm performance is a key element in any organisation (Nwankpa, Roumani, 2016), it pushes academics to study theories and antecedents for business performance. This is because there are more and more competition markets, executives and their managers need to always be informed and aware about the level of firm performance (Sohal,

Gordon, Fuller, Simon, 1999; Terziovski, Samson, 1999). Thus, many researchers decided to focus on the factors that explain firm performance and study the changes in performance depending on the business (March, Sutton, 1997).

2.3.1 Definition

In fact, firm performance is a measure which can offer non-financial and financial indicators that indicate how a firm reaches its goals and objectives. It is also defined as "a measure of how well a firm is able to meet its goals and objectives compared with its primary competitors" (Cao, Zhang, 2011).

In this research, firm performance will reflect the extent to which an organisation reaches its goals and objectives from a financial perspective.

2.3.2 Resource-based View

Because there was a booming trend in studies on firm performance, scholars established theories such as the resource-based view. The resource-based view states that the competitive advantage of a firm resides in its valuable, rare, inimitable and non-substitutable

resources (Barney, 1991). The first insight from this theory is that firms reach performance through resources, skills that are related to the company, and those which are rare and hard for competitors to imitate (Barney, 1986; Bharadwaj, 2000). Then, firms can reach a competitive advantage by obtaining or developing previous resources (Barney, 1991; Amit, Schoemaker, 1993).

Chapter 3 – Model and Methodology

3.1 Conceptual Model

The concepts of digital transformation, business-IT alignment and firm performance were described in the previous chapter; however, no connection has been established between them yet. The following section will present the two-way interactions of these three concepts and propose a conceptual model for this thesis (El Sawy, Malhotra, Park, Pavlou, 2010).

First, scholars touched on the link between the digital transformation and the business-IT alignment process. Indeed, a company that has digital capabilities and resources but does not use them, for a certain reason, would be facing misalignment between business and IT and, in the end, diminished performance (Sambamurthy, Bharadwaj, Grover, 2003). Moreover, the effects of digital transformation on the process of alignment were analysed through the lens of privacy. Digitalisation calls for stronger privacy and safety concerns which impacts IT governance policies (Gupta, Zhdanov, 2012). In the same way, established concepts like business-IT alignment need to be

discussed again for this changing business environment (Horlach, Drews, Schirmer, 2016). Since business and IT departments and strategies should not complement each other, it is essential to analyse the way they merge, and how it impacts firms (Kahre, Hoffmann, Ahlemann, 2017). Given that the literature about business-IT alignment is rich and mature, the connection with digital transformation is still not clear, because of a lack of transparency (Kahre, Hoffmann, Ahlemann, 2017). In this way, research needs to focus on the current effects of digital transformation on alignment processes and their impact on firms. The development of new business models and transformation of industries by digital technologies call for a rethinking of competitive advantage that is based on the merging of business strategy and IT (Woodard, Ramasubbu, Tschang, Sambamurthy, 2013). Moreover, the Information Systems literature needs to include additional studies on the alignment between business and IT, identify core IT resources, and how to manage IT and technology in general as a general resource. There is a need to understand the new paradigm of the digital economy and its consequences on alignment (Woodard, Ramasubbu, Tschang, Sambamurthy, 2013). Also, past studies viewed alignment from a binary perspective as the presence or absence of formal interactions between IT and business projects. Recent authors have shown that alignment is complex and multidimensional, reflecting the characteristics of the digital revolution (Tallon, 2011). Therefore, the following hypothesis is suggested:

Hypothesis 1: Does digital transformation have a positive effect on business-IT alignment?

Then, still in a two-way interaction, only a few research professionals have analysed the effects of digital transformation on firm performance. Because digital transformation has dramatically raised interest among practitioners and researchers, there have been more and more papers published in this area. However, even if the digital literature starts to provide insights, there are still no concrete studies linking digital business strategy to firm performance in a holistic way (Kahre, Hoffmann, Ahlemann, 2017). The only papers stating this causal relationship have been drawn from case studies. For example, the digital transformation has increased firm efficiency and effectiveness (Collin, Hiekkanen, Korhonen, Halen, Itala, Helenius, 2015). This can be explained by streamlined operations, improved resources and new capabilities (Drnevich, Croson ,2013; Fitzgerald, Kruschwitz, Bonnet, Welch, 2014). Digital transformation also impacts firm performance through profitability measurements like return on assets, return on investments and return on sales (Ganguly, 2015; Granados, Gupta, 2013). The use of technologies such as mobile internet, social media, and big data can foster performance in organisations (Nwankpa, Roumani, 2016). Another example of the effect of digital transformation on firm performance is from the companies Best Buy and Starbucks that want to

transform their customer side operations and combine all the data and information within their organisation using digital technologies (Kovac, Chernoff, Denneen, Mukharji, 2009; Setia, Venkatesh, Joglekar, 2013). From this literature background, the following hypothesis is proposed:

Hypothesis 2: Does digital transformation have a positive effect on firm performance?

Besides this, the richest literature related to the relationship of the concepts used in this thesis concerns alignment and firm performance. Developing the alignment process in an organisation can increase profitability and help to maintain a solid competitive advantage (Kearns, Lederer, 2000). Alignment enables greater revenues (Kunnathur, Shi, 2001), cost reductions (Johnson, Lederer, 2010), and improvements in customer value (Celuch, Murphy, Callaway, 2007). Also, cross-domain alignment (as suggested in the SAM framework in 1993), causes stronger financial performance (Gerow, Grover, Thatcher, 2015). The regression results show significance between alignment and firm performance (Luftman, Lyytinen, Zvi, 2017; Charoensuk, Wongsurawat, Khang, 2014). Alignment effects on firm performance are even stronger in very dynamic and hostile competitive environments (Yayla, Hu, 2012). From a holistic perspective, alignment demonstrates a positive relationship with firm performance across several studies (Gerow, Grover, Thatcher, Roth, 2014). The gap between functional investments in IT and the

general business value of the organisation must be shrunk if scholars in this field attribute, in a reliable way, causal effects on firm performance to IT benefits and alignment effects (Drnevich, Croson ,2013). In this way, the following hypothesis is raised:

Hypothesis 3: Does business-IT alignment have a positive effect on firm performance?

Moreover, the indirect effect from digital transformation through alignment to firm performance has never been studied. Because all the previous interactions between two out of the three concepts show an overall positive relationship, the assumption that there is an indirect effect can be made. Then, the following hypothesis is developed:

Hypothesis 4: Is there any indirect effect from digital transformation through business-IT alignment to firm performance?

Comparisons of existing models studying the relationships between digital transformation, business-IT alignment and firm performance are presented in **Figure 7**.

