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of Management**

# Working Paper Series

**Daria Arkhipova and
Giovanni Vaia**

## Integrating third parties in digitally mature companies: Determinants of innovation success


**Working Paper n. 3/2018
March 2018**

**ISSN: 2239-2734**

# Integrating Third Parties in Digitally Mature Companies: Determinants of Innovation Success

**DARIA ARKHIPOVA**
daria.arkhipova@unive.it
Department of Management
Ca' Foscari University Venice

**GIOVANNI VAIA**
g.vaia@unive.it
Department of Management
Ca' Foscari University Venice

*(March 2018)*

**Abstract**

*We develop and empirically analyse a theoretical model that examines both the antecedents of digital maturity and the involvement of external third parties in companies undergoing digital transformation. We use structural equation modelling technique to test our propositions using the survey data from IT executives on self-reported importance scores they assign to different types of IT competences. We find that digitally mature companies are more likely to establish partnerships with the third parties with a purpose of jointly carrying out digital innovation projects.*

**Keywords:** digital transformation, digital maturity, sourcing decisions

**Correspondence to:**

Daria Arkhipova Dept. of Management, Ca' Foscari University of Venice
San Giobbe, Cannaregio 873
30121 Venice, Italy
E-mail: daria.arkhipova@unive.it

## 1. INTRODUCTION

Over the past decade, both scholars and practitioners emphasized the growing importance of digital transformation as a means for achieving and sustaining competitive advantage (Pavlou and El Sawy, 2010; Fitzgerald et al., 2013;). As a result, organizational IT departments – and senior-level IT executives as their primary representatives - have been demanded to lead and execute the process of transformation, and many have acknowledged the challenges associated with this new role (Westerman and Weill, 2004; Chen et al., 2010). First, as leaders of the transformation, IT executives find themselves under ever increasing pressure to "determine the values and cultures of the IT function and instil the belief that an IT's staff first duty is to the contribution of achieving business solutions" (Feeny and Wilcocks, 1999). To that end, the intrinsic beliefs of IT executives as to which capabilities need to be prioritized set an overall direction for the organizational IT function and eventually define which level of "digital maturity" the company will be able to achieve.

Second, organizational IT is expected to go beyond its traditional role as a "functional subordinate to business" and to participate in digital innovation process *on a par* with the business instead (Zwieg et al., 2006; Simon, 2007; Heart et al., 2010; Wilkerson, 2012; Bharadwaj et al., 2013; Wu et al., 2015). Doing so requires an entirely new set of competences from IT that might be not readily available internally. To address the resultant capability gap, IT managers may choose to access lacking capabilities externally by building value-enhancing partnerships with the third-parties in order to jointly develop innovations of strategic importance (Weeks and Feeny, 2008; Lacity and Wilcocks, 2013; Oshri et al., 2015; Aubert et al., 2015).

Given the amount of attention these themes have received in the business press (Westerman et al., 2012; Kiron, 2017; Kane, 2017; Weill and Woerner, 2018), we hypothesize that the extent to which IT managers will be predisposed to involve external third-parties in the digital innovation processes depends on the level of digital maturity of the whole organization.

In what follows, we develop and empirically analyse a theoretical model that examines the antecedents of digital maturity, in terms of skills and competences prioritized within IT, and the decision to involve external third parties in digital transformation projects. Digitally mature organizations demonstrate low tolerance towards skill gaps and take immediate actions to develop the skills necessary to benefit from the digital trends (Kane et al, 2015). Moreover, according to Grigoriou and Rothaermel (2016) the effectiveness of external knowledge sourcing depends on the properties and combination of internal knowledge.

We use structural equation modelling technique to test our propositions using the survey data from IT executives on self-reported importance scores they assign to different ICT competences. We employ European e-competences framework for ICT professionals (http://www.ecompetences.eu/) to develop competence-related measures.

Our results demonstrate that the relationship between the managerial beliefs regarding the importance of ICT competences and the degree of digital maturity is competence-specific. We find that assigning higher importance to strategic planning and management aspects in the IT function leads to higher levels of digital maturity. Conversely, placing excessive importance on operational support activities was found to be characteristic of the companies that are lagging behind with respect to digital maturity. With regards to sourcing decisions, we find that digitally mature companies are more likely to establish partnerships with the third parties to extract business value from the third-party collaborations. Our results support the argument that "developing digital innovation capability requires fundamentally rethinking how the business is organized, how it makes decisions, with whom it partners, and how those partnerships are managed … managing innovation concerns by opening up opportunities for collaboration with external partners without disturbing existing internal innovation practices" (Svahn et al., 2017).

The paper is organized as follows. We start by reviewing the extant literature on the specifics of digital transformation and capability sourcing decisions as well as examine the types of competences that a modern IT professional is expected to possess to perform her job. Next, we formulate a set of hypotheses and devise a structural model. We conclude by discussing our results and their theoretical and practical implications.

## 2. BACKGROUND

### Digital enterprise and digital maturity concepts

The notions of "digital" and "technology innovation" have become nearly synonymous – partly due to the etymology of the term "digital", partly because almost any type of innovation nowadays is underpinned by technology. Yet, from an academic standpoint, using these two terms interchangeably appears to be imprecise as the former has a set of distinctive characteristics that go beyond a simple "technology-enabled innovation" and thus calls for a more elaborate definition.

A digital enterprise can be defined as an enterprise that has the following four characteristics (Corso et al, 2017):

(1) a company is able to easily adapt to a continuously changing environment;

(2) a company sets ambitious goals and constantly challenges the status quo;

(3) a company's decision-making is driven by innovative thinking and relies on a deep knowledge of the external market;

(4) a company uses technology in order to maximize both the strategic and the operational value and gain a significant competitive advantage.

Once the term is defined, however, the next question then becomes of whether – and indeed, how – digital maturity can be measured and whether the traditional, innovation-related measures still apply or need to be revisited to capture the specifics of digital innovation. As the concept of digital maturity has initially originated from in the practitioners' literature, most of the existing measurements are limited to executives' self-assessment of the digital maturity levels of their organizations with respect to the industry peers (Catlin et al., 2015; Westerman et al., 2012; Kane et al., 2017). Although we recognize the benefits of using a self-reported single measure, they are prone to respondents' cognitive biases and subjective interpretations. To that end, we have identified nine items that reflect the multi-dimensional nature of the large-scale transition from a traditional to digital enterprise.

*Digital product innovation.* One of the most straightforward elements of the digitally mature organization relates to introducing new digital products and services. The distinguishing feature of the digital transformation, however, is that customer-centric digital innovation has become equally imperative for companies in high-tech and non-tech industry sectors. A digitally mature enterprise thus will have a certain degree of familiarity with developing new, technology-enabled value propositions to its customers.

*Digital process innovation.* Whereas IT-enabled automation of the existing processes (e.g. paper-based or manual tasks) has been emblematic of the pre-digital age, digital technologies enable organizations to design new, previously unfeasible, organizational or operational processes that can not only drive down costs but also create value. Hence, organizations that introduce new technology-enabled processes can be considered more digitally mature as opposed to those that use technology for marginally improving their old processes.

*IT-business partnership.* The topic of alignment between IT and business has long been central to both academics and practitioners but unlike the past work that regards IT and business as two separate, distinctively different functions that need to be aligned with one another (Henderson and Venkatraman, 1993), an emergent perspective in a digital context implies that IT and business are viewed holistically as an amalgam, with two previously separate functions fused together in a coherent, tightly integrated whole (Arkhipova et al., 2016). In this regard, the extent to which an IT executive is involved in the strategic decision-making serves as an indication of IT being treated as an equal partner as opposed to passively executing the orders from the top management team – which is a sign of digital maturity.

*Ease of new technology integration.* This element of digital maturity captures the degree of technical readiness of a company's information system (IS). That is, digitally mature companies are expected to make investments in technological upgrade of their IT infrastructure to facilitate testing and integration of new hardware or software applications.

*Personalized real-time data availability.* The immediate availability of data to the users in real-time requires a company to collect, store and deliver the data instantaneously – a capability that is becoming mainstream due to the recent technology advancements. What distinguishes a digitally mature enterprise is that it relies on advanced algorithms that personalize the type of data that will be displayed to the user based on her needs and requirements. Doing so simplifies the analytics and decision-making process as it no longer requires the user to search, extract and filter relevant information.

*Agile work processes.* Unlike traditional, waterfall IT project development, agile processes emphasize iterative nature of product development and the importance of customer feedback to minimize the waste of resources and to gear the efforts towards business value creation (Blank, 2013). Hence, organizations that are highly familiar with agile methodologies and use them as their primary work mode demonstrate their intentions to eliminate legacy work processes and become more digitally mature.

*People development.* One of the inevitable consequences of digitalization is that some of the routine parts of the intellectual tasks are being increasingly performed by software. While it can be considered as a legitimate threat of technology-driven job replacement, the recent studies have shown that only selected activities will be handled by technology thus freeing up employee time for performing more value-added tasks (Chui et al., 2016). That is, companies that invest in building the right mindset of their employees facilitate the adoption of new technologies and build a culture which enables people to positively respond to changes thereby increasing the level of their digital maturity.

*Experimentation culture.* Digital transformation requires fundamental rewiring of how organizations "think" and operate, including the authority-based manager-subordinate relationship. Digitally mature companies are characterised by "flat", horizontal organizational structures that value the input and initiative coming from their employees. In implementing such structures, both management and employees need to be comfortable with taking risks without fearing for their job security or reputation. It is only possible in organizations that endorse experimentation attempts and do not penalize employees in case of failure. We therefore consider experimentation culture to be one of the elements of a digitally mature enterprise.

*Data security.* The final characteristic of a digitally mature enterprise relates to the importance that the company places on the activities related to data protection and security. Given that data and information – customer- and internal data alike – are a critical resource for a digital company, demonstrating risk awareness and taking active measures to protect the company from infrastructural vulnerabilities and potential security breaches can be considered as a sign of digital maturity.