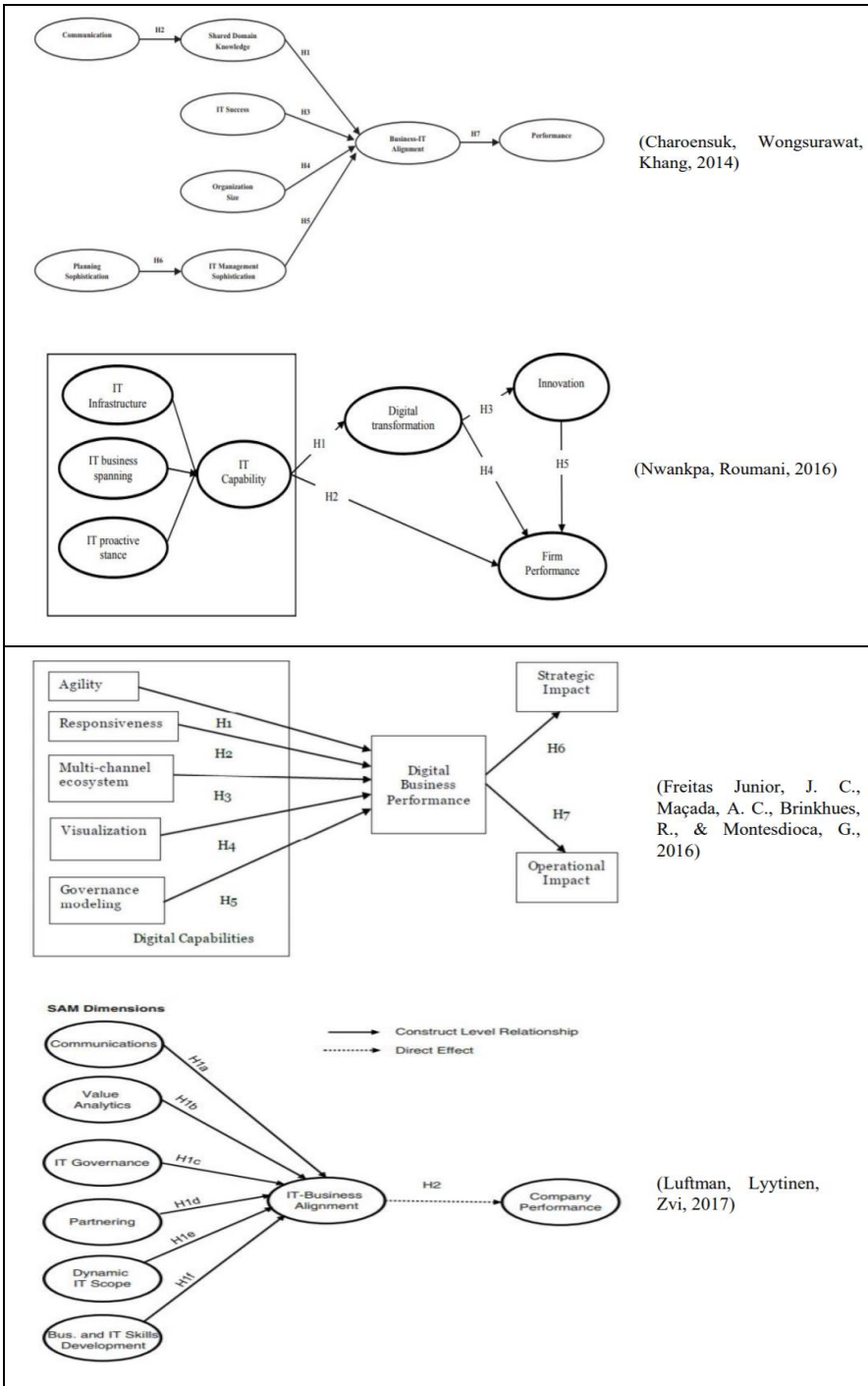

Figure 7. Comparison of existing literature models regarding digital transformation, business-IT alignment and firm performance

In this way, the three concepts of digital transformation, business-IT alignment and firm performance never have been studied in a three-way model. Because scholars need to pay more attention to the effects of the digital transformation (Nwankpa, Roumani, 2016), there is a need to analyse its impact on alignment and firm performance. Indeed, it seems necessary to expand on the current causal relationship of alignment and firm performance by including the digital transformation process. The established process of alignment between business and IT functions need to be analysed under the new perspective of digital transformation (Horlach, Drews, Schrimer, 2016).

From this literature foundation, the following conceptual model is proposed for this thesis (**Figure 8**).

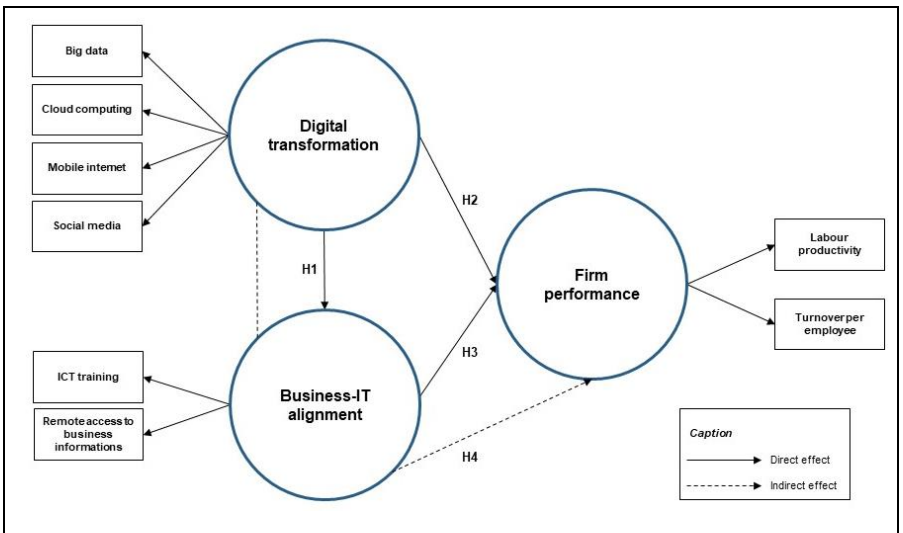

Figure 8. Conceptual model

3.2 Data

This thesis research uses a latent variable model using 2016 data from 32 countries in Europe: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, UK and Turkey.

This data is from Eurostat which is the official statistical office of the European Union. Two datasets are used in this study. The first one refers to the digital transformation and business-IT alignment variables. It is called 'ICT usage in enterprises' and gathers collected data from the Eurostat Model Questionnaires on ICT usage and e-commerce in firms. The second one is about the firm performance variable and refers to the 'Annual enterprise statistics for special aggregates of activities'. Indeed, firms transmit aggregated data to Eurostat where the results are weighted in the percentage of enterprises. These two datasets can be crossed for this research, since coherence calculations have been carried out in 2013 between the ICT usage survey which corresponds to the first dataset and the business statistics which make up the second one.

This Eurostat source is used because it provides data for digital transformation, business-IT alignment and firm performance. Also, this

European data completes previous research since most of the alignment studies were conducted in North America (Yayla, Hu, 2012).

3.3 Variables

3.3.1 Latent Variables Model

This thesis uses a latent variables model. This type of model can be used with theoretical concepts such as alignment, for example. Because these concepts are hard to measure with only one proxy variable, direct observations are not possible for these latent variables. Thus, these measurements need to be deduced from other variables that can be measured, which are called indicators (Tenenhaus, 1998). From this latent variable model emerges two kinds of variables: the latent variables that represent theoretical concepts and the indicators that altogether represent the latent variable.

3.3.2 Variables Used

From the latent variables model used, there are three latent variables which are digital transformation, business-IT alignment and firm performance, and eight corresponding indicators. Details about these variables are provided in **Table 1**.