**Digital competences**

The research in the domain has advanced in two main directions. First, scholars in IS field have sought to conceptually identify competence categories and assess their relative importance for IT profession. In line with this stream of research, a general consensus has emerged that IT profession increasingly requires business acumen, managerial and interpersonal skills (Feeny and Wilcocks, 1999; Wade and Hulland, 2004; Bullen et al., 2007). The evidence of this trend dates back to 1990s (Cross et al., 1997) but most researchers and practitioners agree that it has been exacerbated in the advent of digital technologies (Bharadwaj et al., 2013; Fichman et al., 2014). That is, as the role of IT within an organization transitions towards strategic partner in innovation, so does the role of a CIO and competences he or she needs to develop to succeed as a leader of digital transformation.

The second line of inquiry investigates the effect of competency and proficiency on firm-level performance and organizational decision making. Tippins and Sohi (2003) examine the relationship between IT competence and firm performance. In doing so, the authors develop a novel conceptualization of IT competency as a combination of IT knowledge, IT operations and IT objects and develop a set of items to measure the construct. Bassellier and Benbasat (2004) use structural model to explain how business competence affects the propensity of IT professionals to form cross-functional partnerships with business colleagues. The authors conceptualize business competence as a construct formed by organizational-specific knowledge, interpersonal and managerial skills. Chen el al (2010) apply exploitation – exploration lens to analyse organizational antecedents and effects in relation to different types of IT leadership. They find that CIOs need to master supply-side, exploitation-focused style of leadership before moving to a more advanced demand-side leadership style aimed at deriving business value from IT. Heart et al (2010) have explored the mediating role of IT managerial capabilities on enterprise adaptability. The summary of the reviewed literature is presented in Table 1.

| Reference | Research objective(s) | Conceptualization of IT competence | Key findings |
|---|---|---|---|
| Feeny and Willcocks (1998) | To develop a framework for planning and structuring IT function in-house | - Business Systems Thinking<br>- Relationship building<br>- Leadership<br>- Informed buying<br>- Contract Facilitation<br>- Vendor Development<br>- Contract Monitoring<br>- Architecture planning<br>- Making technology work | Nine capabilities can be divided in three partially overlapping categories: (1) Business and IT vision, (2) Delivery of IT services) and (3) Design of IT architecture |
| Tippins and Sohi (2003) | - To develop a unified and time-invariant conceptualization of IT competency<br>- To develop an understanding of how IT impacts firm | - IT knowledge<br>- IT operations<br>- IT objects | Organizational learning mediates the relationship between IT competency and firm performance |

| | | | |
|---|---|---|---|
| | performance" | | |
| Bassellier and Benbasat (2004) | - To examine the areas of knowledge that constitute business competence for IT professionals<br>- To explore contribution of business competence of IT professionals to the development of IT-business partnerships | - Organizational-specific<br>  - Organizational overview<br>  - Organizational units<br>  - Organizational responsibility<br>  - IT-business integration<br>- Interpersonal and management<br>  - Interpersonal communication<br>  - Leadership<br>  - Knowledge Networking | Business competence positively impacts the intentions of IT professionals to partner with their business clients |
| Wade and Hulland (2004) | - To understand the role of IS resources and capabilities within the firm through a theoretical lens of resource-based view | Outside-in<br>External relationship management<br>Market responsiveness<br>Spanning<br>IS-business relationships<br>IS planning and change management<br>Inside-Out<br>IS infrastructure<br>IS technical skills<br>IS development<br>Cost effective IS operations | The paper presents a typology of IS resources and formulates a series of propositions to guide empirical research in IS research |
| Bullen, Abraham, Gallagher, Kaiser, and Simon (2007) | - To identify critical IT skills and capabilities to be kept in-house vs. to be sourced through third parties | - Technical<br>- Business domain<br>- Project management<br>- Sourcing<br>- IT administration | Client-facing skills are retained in-house; IT professionals need to maintain a balance between hard, technical skills and soft "business oriented" skills |
| Heart, Maoz and Pliskin (2010) | - To examine the effect of IT executives' managerial capabilities on IT-enabled adaptability | - Ability of IT and organizational management to operate together in developing long- and mid-term plans<br>- Ability to plan, organize and lead complex projects<br>- Ability to coordinate, control and monitor IT projects | Managerial capabilities of IT executives fully mediate the effect of IT governance on enterprise adaptability |
| Chen, Preston and Chia (2010) | - To analyse organizational antecedents and effects in relation to different types of IT leadership using exploitation-exploration theoretical perspective. | Two types of IT leadership:<br>- Supply-side leadership focuses on exploitation of current IT capabilities for meeting existing business needs<br>- Demand-side leadership focuses on unlocking new sources of business value by exploring novel IT-driven opportunities | The paper proposes and empirically tests a staged model according to which CIOs need to demonstrate supply-side operational leadership before moving to a more advanced demand-side leadership |

Table 1. Summary of academic studies on the role of IT competences

Two important observations emerge from the review of the extant IT competence research. First, little agreement between scholars exists with regards to IT competence definitions – most of the papers resort to generic labels (e.g. "technical" or "business" skills) without specifying them in much detail. Second, the proposed definitions of IT competences have undergone minimal modifications over the past decades and this casts some doubts on whether they can adequately capture the type of skills required from IT managers tasked with leading digital transformation.