Table 1. Definition of variables

Latent variables	**Indicators**	**Definition**
Digital transformation	Big data	Enterprises analysing big data from any data source
	Cloud computing	Buy cloud computing services used over the internet
	Mobile internet	Provide to employees portable devices that allow a mobile connection to the internet for business use
	Social media	Use any social media
Business-IT alignment	ICT training	Enterprises that providing training to develop / upgrade ICT skills of their personnel
	Remote access to business information	Provide to employees remote access to the enterprise's e-mail system, documents or applications
Firm performance	Labour productivity	Apparent labour productivity (gross value added per person employed)
	Turnover per employee	Turnover per person employed

These definitions are taken from the Eurostat databases. First, regarding the digital transformation, the constructs are chosen because they represent important technologies that have emerged during the digital transformation phenomenon such as the use of social media platforms (Susarla, Oh, Tan, 2012); big data analysis (Nwankpa, Roumani, 2016); cloud computing (Mohammed, Altmann, Hwang, 2009; Shim, Kim, Altmann, 2016); and the internet connection from mobile devices (Bharadwaj, El Sawt, Pavlou, Venkatraman, 2013). Then, the business-IT alignment construct is represented by two indicators which are ICT training and remote access to business information. The first measure is related to the SAM framework developed in 1993 in the skills dimensions. Skills are part of the business and IT infrastructures and processes and are involved in the alignment between those functions (Henderson, Venkatraman, 1993). Second, the remote access measure refers to the communication domain of alignment which is one of the most important antecedents and enablers of this process (Luftman, Papp, Brier, 1999). Moreover, the firm performance latent variable is composed of two indicators. The first one is labour productivity which has already been used in prior research to measure firm performance (Al-Matari, Al-Swidi, Fadzil, 2014). The second indicator is the turnover per employee which has also been considered as an antecedent to firm performance (Arthur, 1994).

The descriptive statistics are shown in **Table 2**. The following statistics did not raise any concerns.

Table 2. Descriptive statistics

	No.	Mean	Median	Min	Max	Standard deviation	Skewness
Social_med	1	47.156	46.000	25.000	71.000	12.674	0.175
Big_data	2	11.219	11.000	3.000	19.000	3.935	0.106
Cloud_comp	3	20.969	18.000	2.000	57.000	13.004	1.013
Mobile_int	4	70.812	72.000	41.000	94.000	11.847	-0.685
ICT_trai	5	21.156	22.000	2.000	42.000	9.271	0.053
Remote_acc	6	63.281	65.000	30.000	90.000	14.757	-0.175
Labour_pro	7	47.875	39.000	8.000	136.000	33.679	1.050
Turnover_per	8	184.688	144.000	61.000	545.000	114.398	1.485

The correlations between these variables are shown in **Table 3**. These variables demonstrate relatively normal correlations ranging from 0.228 to 0.726. The threshold for this correlation analysis is set at 0.85; above this value, the variables are considered to be highly correlated (Hair, Black, Babin, Anderson, 2010).

Table 3. Correlations between the eight variables

	Social_media	Big_data	Cloud_com...	Mobile_inte...	ICT_training	Remote_ac...	Labour_pro...	Turnover_p...
Social_media	1.000							
Big_data	0.628	1.000						
Cloud_computing	0.711	0.532	1.000					
Mobile_internet	0.437	0.403	0.637	1.000				
ICT_training	0.694	0.458	0.643	0.599	1.000			
Remote_access_to_business_informations	0.550	0.228	0.570	0.585	0.496	1.000		
Labour_productivity	0.618	0.502	0.581	0.420	0.685	0.416	1.000	
Turnover_per_employee	0.527	0.486	0.558	0.443	0.659	0.367	0.726	1.000

3.3.3 Control Variables

This research included firm size as a control variable since prior research demonstrated that firm size can affect firm performance (Kim, Lee, 2010). Firm size is divided into three categories which are small (10-49 persons employed), medium (50-249 persons employed), and large (250 persons employed or more) based on the classification of Eurostat.

Descriptive statistics with control variable are presented in **Table 4**. These statistics did not raise any concerns.

Table 4. Descriptive statistics including control variable

	No.	Missing	Mean	Median	Min	Max	Standard D...	Excess Kurt...	Skewness
Size_company	1	0	2.000	2.000	1.000	3.000	0.816	-1.516	0.000
Social_media	2	0	56.740	56.000	23.000	96.000	16.635	-0.698	0.128
Big_data	3	0	17.448	15.000	1.000	43.000	9.777	0.164	0.858
Cloud_computing	4	0	30.792	29.000	6.000	87.000	17.835	0.104	0.776
Mobile_internet	5	0	80.990	84.000	38.000	100.000	14.340	0.263	-0.813
ICT_training	6	0	40.198	38.000	3.000	88.000	22.936	-1.097	0.330
Remote_access_to_business_informations	7	0	77.240	84.000	27.000	100.000	18.177	-0.403	-0.757
Labour_productivity	8	0	44.781	34.000	13.000	136.000	30.459	0.819	1.122
Turnover_per_employee	9	0	179.438	142.000	40.000	545.000	118.450	1.556	1.338

3.4 Methodology

The methodology used for this thesis is partial least squares structural equation modeling using the software SmartPLS 3.

3.4.1 Technique

Structural Equation Modeling (SEM) is a technique combining factor analysis and regression. There are two types of SEMs, the covariance-based SEM and the partial least squares SEM (Ravand, Baghaei, 2016). This thesis research will use the PLS-SEM because it is the most used methodology for analysing a cause-effect relationship (Fritzsche, Oz, 2007); it does not require normal distribution and is more reliable in situations when complex models with many variables and path relationships need to be studied (Hair, Hult, Ringle, Stasrstedt, 2014). In PLS-SEM, the variance of the latent variables is maximised by estimating partial model links in an iterative sequence of ordinary least squares regressions (Hair, Hult, Ringle, Stasrstedt, 2014).

Regarding the model, PLS-SEM consists of two components: structural model that shows the relationships (paths) between the latent variables, here, digital transformation, business-IT alignment and firm performance; and a measurement model that shows the relationships between these latent variables to their respective indicators which are, in

this thesis, the eight variables (Barclay, Higgins, Thompson, 1995; Fornell, 1982). Moreover, there are two scales in PLS-SEM: the formative scale which refers to no correlation at all between the indicators, and the reflective scale which assumes that it can be possible to observe correlation between indicators. Then a reliability and validity tests need to be conducted. The reflective scale will be used for this research; then, the latent variables arrows will point to their indicators (Wong, 2013).

3.4.2 Software Used

The software used here is SmartPLS 3, because it is one of the most commonly used tools when conducting the PLS-SEM technique (Wong, 2013). Developed by Ringle, Wende and Will in 2005, SmartPLS uses the Java programming language (Temme, Kreis, Hildebrandt, 2010). Freely available and used all around the world by scholars in PLS-SEM, it provides an intuitive interface and efficient reporting features (Wong, 2013).

Chapter 4 – Results and Analysis

4.1 Results

The results of this research are presented in **Figure 9**.