To that end, in our study we have relied on European e-competences framework to classify and define the competences. According to the framework, the competences required for IT professionals can be grouped into five categories[1]. Differently from most of the existing frameworks that classify competences based on their functional characteristics (technical, managerial, interpersonal), e-competence framework departs from the set of *activities* that need to be performed within IT.

The first competence group encompasses activities related to planning and designing IT systems and aligning them with the overall business strategy. These activities are strategic in nature and require understanding overall vision, setting goals and establishing an overall direction for the company's IT. We hereafter refer to these as "*strategic planning*" competences. Competences such as innovation and ability to monitor technology trends also make part of this category.

The second group of competences is largely technical in nature as it includes activities directly related to developing and deploying IT applications. It requires "hard" skills such as programming, knowledge of hardware and software components and systems integration. We refer to this category as "*technical development*".

The third competence group relates to support activities that need to be performed after a new hardware or software has been deployed. This category – hereafter referred to as "*operational support*" - includes competences such as user support, service delivery, change and problem management. As with the "technical development" category, operational support requires a certain degree of functional and technical knowledge of information systems. What distinguishes operational support is that in addition it requires skills related to user interaction and knowledge of organizational procedures.

The fourth competence group relates to the type of activities that go beyond the primary mission of IT in its traditional sense but are indispensable for enabling smooth IT operation. These activities are more area-specific and define the relationship IT department with its employees, with other departments within the same firm as well as with the external partners along the industry value chain.

[1] The original competence categories are named as follows: plan, build, run, enable and manage. For the purpose of this academic publication, we adjust the category titles in order to capture better the type of competences that each of the categories encompasses.

On the internal side, activities include developing firm-level IT security strategy and promoting it across the entire organisation; identifying and addressing organizational IT skills gaps and devising policies for information storage, analytics and distribution. On the external side, activities are related to interacting and managing IT relationships with other entities outside the boundaries of the firm and encompass activities such as purchasing, sales, channel and contract management. We refer to this category of skills as "IT enablement".

Finally, the fifth group of competences relates to "IT management" skills. The category involves a series of activities that deal with the actual implementation of the existing ICT policies with regards to quality, risk and business change. Furthermore, these activities involve measuring the effectiveness of the existing organizational IT-enabled processes and continuously seeking out opportunities for further improvement.

The existing research suggests that the role of IT manager within an organisation has gradually shifted from a technology supplier to strategic partner. Such shift will thus require a new set of competences which are more related to business, strategy and innovation and less related to operational tasks of building and deploying software. Hence, we posit:

*H1: The more importance IT manager assigns to strategic planning competences in her job, the higher the degree of digital maturity*

*H2: The more importance IT manager assigns to technical development competences in her job, the lower the degree of digital maturity*

*H3: The more importance IT manager assigns to operational support competences in her job, the lower the degree of digital maturity*

Not only IT managers are required to have innovative ideas for the business but are expected to implement them within the realm of an existing organization. To that end, IT managers are tasked with creating initial starting conditions that would enable them to introduce new innovations and timely spot the gaps that might hinder digital innovation. Their ability to establish relationships with technology suppliers and negotiate favourable conditions thus facilitates access to new technologies and increases the digital maturity of her respective ICT department. Hence, we posit:

*H4: The more importance IT manager assigns to IT enablement competences in her job, the higher the degree of digital maturity*

Furthermore, as digital technology landscape is in perpetual flux, the recently updated processes or innovations can become obsolete or be displaced by a new technology. The ability of IT manager to timely identify the existing inefficiencies and measure the effectiveness of the process becomes important for digital maturity. Hence, we posit:

*H5: The more importance IT manager assigns to IT management competences in her job, the higher the degree of digital maturity.*

**Sourcing decisions in digital transformation projects**

Recent theoretical work has provided a more nuanced understanding of the factors that determine the use of external sourcing in building new knowledge (Kale et al, 2002; Rothaermel and Deeds, 2004) and of the modes that facilitate integration of new knowledge and increase the effectiveness of combining internal and external sourcing modes (Chesbrough, 2003; Parmigiani and Mitchell, 2009; Capron and Mitchell, 2009). To that end, one of key determinants that drive the external sourcing decision relates to the difference in the existing internal capability levels (Jacobides and Hitt, 2005; Kogut and Zander, 1992). Furthermore, the extent to which a firm will be able to leverage the complementarities between external and internal knowledge sourcing has been attributed to the firm's absorptive capacity (Cohen and Levinthal, 1990), the type of the firm's prior experience (Hoang and Rothaermel, 2010), and the firm's ability to recombine knowledge and reduce knowledge coordination costs (Grigoriou and Rothaermel, 2017).

Oshri and others (2015) investigated that client–supplier relationships play a major role in facilitating strategic innovation through outsourcing, suggesting that strategic innovation happens under certain conditions. In this study we examine whether digital maturity of an organization affects the decision to source capabilities externally in digital transformation projects.