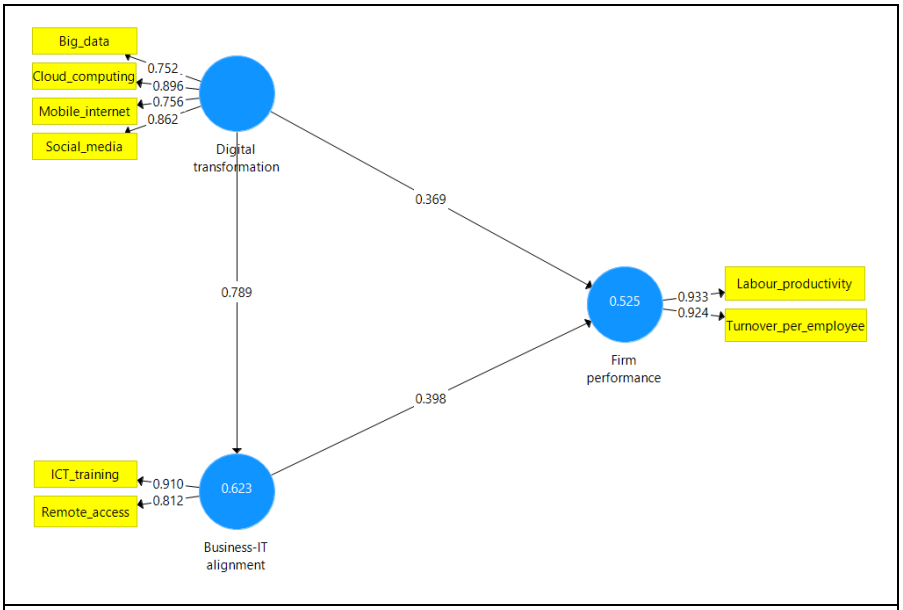

Figure 9. Results from the PLS-SEM model with path coefficients between latent variables and weights of indicators

First, the coefficient of determination R^2 which is in the blue circles, representing the latent variables, refers to the source of the

variance of these latent variables. In other words, the R^2 of business-IT alignment is 0.623 which means that the only latent variable pointing to the alignment variable, which is digital transformation, explains 62.3% of the variance in business-IT alignment.

Then, all the path relationships between the latent variables are significant. A path coefficient shows significance if it is stronger than 0.2 (Hwang, Malhotra, Kim, Tomiuk, Hong, 2010). Thus, the path coefficient between digital transformation and business-IT alignment is 0.789 which is significant. The path between digital transformation and firm performance is 0.369 which is also significant. The path between business-IT alignment and firm performance is 0.398 which is significant.

The loadings of the indicators measure the relationship between the indicators and their respective latent variables, and all show significance in this research. See **Table 5**.

The indicator loadings must be above 0.7 in a reflective scale model, which represents a level at which 50% of the indicator variance can be explained (Hair, Hult, Ringle, Stasrstedt, 2014). Then, all the indicators loadings are correctly chosen for their latent variable because they are all above 0.7.

Table 5. Loadings of indicators (coefficients measuring the relationship between indicators and their latent variables)

	Business-IT alignment	Digital transformation	Firm performance
Big_data		0.752	
Cloud_computing		0.896	
ICT_training	0.910		
Labour_productivity			0.933
Mobile_internet		0.756	
Remote_access	0.812		
Turnover_per_employee			0.924
Social_media		0.862	

4.1.1 Results with the Control Variable

A multi-group analysis (MGA) was conducted in the software SmartPLS to analyse whether firm size provides similar results to those in Section 4.1. The results are presented in **Table 6**.

Table 6. Results with the control variable

	Path Coefficients-diff (| Large - Medium |)	Path Coefficients-diff (| Large - Small |)	Path Coefficients-diff (| Medium - Small |)	p-Value(Lar...	p-Value(Lar...	p-Value(Me...
Business-IT alignment -> Firm performance	0.274	0.362	0.088	0.897	0.951	0.641
Digital transformation -> Business-IT alignment	0.065	0.081	0.016	0.748	0.809	0.573
Digital transformation -> Firm performance	0.214	0.321	0.107	0.147	0.063	0.334

Findings show that between large and medium firms, the path coefficients show a difference from 0.065 to 0.274. In other words, the difference of the effect of digital transformation on business-IT alignment between large and medium firms is very small (0.065). There

is no concern raised regarding the differences between large and medium firms. In the same way, between medium and small firms, the path coefficients show a difference from 0.088 to 0.107. Again, there is no significant difference in the path relationship and effects between medium- and small-sized firms. However, the results show significant differences in all path relationships between large and small firms. Indeed, the difference in path coefficients between large and small firms of business-IT alignment on firm performance is 0.362 which is significant. It is the same case for the effect of digital transformation on firm performance between large and small firms with a path coefficient difference of 0.321. P-values do not raise any concerns regarding the size of firms. Differences in results are only shown when comparing large and small firms which is understandable since large and small enterprises do not have the same strategic priorities such as business-IT alignment and assets to deploy digital transformation technologies within their organisations.

4.2 Tests for Reliability and Validity

The internal consistency reliability is either measured by Cronbach's alpha or composite reliability. However, the latter is better used in PLS-SEM because Cronbach's alpha seems to provide too conservative a measurement (Bagozzi, Yi, 1988). This composite reliability measure needs to be stronger than 0.7 to be acceptable. As

seen in **Table 7**, all the composite reliability measures are at a minimum of 0.852 which means that there is high internal consistency and reliability between the latent variables and their indicators.

The convergent validity is expressed by the average variance extracted. The acceptable threshold is from 0.5 (Fornell, Larcker, 1981). As seen in **Table 7**, all average variance extracted values are higher than 0.6.

Table 7. Test results for reliability (composite reliability) and validity (average variance extracted)

	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Business-IT alignment	0.715	0.852	0.743
Digital transformation	0.852	0.890	0.670
Firm performance	0.843	0.926	0.863

4.3 Bootstrapping Test

The significance of the path relationships cannot only be supported by the PLS-SEM. The bootstrapping technique also needs to be used. This technique is, in fact, analysing the relationships between the latent variables. In this technique, many subsamples are taken from the original sample and replaced with an alternative to give bootstrap errors which, in the end, provide T-statistics for significance testing of

the structural path analysis (Wong, 2013). The parameters for this bootstrapping technique in this thesis are two-tailed t-tests, with 550 subsamples and a significance level of 5%. Within the bootstrapping procedure, the path coefficient is significant if its T-statistics values are higher than 1.96 (Wong, 2013). A seen in **Table 8**, all the T-statistics are larger than the threshold of 1.96 which means that all path relationships are significant.

Table 8. Bootstrapping results (T-statistics)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Business-IT alignment -> Firm performance	0.398	0.401	0.161	2.465	**0.014**
Digital transformation -> Business-IT alignment	0.789	0.791	0.059	13.379	**0.000**
Digital transformation -> Firm performance	0.369	0.382	0.175	2.113	**0.035**

4.3.1 Bootstrapping Test with the Control Variable

A bootstrapping test was also conducted including the control variable. The results are presented in **Table 9**.

Table 9. Bootstrapping results with the control variable

	t-Values (Large)	t-Values (Medium)	t-Values (Small)	p-Values (Large)	p-Values (Medium)	p-Values (Small)
Business-IT alignment -> Firm performance	0.091	1.668	2.139	0.927	0.096	0.033
Digital transformation -> Business-IT alignment	9.324	11.871	13.311	0.000	0.000	0.000
Digital transformation -> Firm performance	6.009	2.824	2.119	0.000	0.005	0.034

The results show that the T-statistics are all above 1.96 except for large firms in the path of business-IT alignment and firm performance

(0.091) and medium firms for the same path (1.668). The other two path coefficients are significant for small, medium and large firms (Wong, 2013).

4.4 Analysis

The results confirm the first three hypotheses. First, digital transformation impacts positively on business-IT alignment (0.789 and $p \leq 1\%$) which shows very strong significance in this path relationship. This result confirms the assumptions previously made in this thesis that digital technologies impact positively on the process of business-IT alignment (Horlach, Drews, Schirmer, 2016; Woodard, Ramasubbu, Tschang, Sambamurthy, 2013). Then, the digital transformation phenomenon also positively impacts on firm performance (0.369 and $p \leq 5\%$). This result supports the previous findings of the digital benefits on an organisation's performance (Collin, Hiekkanen, Korhonen, Halen, Itala, Helenius, 2015; Ganguly, 2015; Granados, Gupta, 2013; Nwankpa, Roumani, 2016). Besides this, business-IT alignment as shown in the research area, positively affects firm performance (0.398 and $p \leq 5\%$). This result confirms the prior findings in the rich literature of alignment (Kearns, Lederer, 2000; Kunnathur, Shi, 2001; Luftman, Lyytinen, Zvi, 2017; Charoensuk, Wongsurawat, Khang, 2014; Yayla, Hu, 2012).

Hypotheses 1, 2 and 3 are all supported with good to strong significance levels.

4.5 Indirect Effects

Indirect effects can also be measured in the PLS-SEM methodology. The indirect effect from digital transformation through business-IT alignment to firm performance refers to Hypothesis 4. The result shows a path relationship coefficient of 0.314. See **Table 10**. Since this value is higher than 0.2, this indirect effect is significant (Wong, 2013). The digital transformation tools such as social media, big data, cloud computing and mobile internet reinforce alignment between the business and IT functions which, in the end, positively affects firm performance.

Hypothesis 4 is supported.

Table 10. Indirect effects results (from digital transformation through business-IT alignment to firm performance)

	Specific Indirect Effects
Digital transformation -> Business-IT alignment -> Firm performance	0.314

Chapter 5 – Conclusion and Discussion

5.1 Summary of Findings

This thesis research has shown that digital transformation plays a significant role in the model of business-IT alignment and firm performance. First, it demonstrated that digital technologies such as social media platforms, big data, cloud computing and mobile internet lead to greater alignment between business and IT functions. This implies that digital transformation tends to reduce the alignment gap between business and IT in organisations. Because the alignment gap is one of the most important concerns among both researchers and businesses (Luftman et al. 1993; McKeen and Smith, 2003), digital transformation appears to be one solution to cope with it. Then, this study has shown that digital transformation also impacts positively on firm performance. Even if this correlation is less important than the previous one, the relationship between the digital paradigm and the organisation's performance is quantified and shows significance. The technologies used in this digital transformation foster the performance of firms (Nwankpa, Roumani, 2016). Moreover, the established process of business-IT alignment showed positive effects on firm performance in this research

(Gerow, Grover, Thatcher, Roth, 2014). Finally, and importantly, there is an existing indirect effect in this triangular relationship from digital transformation through business-IT alignment to firm performance. Even if the alignment process leads to stronger performance, it is boosted by digital transformation technologies. Integrating the three concepts in the same path relationship shows that the combination of digital technologies and alignment policy can foster the performance of companies.

The results surprisingly showed strong influence of the use of digital technologies on the process of business-IT alignment. Even though the expectations lead to a positive relationship between those two concepts, it is surprising to observe how strong is the path relationship coefficient. The findings also strengthens the importance to pay attention to the digital transformation in order to maximize the benefits within any firm.

5.2 Discussion

5.2.1 Academic Contributions

First, this study might contribute to the academic environment in strategic and technology management literature. Indeed, this research raised the importance of the digital transformation in the alignment

process that any company can implement. Because business-IT alignment is an established concept which has been studied for 30 years, it is necessary to emphasise that the digital transformation impacts upon it. In other words, this study contributes to the current research by taking into account that new technologies enabled in the entire phenomenon of digital transformation are not only affecting firm performance in general but also the process of alignment. Until, now, this path relationship has only been suggested or touched upon.

Additionally, this thesis contributes to the research area of alignment by interpreting a causal indirect effect from digital transformation to firm performance via business-IT alignment. No studies previously have demonstrated this inter-relationship between the three concepts.

5.2.2 Managerial Contributions

Then, this thesis research might also contribute to the managerial environment. Indeed, it extends the current support for understanding the benefits of digital transformation and business-IT alignment on firm performance. The contribution of this research is to demonstrate the solution for achieving firm performance by aligning business and IT through the use of digital technologies. For managers such as Chief Information Officers, IT teams or dedicated business groups who are in charge of reducing the alignment gap, this research brings digital

transformation to light as a possible solution. This research might also comfort executives and strategy managers in the sense that alignment is a continuous process that has recently been impacted upon by digital transformation and which now presents new opportunities to support stronger firm performance.

5.3 Limitations

This work involved several limitations. First, the data used from Eurostat is only limited to the European region which reduces the replicability of the study in other areas of the world. Even if most of the alignment research were conducted in North America, this study should have included more diverse geographical areas to provide a more holistic approach. Then, because of the complexity of using partial least squares structural equation modeling, it is complicated to find the right indicators for the respective latent variables. Even if the loadings coefficients and tests showed significance between the selected eight indicators and their three latent variables, it is still advisable to choose additional or other variables. For example, the alignment variable is limited to the communication and skills domains of the SAM framework. Other dimensions such as processes, or IT governance might be taken into consideration while referring to alignment. In the same way, firm performance is limited to productivity and turnover per employee.

However, non-financial measures such as customer or employee satisfaction in prior studies have shown great correlation with firm performance.

5.4 Further Research

Future research might focus more specifically on the changing role of business-IT alignment from the perspective of digital transformation. An emerging concept was developed in the last five years on the effect of digital transformation on the IT functions in a firm. about it refers to two-speed IT that is provoked by digital technologies and processes. This two-speed IT is also called Bimodal IT (Horlach, Drews, Schirmer, 2016). In other words, to conduct digital transformation, firms perform, on the one hand, digital innovation in order to react quickly to fast changing environments and provide faster services for customer experience. On the other hand, traditional IT manages the infrastructure of systems and the organisation (Horlach, Drews, Schirmer, 2016). Because these two ways of managing IT lead to different governance policies, processes and structures, firms have started to implement Bimodal IT.

Besides this, Bimodal IT tends to reduce the alignment gap between business and IT (Horlach, Drews, Schirmer, 2016). For

example, this may be achieved with IT service management, a firm's architecture, and project management.

In this way, further research should provide solutions on how to maximise the alignment between business and IT even in the face of Bimodal IT or the two-speed IT phenomenon created by the digital transformation.

Bibliography (APA Style)

Al-Matari, E. M., Al-Swidi, A. K., & Fadzil, F. H. B. (2014). The measurements of firm performance's dimensions. *Asian Journal of Finance & Accounting*, *6*(1), 24.

Ambrosini, V., Bowman, C., & Collier, N. (2009). Dynamic capabilities: an exploration of how firms renew their resource base. *British Journal of Management*, *20*, S9-S24.