Indeed, such logic is being challenged in digital transformation projects for several reasons. First, because digital transformation is relatively novel to the companies in most industries, IT departments may not have developed a sufficient expertise internally yet and therefore may need to access a range of capabilities externally until they develop these skills to the extent that the reliance on third parties is no longer required. Second, the dynamic nature of technology development brings uncertainty with regards to whether today's "core" competences will remain critical and relevant for the business in the long run. Hence, in times of uncertainly, instead of putting themselves at the risk of investing time and effort in building skills that may soon become obsolete, companies are likely to access these skills through partnerships with specialized third parties (Lacity et al., 2010; Aubert et al., 2015). Third, thanks to cloud technologies, many IT functions that traditionally have been kept in-house are now possible to procure from the outside for a smaller cost without compromising on service security and reliability. Finally, digital transformation projects are not strictly finite – as new technologies continue to emerge, IT managers will be expected to learn continuously thus making "keep core capabilities in-house" goal difficult to achieve and suggesting yet another argument in favour of third-party involvement.

The extent to which an IT manager is willing to engage external partners in devising innovative solutions and the ability to successfully manage third-party involvement in innovation, so we argue, will depend on the degree of digital maturity. Such "open" arrangements require the right mindset as it inevitably requires IT manager to relinquish some of her control. Furthermore, their successful outcomes depend on whether IT leader is able to evaluate the likelihood of potential business outcomes and is familiar with agile modes of coordinating collaborative activities. Hence, we posit:

*H6: The higher the degree of digital maturity, the higher the degree third-party involvement in digital innovation*

The complete theoretical model with hypothesized paths is depicted in Figure 1.

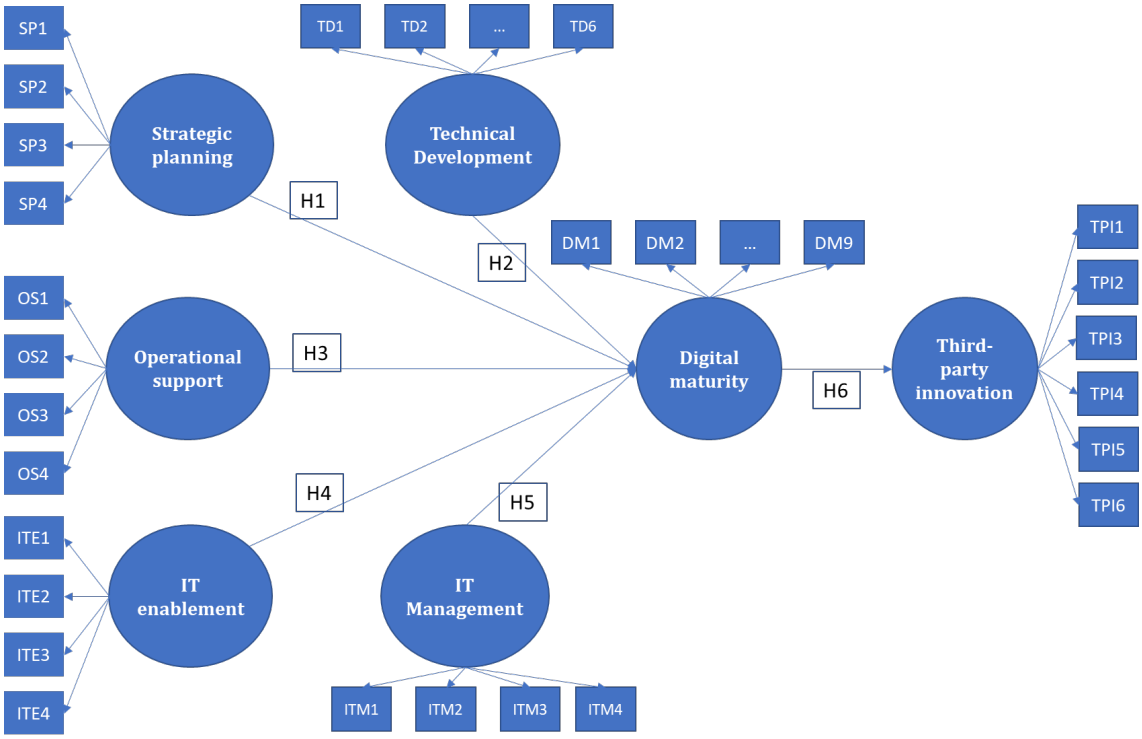


Figure 1. Conceptual path model

## 3. DATA AND METHOD

We have relied on survey method to collect our data. Our data comes from two different sources. First, we have solicited help from an independent market research firm for reaching out to the broader pool of respondents with the specifics characteristics we were interested in. Second, we have sent out the survey to the contacts of the Digital Enterprise Lab (DEL) of Ca' Foscari University of Venice. In both instances, our respondents were based in Italy and at a time of completing the survey occupied a senior managerial role in information technology department of their respective enterprise. We have obtained 105 observations in total.

To qualify for taking part in the survey, each respondent was asked to answer a series of screening questions. First, we were interested only in respondents that were employed in companies that have carried out or have been considering carrying out a digital transformation initiative. Second, to minimize the risk of non-response or randomizing, our respondents were supposed to be involved in the digital transformation initiative their companies were carrying out. Third, our respondents were supposed to be familiar with the involvement of the third parties in the process of digital transformation. Failure to respond affirmatively to the first and second screening questions or choosing an "I do not know" response option for the third screening question resulted in the exclusion of a respondent from the survey.