Amit, R., & Schoemaker, P. J. (1993). Strategic assets and organizational rent. Strategic management journal, 14(1), 33-46.

Arthur, J. B. (1994). Effects of human resource systems on manufacturing performance and turnover. *Academy of Management journal*, *37*(3), 670-687.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the academy of marketing science*, *16*(1), 74-94.

Baker, J., Jones, D., Cao, Q., & Song, J. (2011). Conceptualizing the dynamic strategic alignment competency. *Journal of the Association for Information Systems*, *12*(4), 2.

Barclay, D., Higgins, C., & Thompson, R. (1995). *The partial least squares (PLS) approach to casual modeling: personal computer adoption ans use as an Illustration*.

Barney, J. B. (1986). Strategic factor markets: Expectations, luck, and business strategy. *Management science*, *32*(10), 1231-1241.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, *17*(1), 99-120.

Bergeron, F., Raymond, L., & Rivard, S. (2004). Ideal patterns of strategic alignment and business performance. *Information & management*, *41*(8), 1003-1020.

Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS quarterly*, 169-196.Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: toward a next generation of insights. *MIS quarterly*, 471-482.

Bishop, C. M. (2006). *Pattern recognition and machine learning*. springer.

Bowersox, D. J., Closs, D. J., & Drayer, R. W. (2005). The digital transformation: technology and beyond. *Supply Chain Management Review*, *9*(1), 22-29.

Broadbent, M., & Weill, P. (1993). Improving business and information strategy alignment: Learning from the banking industry. *IBM systems journal*, *32*(1), 162-179.

Brynjolfsson, E., & Hitt, L. (1995). Information technology as a factor of production: The role of differences among firms. *Economics of Innovation and New technology*, *3*(3-4), 183-200.

Burn Janice, M., & Colonel, S. (2000). A comparison of the business and IT management on success factors for strategic alignmen. *Information & Management*, *37*, 197-216.

Campbell, B. R. (2005). Alignment: Resolving ambiguity within bounded choices. In *Pacific Asia Conference on Information Systems*. University of Hong King.

Celuch, K., Murphy, G. B., & Callaway, S. K. (2007). More bang for your buck: Small firms and the importance of aligned information technology capabilities and strategic flexibility. *The Journal of High Technology Management Research*, *17*(2), 187-197.

Chan, Y. E., Huff, S. L., Barclay, D. W., & Copeland, D. G. (1997). Business strategic orientation, information systems strategic orientation, and strategic alignment. *Information systems research*, *8*(2), 125-150.

Chan, Y. E., & Reich, B. H. (2007). IT alignment: what have we learned? Journal of Information technology, 22(4), 297-315.

Charoensuk, S., Wongsurawat, W., & Khang, D. B. (2014). Business-IT Alignment: A practical research approach. *The Journal of High Technology Management Research*, *25*(2), 132-147.

Chen, L. (2010). Business–IT alignment maturity of companies in China. *Information & management*, *47*(1), 9-16.

Collin, J., Hiekkanen, K., Korhonen, J. J., Halén, M., Itälä, T., & Helenius, M. (2015). It leadership in transition-the impact of digitalization on finnish organizations.

Coltman, T., Tallon, P., Sharma, R., & Queiroz, M. (2015). Strategic IT alignment: twenty-five years on.

Danneels, E. (2011). Trying to become a different type of company: Dynamic capability at Smith Corona. *Strategic Management Journal*, *32*(1), 1-31.

Drnevich, P. L., & Croson, D. C. (2013). Information technology and business-level strategy: toward an integrated theoretical perspective. *Mis Quarterly*, 483-509.

Earl, M. J. (1989). *Management strategies for information technology*. Prentice-Hall, Inc..

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they?. *Strategic management journal*, *21*(10-11), 1105-1121.

El Sawy, O. A. (2003). The IS Core IX: The 3 Faces of IS identity: connection, immersion, and fusion. *Communications of the Association for Information Systems*, *12*(1), 39.

El Sawy, O. A., Malhotra, A., Park, Y., & Pavlou, P. A. (2010). Seeking the configurations of digital ecodynamics: It takes three to tango. Research Commentary. *Information Systems Research*, *21*(4), 835-848.

European Commission (2018). Digital Transformation Scoreboard 2018. EU businesses go digital: Opportunities, outcomes and uptake, 1-138.

Fearon, C., Manship, S., McLaughlin, H., & Jackson, S. (2013). Making the case for "techno-change alignment" A processual approach for understanding technology-enabled organisational change. *European Business Review*, *25*(2), 147-162.

Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). Embracing digital technology: A new strategic imperative. *MIT sloan management review*, *55*(2), 1.

Forbes Insight Report. 2016. "How Digital Transformation Elevates Human Capital Management: Turning Talent into a Strategic Business Force", http://www.forbes.com/forbesinsights

Fornell, C. (1982). *A second generation of multivariate analysis. 2. Measurement and evaluation* (Vol. 2). Praeger Publishers.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, *18*(1), 39-50.

Freitas Junior, J. C., Maçada, A. C., Brinkhues, R., & Montesdioca, G. (2016). Digital capabilities as driver to digital business performance.

Fritzsche, D., & Oz, E. (2007). Personal values' influence on the ethical dimension of decision making. *Journal of Business Ethics*, *75*(4), 335-343.

Galindo-Martín, M. Á., Castaño-Martínez, M. S., & Méndez-Picazo, M. T. (2018). Digital transformation, digital dividends and entrepreneurship: A quantitative analysis. *Journal of Business Research*.

Ganguly, A. (2015). Optimization of IT and Digital Transformation: Strategic Imperative for Creating a New Value Delivery Mechanism and Sustainable Future in Organization. *European Journal of Business and Innovation Research*, *3*(2), 1-13.

Gartlan, J., & Shanks, G. (2007). The alignment of business and information technology strategy in Australia. *Australasian Journal of Information Systems*, *14*(2).

Gerow, J. E., Grover, V., Thatcher, J. B., & Roth, P. L. (2014). Looking toward the future of IT-business strategic alignment through the past: A meta-analysis. *Mis Quarterly*, *38*(4), 1059-1085.

Gerow, J. E., Thatcher, J. B., & Grover, V. (2015). Six types of IT-business strategic alignment: an investigation of the constructs and their measurement. *European Journal of Information Systems*, *24*(5), 465-491.

Granados, N., & Gupta, A. (2013). Transparency strategy: competing with information in a digital world. *MIS quarterly*, 637-641.

Gupta, A., & Zhdanov, D. (2012). Growth and sustainability of managed security services networks: an economic perspective. *Mis Quarterly*, *36*(4), 1109-1130.

Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). Multivariate data analysis: A global perspective (Vol. 7).

Henderson, J. C., Thomas, J. B., & Venkatraman, N. (1992). Making sense of it--strategic alignment and organizational context.

Henderson, J. C., & Venkatraman, H. (1999). Strategic alignment: Leveraging information technology for transforming organizations. *IBM systems journal*, *38*(2.3), 472-484.

Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., ... & Calantone, R. J. (2014). Common beliefs and reality about PLS: Comments on Rönkkö and Evermann (2013). *Organizational Research Methods*, *17*(2), 182-209.

Horlach, B., Drews, P., & Schirmer, I. (2016). Bimodal IT: Business-IT alignment in the age of digital transformation. *Multikonferenz Wirtschaftsinformatik (MKWI)*, 1417-1428.

Hunt, G. E. (1993). Management Challenges for Survival in the 1990s. *Journal of Information Technology*, *8*(1), 43-49.

Hwang, H., Malhotra, N. K., Kim, Y., Tomiuk, M. A., & Hong, S. (2010). A comparative study on parameter recovery of three approaches to structural equation modeling. *Journal of Marketing Research*, *47*(4), 699-712.

Johnson, A. M., & Lederer, A. L. (2010). CEO/CIO mutual understanding, strategic alignment, and the contribution of IS to the organization. *Information & Management*, *47*(3), 138-149.

Johnston, R., & Pongatichat, P. (2008). Managing the tension between performance measurement and strategy: coping strategies. *International Journal of Operations & Production Management*, *28*(10), 941-967.

Kahre, C., Hoffmann, D., & Ahlemann, F. (2017). Beyond business-IT alignment-digital business strategies as a paradigmatic shift: a review and research agenda.

Kappelman, L., McLean, E., Luftman, J., & Johnson, V. (2013). Key Issues of IT Organizations and Their Leadership: The 2013 SIM IT Trends Study. *MIS Quarterly Executive*, *12*(4).

Kearns, G. S., & Lederer, A. L. (2000). The effect of strategic alignment on the use of IS-based resources for competitive advantage. *The Journal of Strategic Information Systems*, *9*(4), 265-293.

Kearns, G. S., & Sabherwal, R. (2006). Strategic alignment between business and information technology: a knowledge-based view of behaviors, outcome, and consequences. *Journal of management information systems*, *23*(3), 129-162.

Khanfar, M., & Zualkernan, I. A. (2010, March). Assessing the IT-business alignment maturity in a hospitality and exhibition company. In *2010 Second International Conference on Engineering System Management and Applications* (pp. 1-6). IEEE.

Kim, D., & Lee, R. P. (2010). Systems collaboration and strategic collaboration: their impacts on supply chain responsiveness and market performance. *Decision Sciences*, *41*(4), 955-981.

King, W. R. (1978). Strategic planning for management information systems. *MIS quarterly*, 27-37.

Kovac, M., Chernoff, J., Denneen, J., & Mukharji, P. (2009). Balancing Customer Service and Satisfaction. *Harvard Business Review Blog Network*.

Kunnathur, A. S., & Shi, Z. (2001). An investigation of the strategic information systems planning success in Chinese publicly traded firms. *International Journal of Information Management*, *21*(6), 423-439.

Lederer, A. L., & Mendelow, A. L. (1989). Coordination of Information Systems Plans with Business Plans1. *Journal of Management Information Systems*, *6*(2), 5-19.

Lucas Jr, H., Agarwal, R., Clemons, E. K., El Sawy, O. A., & Weber, B. (2013). Impactful research on transformational information

technology: an opportunity to inform new audiences. *Mis Quarterly*, 371-382.

Luftman, J. N. (1996). Applying the strategic alignment model. *Competing in the information age: Strategic alignment in practice*, 43-69.

Luftman, J. (2004). Assessing Business-IT Allignment Maturity. In *Strategies for information technology governance* (pp. 99-128). Igi Global.

Luftman, J., & Ben-Zvi, T. (2010). Key issues for IT executives 2009: difficult economy's impact on IT. *MIS Quarterly Executive*, *9*(1), 203-213.

Luftman, J., & Brier, T. (1999). Achieving and sustaining business-IT alignment. *California management review*, *42*(1), 109-122.

Luftman, J., Kempaiah, R., & Rigoni, E. H. (2009). Key issues for IT executives 2008. *MIS Quarterly Executive*, *8*(3).

Luftman, J., Lyytinen, K., & Zvi, T. B. (2017). Enhancing the measurement of information technology (IT) business alignment and its influence on company performance. *Journal of Information Technology*, *32*(1), 26-46.

Luftman, J., Papp, R., & Brier, T. (1999). Enablers and inhibitors of business-IT alignment. *Communications of the Association for information Systems*, *1*(1), 11.

Maes, R., Rijsenbrij, D., Truijens, O., & Goedvolk, H. (2000). Redefining business-IT alignment through a unified framework. Universiteit Van Amsterdam/Cap Gemini White Paper.

March, J. G., & Sutton, R. I. (1997). Crossroads—organizational performance as a dependent variable. *Organization science*, *8*(6), 698-706.

Margolies, B., Shapanka, G., Schoelen, S., Beams, B., Simmons, T., Hucks, B., Lawler, M. O., Waddell, R., and Harding, J. 2013. Global Technology Leadership Strategies: Leading Technology Executives on Creating Strategic Alignment in a Rapidly Evolving Global Environment (Inside the Minds), Boston: Thomson Reuters/Aspatore.

Martin, A. (2008). Digital literacy and the 'digital society'. Digital literacies: Concepts, policies and practices, 30 (pp. 151–176).

Mazzone, D. M. (2014). *Digital or death: digital transformation: the only choice for business to survive smash and conquer*. Smashbox Consulting Inc.

McAdam, R., Bititci, U., & Galbraith, B. (2017). Technology alignment and business strategy: a performance measurement and Dynamic Capability perspective. *International Journal of Production Research*, *55*(23), 7168-7186.

McDonald, M. P., & Rowsell-Jones, A. (2015). The Digital Edge: Exploiting Information & Technology for Business Advantage (Stamford, CT: Gartner, 2012); San Francisco Municipal Transportation Agency,"SFpark: Pilot Project Evaluation," June 2014.

McKeen, J. D., & Smith, H. (2003). *Making IT happen: critical issues in IT management* (p. 366). Chichester: Wiley.

McLean, E. R., & Soden, J. V. (1977). *Strategic planning for MIS*. Wiley.

Mohammed, A. B., Altmann, J., & Hwang, J. (2009). Cloud computing value chains: Understanding businesses and value creation in the cloud. In *Economic models and algorithms for distributed systems* (pp. 187-208). Birkhäuser, Basel.

Monahan, S., & Nardone, R. (2007). How Unilever aligned its supply chain and business strategies. *Supply Chain Management Review*, *11*(8).

Moore, S. (2012). How to align your IT services strategy with the business. *CIO Magazine*.

Morton, Scott. "MS (1991)." *The Corporation of the 1990s*(1991): 122-158.

Nwankpa, J. K., & Roumani, Y. (2016). IT capability and digital transformation: A firm performance perspective.

Orlikowski, W. J. (2009). The sociomateriality of organisational life: considering technology in management research. *Cambridge journal of economics*, *34*(1), 125-141.

Oussous, A., Benjelloun, F. Z., Lahcen, A. A., & Belfkih, S. (2018). Big Data technologies: A survey. *Journal of King Saud University-Computer and Information Sciences*, *30*(4), 431-448.

Palmer, J. W., & Markus, M. L. (2000). The performance impacts of quick response and strategic alignment in specialty retailing. *Information Systems Research*, *11*(3), 241-259.

Papp, R. G. (1995). *Determinants of strategically aligned organizations: a multi-industry, multi-perspective analysis*(Doctoral dissertation, Stevens Institute of Technology).