An overview of the key sample characteristics is presented in Table 2.

| Sample characteristics | | Frequency | Percentage, % |
|---|---|---|---|
| Country | Italy | 105 | 100 |
| Industry sector | Retail, distribution and transport | 8 | 7.62 |
| | Manufacturing | 16 | 15.24 |
| | Financial and professional services | 9 | 8.57 |
| | Public sector, defense and education | 7 | 6.67 |
| | ICT | 52 | 49.52 |
| | Resources, utilities and construction | 4 | 3.81 |
| | Others | 9 | 8.57 |
| Revenue | Less than €2 millions | 1 | 0.95 |
| | €2 millions - €10 millions | 21 | 20.00 |
| | €10 millions - €50 millions | 33 | 31.43 |
| | More than €50 millions | 47 | 44.76 |
| | No answer | 3 | 2.86 |
| Firm size | Small (< 250 employees) | 11 | 10.48 |
| | Medium-large (250-999 employees) | 48 | 45.71 |
| | Large (1,000-3,000 employees) | 30 | 28.57 |
| | Extremely large (>3,000 employees) | 16 | 15.24 |

Table 2: Sample characteristics

**Exogenous variables**

Our model includes five exogenous competence-related variables: (1) strategic planning, (2) technical development, (3) operational support, (4) IT enablement and (5) IT management. As a point of departure, we have used the list of 40 competences identified for professionals in information technology and communication (ICT) domain by the European e-Competence Framework. In the questionnaire, our respondents were asked to assign an importance score for each competence for their job on a scale from 1 ("this skill is not at all important") to 4 ("this skill is critical"). We have retained the original classification of the competences into five main ICT business areas, as proposed by the Framework, but have modified the variable labels such as to conform with terminology used in the prior academic research. As a result, the number of measurement items per construct initially varied from four to 12. To refine our measures, we used the results of convergent and discriminant validity tests as a guidance for dropping and retaining the items for each construct (see the next section for more details).

**Endogenous variables**

Given that no prior well-established measures have existed for *digital maturity* in the academic literature, we have developed measurement scales specifically for this study. In so doing, we have followed three steps. As a first step, we have reviewed academic and practitioners' literature to gain a more nuanced understanding of the critical aspects of digital transformation and of what distinguishes a digitally mature enterprise from a digital "novice". Next, based on the literature review, we have developed a set of six measurement items and have validated them in a series of interviews with four senior-level managers with an extensive expertise in digital transformation and IT. Finally, our research team has critically evaluated the professionals' feedback, modified a set of existing items thereupon and added three new items that have surfaced during the interviews. As a result, the construct of digital maturity was measured using a nine-item five-point Likert scale where 1 corresponded to "completely disagree" and 5 – to "completely agree" response options, respectively.

With regards to *third-party involvement in digital transformation*, we have adapted the measure of strategic innovation used in IS research (Jansen et al., 2006; Oshri et al., 2015). Whereas the original scale was used to measure innovation without making a specific reference to whether these innovations were digital or not, the modified scale was intended to elicit responses as to whether third parties were involved in the process of identifying an opportunity, co-developing and eventually jointly introducing new *digital* products on the market as well as experimenting with digital business models and digitalizing internal operations. The construct was measured by using six-item five-point Likert scale.

## 4. ANALYSIS AND RESULTS

To test our hypotheses, we have relied on partial-least squares structural equation modelling (PLS SEM) technique[2]. Because PLS-SEM uses nonparametric bootstrapping procedure to test the significance of the relationships between the variables, it does not require the data to be normally distributed and allows to run the analysis for datasets with less than 200 observations (Chin, 1998; Hair et al., 2011). Hence, the choice of PLS-SEM method for analysis was deemed to be more appropriate for our dataset compared to more widely adopted, covariance-based SEM procedures.

**Measurement model**

Before we proceed to testing the hypothesized internal relationships between the variables, we need to establish convergent and discriminant validity of the latent constructs included in our model first. We used *reflective* indicators to measure all our constructs – the assumption being that the changes in the individual indicators are caused by the variance in the focal latent construct and co-vary in the same direction (MacKenzie et al., 2011). Using the reflective scale determines the type of tests that need to be performed to validate the construct.

Table 3 reports convergent validity and internal consistency values for the five exogenous, competence-related constructs. It is noteworthy that Table 3 deliberately omits the information about the dropped indicators that failed to meet the accepted criteria and includes only those indicators that passed the validity tests. To establish convergent validity, we started by analysing the magnitude and significance of the factor loadings for each construct first. As can be inferred from the table, we have retained only those indicators whose factor loadings were equal or exceeded the recommended threshold of 0.7 and were statistically significant at $p<0.01$. Next, we analysed average variance extracted (AVE) for each construct. Following MacKenzie et al (2011), the calculated values of AVE should exceed the value of 0.5 to allow us to conclude that the amount of variance captured by the focal construct from its indicators is larger than the amount of variance caused by the measurement error. The reported AVE values for all constructs meet this criterion. Finally, we used Cronbach α and composite reliability (CR) scores to establish internal consistency between the constituent indicators for each construct. For each construct, both values pass the acceptance criteria as they exceed or are equal to 0.7.