Pollalis, Y. A. (2003). Patterns of co-alignment in information-intensive organizations: business performance through integration strategies. *International journal of information management*, *23*(6), 469-492.

Preston, R. (2014). CIO worries: Security, talent and (sadly)'alignment'. *InformationWeek*.

Pyburn, P. J. (1983). Linking the MIS plan with corporate strategy: an exploratory study. *MIS quarterly*, 1-14.

Qiu, J., Wu, Q., Ding, G., Xu, Y., & Feng, S. (2016). A survey of machine learning for big data processing. *EURASIP Journal on Advances in Signal Processing*, *2016*(1), 67.

Ravand, H., & Baghaei, P. (2016). Partial Least Squares Structural Equation Modeling with R. *Practical Assessment, Research & Evaluation*, *21*(11).

Reich, B. H., & Benbasat, I. (1996). Measuring the linkage between business and information technology objectives. *MIS quarterly*, 55-81.

Reich, B. H., & Benbasat, I. (2000). Factors that influence the social dimension of alignment between business and information technology objectives. *MIS quarterly*, 81-113.

Reis, J., Amorim, M., Melão, N., & Matos, P. (2018, March). Digital transformation: A literature review and guidelines for future research. In *World Conference on Information Systems and Technologies* (pp. 411-421). Springer, Cham.

Rich, E. (1985). Artificial intelligence and the humanities. Computers and the humanities. 19(2), 117-122.

Rockart, J. F., & Short, J. E. (1989). IT in the 1990s: Managing organizational interdependence. *MIT Sloan Management Review*, *30*(2), 7.

Saat, J., Franke, U., Lagerstrom, R., & Ekstedt, M. (2010, October). Enterprise architecture meta models for IT/business alignment situations. In *2010 14th IEEE International Enterprise Distributed Object Computing Conference* (pp. 14-23). IEEE.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS quarterly*, 237-263.

Sauer, C., & Yetton, P. W. (1997). The Right Stuff–An introduction to new thinking about management. *Steps to the Future: Fresh thinking on the management of IT-based organizational transformation, 1st edn, San Francisco: Jossey-Bass*, 1-21.

Sardana, D., Terziovski, M., & Gupta, N. (2016). The impact of strategic alignment and responsiveness to market on manufacturing firm's performance. *International Journal of Production Economics*, *177*, 131-138.

Schwab, K. (2016). The Fourth Industrial Revolution (World Economic Forum, Geneva).

Schwarz, A., Kalika, M., Kefi, H., & Schwarz, C. (2010). A dynamic capabilities approach to understanding the impact of IT-enabled businesses processes and IT-business alignment on the strategic and operational performance of the firm. *Communications of the Association for Information Systems*, *26*(1), 4.

Setia, P., Setia, P., Venkatesh, V., & Joglekar, S. (2013). Leveraging digital technologies: How information quality leads to localized capabilities and customer service performance. *Mis Quarterly*, 565-590.

Shim, D., Kim, J. G., & Altmann, J. (2016). Strategic management of R&D and marketing integration for multi-dimensional success of new product developments: an empirical investigation in the Korean ICT industry. *Asian Journal of Technology Innovation*, *24*(3), 293-316.

Silvius, A. J. (2007). Exploring differences in the perception of business & IT alignment. *Communications of the IIMA*, *7*(2), 3.

Sohal, A. S., Gordon, J., Fuller, G., & Simon, A. (1999). Manufacturing practices and competitive capability: an Australian study. *Technovation*, *19*(5), 295-304.

Stolterman, E., & Fors, A. C. (2004). Information technology and the good life. In *Information systems research* (pp. 687-692). Springer, Boston, MA.

Susarla, A., Oh, J. H., & Tan, Y. (2012). Social networks and the diffusion of user-generated content: Evidence from YouTube. *Information Systems Research*, *23*(1), 23-41.

Tallon, P. P. (2011). Value chain linkages and the spillover effects of strategic information technology alignment: A process-level view. *Journal of Management Information Systems*, *28*(3), 9-44.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, *18*(7), 509-533.

Tenenhaus, M. (1998). *La régression PLS: théorie et pratique*. Editions technip.

Teo, T. S., & King, W. R. (1996). Assessing the impact of integrating business planning and IS planning. *Information & management*, *30*(6), 309-321.

Temme, D., Kreis, H., & Hildebrandt, L. (2010). A comparison of current PLS path modeling software: Features, ease-of-use, and performance. In *Handbook of partial least squares* (pp. 737-756). Springer, Berlin, Heidelberg.

Terziovski, M., & Samson, D. (1999). The link between total quality management practice and organisational performance. *International Journal of Quality & Reliability Management*, *16*(3), 226-237.

Tolboom, I. (2016). The impact of digital transformation: A survey based research to explore the effects of digital transformation on organizations. *Delft University of Technology*.

Ullah, A., & Lai, R. (2013). A systematic review of business and information technology alignment. *ACM Transactions on Management Information Systems (TMIS)*, *4*(1), 4.

Van Der Zee, J. T. M., & De Jong, B. (1999). Alignment is not enough: integrating business and information technology management with the balanced business scorecard. *Journal of management information systems*, *16*(2), 137-158.

Venkatraman, N. (1989). The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of management review*, *14*(3), 423-444.

Westerman, G., Bonnet, D., & McAfee, A. (2014). The nine elements of digital transformation. *MIT Sloan Management Review*, *55*(3), 1-6.

Westerman, G., Calméjane, C., Bonnet, D., Ferraris, P., & McAfee, A. (2011). Digital Transformation: A roadmap for billion-dollar organizations. *MIT Center for Digital Business and Capgemini Consulting*, *1*, 1-68.

Woodard, C. J., Ramasubbu, N., Tschang, F. T., & Sambamurthy, V. (2013). Design capital and design moves: The logic of digital business strategy. *Mis Quarterly*, 537-564.

Yayla, A. A., & Hu, Q. (2012). The impact of IT-business strategic alignment on firm performance in a developing country setting: exploring moderating roles of environmental uncertainty and strategic orientation. *European Journal of Information Systems*, *21*(4), 373-387.

Yetton, P. W., & Johnston, K. D. (2001). Competing forms of fit in a professional bureaucracy: IT management dilemmas. *International Journal of Healthcare Technology and Management*, *3*(2-4), 142-159.

Abstract (Korean)

디지털 전환은 빠르게 변화하는 환경에서 비즈니스 모델과 경제를 교란시킨다. 또한, 비즈니스-IT 간의 제휴는 연구원들과 관리자들 사이에서 가장 큰 관심사가 되었다. 이 과정은 확고한 성과에 기여하는 것으로 나타났다. 그러나 이러한 연속적인 정렬과 디지털 변환의 연관성은 충분히 연구되지 않았다. 본 연구는 디지털 전환이 비즈니스-IT 의 조정과 확고한 성능에 미치는 영향을 분석한다. 부분 최소 제곱 구조 방정식 모델링 기법을 사용하여 이 세 가지 개념 사이의 경로 관계를 관찰한다. 결과는 디지털 변환에 의해 정렬이 증가하며, 비즈니스-IT 조정을 통해 디지털 변환과 확실한 성능 사이에 간접적인 영향이 있음을 보여준다.

주요어 : 디지털 전환, 컨버전스, 비즈니스, IT, 기업 성능

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