[2] Ringle, Christian M., Wende, Sven, and Will, Alexander (2005). SmartPLS 2.0.M3. Hamburg: SmartPLS, http://www.smartpls.de.

| **Reflective constructs: exogenous** | Factor loadings (*** p<0.01) | Cronbach α | CR | AVE |
|---|---|---|---|---|
| **Strategic planning (plan)** | | **0.697** | **0.815** | **0.524** |
| Business Plan Development | 0.694*** | | | |
| Product/Service Planning | 0.735*** | | | |
| Technology Trend Monitoring | 0.709*** | | | |
| Innovating | 0.757*** | | | |
| **Technical development (build)** | | **0.877** | **0.907** | **0.662** |
| Application Development | 0.815*** | | | |
| Component Integration | 0.811*** | | | |
| Testing | 0.814*** | | | |
| Solution Deployment | 0.779*** | | | |
| Systems Engineering | 0.846*** | | | |
| **Operational support (run)** | | **0.796** | **0.863** | **0.612** |
| User support | 0.719*** | | | |
| Change support | 0.789*** | | | |
| Service Delivery | 0.794*** | | | |
| Problem Management | 0.824*** | | | |
| **IT enablement (enable)** | | **0.727** | **0.828** | **0.547** |
| Information Security Strategy Development | 0.787*** | | | |
| Information and Knowledge Management | 0.743*** | | | |
| Needs Identification | 0.767*** | | | |
| Sales Proposal Development | 0.656*** | | | |
| **IT management (manage)** | | **0.766** | **0.850** | **0.588** |
| Relationship Management | 0.692*** | | | |
| Business Change Management | 0.709*** | | | |
| Information Security Management | 0.827*** | | | |
| IS Governance | 0.829*** | | | |

Table 3: Convergent validity assessment criteria for the exogenous variables

Similarly, Table 4 contains convergent validity assessment for the two endogenous variables – digital maturity and third-party innovation. To decide whether a certain indicator needs to be retained or dropped, we have followed the exact same procedure and were guided by the identical cut-off value recommendations as in case of exogenous variables. As a result, we have retained all the items for the digital maturity construct and all but one item for third-party innovation construct (Digital Process Innovation item, not reported here). As it can be inferred from the Table 4, convergent validity and internal consistency have been established for both endogenous variables.

| **Reflective constructs: endogenous** | Factor loadings (*** p<0.01) | Cronbach α | CR | AVE |
|---|---|---|---|---|
| **Digital Maturity** | | **0.930** | **0.941** | **0.641** |
| Product Innovation | 0.778*** | | | |
| Process Innovation | 0.785*** | | | |
| IT-business partnership | 0.808*** | | | |
| New application integration | 0.725*** | | | |
| Personalized real-time data | 0.731*** | | | |
| Agile work processes | 0.819*** | | | |
| People development | 0.835*** | | | |
| Experimentation culture | 0.826*** | | | |
| Data security | 0.887*** | | | |
| **Third-party innovation** | | **0.788** | **0.854** | **0.540** |
| New digital products development | 0.777*** | | | |
| Digital product experimentation | 0.721*** | | | |
| Digital business model design | 0.774*** | | | |
| New digital product commercialisation | 0.689*** | | | |
| New market opportunity identification | 0.701*** | | | |

Table 4: Convergent validity assessment criteria for the endogenous constructs

To establish discriminant validity of our constructs we have analyzed cross-factor loadings, Fornell-Larcker criterion (Fornell and Larcker, 1981) and heterotrait-monotrait (HTMT) correlation ratio (Henseler et al., 2015). The core idea behind cross-factor loading analysis is that the loading of each indicator should be higher on the respective focal construct it intends to measure than on the other constructs in the model. The results (not reported here) demonstrate that the differences between factor and cross-factor loadings exceed 0.2 for all indicators thus suggesting that discriminant validity has been established. The results of Fornell-Larcker criterion reported in the left-hand side of Table 5 provide additional evidence in support of discriminant validity because the values of $\sqrt{AVE}$ for each construct (diagonal values in bold font) are larger than the values of pairwise correlations between the focal construct and other constructs in the model (off-diagonal values). Finally, HTMT criterion requires the ratio between the average of the correlations between indicators measuring different constructs and the average of the correlations between indicators measuring the same construct to be lower than 0.9 (Henseler et al., 2015). The results reported in the right-hand side of Table 5 demonstrate that, with the exception of one, HTMT ratio values do not exceed the threshold value. We can therefore conclude that the discriminant validity has been established for all constructs in our model based on the three different criteria.

| | Fornell-Larcker Criterion | | | | | | | Heterotrait-Monotrait Ratio (HTMT) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **1. Strategic planning** | **0.724** | | | | | | | | | | | | | |
| **2. Technical development** | 0.313 | **0.813** | | | | | | 0.380 | | | | | | |
| **3. Operational support** | 0.414 | 0.762 | **0.782** | | | | | 0.549 | 0.909 | | | | | |
| **4. IT enablement** | 0.454 | 0.561 | 0.571 | **0.740** | | | | 0.636 | 0.694 | 0.761 | | | | |
| **5. IT management** | 0.588 | 0.481 | 0.585 | 0.576 | **0.767** | | | 0.807 | 0.557 | 0.729 | 0.795 | | | |
| **6. Digital maturity** | 0.483 | 0.290 | 0.195 | 0.358 | 0.427 | **0.801** | | 0.581 | 0.298 | 0.205 | 0.416 | 0.492 | | |
| **7. Third-party innovation** | 0.377 | 0.462 | 0.473 | 0.406 | 0.396 | 0.477 | **0.735** | 0.510 | 0.538 | 0.580 | 0.549 | 0.523 | 0.536 | |

Table 5: Discriminant validity assessment criteria for the reflective constructs. Off-diagonal values are the correlations between the constructs in our model

### Structural model

After having established the construct and measurement validity of the latent constructs, we continue using PLS path modelling to examine the hypothesized relationship between them. We start by analysing the model that simultaneously evaluates direct paths from the five exogenous variables to digital maturity as well as a direct path from digital maturity to third-party innovation (Table 6). The five exogenous competence variables jointly explain 32% of variance in digital maturity. The results indicate that strategic planning has a positive and strongly significant effect on digital maturity ($b=0.362$, $p<0.01$) thus providing support for Hypothesis 1. Furthermore, operational support was found to be negatively associated with digital maturity ($b=-0.373$, $p<0.01$) thus providing evidence in support of Hypothesis 3. Our model also provides moderate support for Hypothesis 5 indicating the presence of positive relationship between IT management variable and digital maturity ($b=0.229$, $p<0.05$). Contrary to our expectations, we did not find empirical support for hypothesis 2 and 4, thus suggesting that there is no statistically significant relationship between either technical development or IT enablement and digital maturity, respectively.

With regards to Hypothesis 6, we found a positive and statistically significant relationship between the level of digital maturity and the degree of third-party involvement in digital transformation projects ($b=0.477$, $p<0.01$).

| ***Hypothesized direct paths*** | **Path coefficients** |
|---|---|
| Strategic planning -> Digital maturity (H1) | 0.362***<br>(0.117) |
| Technical development -> Digital maturity (H2) | 0.288<br>(0.157) |
| Operational support -> Digital maturity (H3) | -0.373***<br>(0.136) |
| IT enablement -> Digital maturity (H4) | 0.113<br>(0.088) |
| IT management -> Digital Maturity (H5) | 0.229**<br>(0.109) |
| Digital maturity -> Third-party innovation (H6) | 0.477***<br>(0.079) |
| ***Specific Indirect Effects*** | |
| Strategic planning -> Digital maturity -> Third-party innovation | 0.173***<br>(0.063) |
| Technical development -> Digital maturity -> Third-party innovation | 0.137<br>(0.084) |
| Operational support -> Digital maturity -> Third-party innovation | -0.178***<br>(0.071) |
| IT enablement -> Digital maturity -> Third-party innovation | 0.054<br>(0.045) |
| IT management -> Digital Maturity -> Third-party innovation | 0.109<br>(0.059) |
| $R^2$ (Digital maturity) | 0.324 |
| $R^2$ (Third-party innovation) | 0.227 |

Table 6: PLS-SEM path coefficients: standard errors in parentheses; *** p<0.01, ** p<0.05. $R^2$ calculates the amount of variance explained in endogenous latent variable(s) and serves as an approximate measure of the goodness of model fit (Garson 2012)

An *ex-post* analysis also revealed the presence of statistically significant indirect effects between strategic planning (b=0.173, p<0.01) and operational support (b=-0.178, p<0.01) and third-party innovation, respectively[3]. To examine whether digital maturity mediates the relationship between the

[3] We have used the bootstrapping procedure proposed by MacKinnon et al (2004) to verify whether the mediation effect of digital maturity is statistically significant. Differently from the traditional four-step procedure by Baron and Kenny (1986) that necessarily requires the direct path between independent and

perceived competence importance and third-party involvement in digital transformation, we have temporarily removed the digital maturity construct and have run the model including only direct paths between five competency constructs and the third-party involvement. The results have demonstrated that none of the antecedent competence variables had a significant direct effect on the third-party involvement thus suggesting that achieving a certain degree of digital maturity is an important step between recognizing the value of IT competences for building a digital enterprise and involving external companies in the process of digital transformation.

dependent variables to be significant, bootstrapping procedure relaxes this assumption. Instead, the bootstrapping procedure requires generating a large number of samples with replacement and estimating indirect effect for each sample. The obtained values were then ranked from highest to lowest and confidence intervals were calculated – as the confidence interval excluded zero, we were able to conclude that the observed indirect effect is significant (MacKinnon et al., 2004).

## 5. DISCUSSION AND CONCLUSION

Our findings have a series of theoretical and practical implications for companies embracing the digital transformation and using outsourcing as a strategic tool to leverage innovation.

Our first set of results identifies the type of activities that need to be prioritized in IT departments in the context of digital transformation.

First, we have empirically confirmed that IT managers' beliefs regarding the importance of strategy-making and management activities for their job are imperative for achieving digital maturity. This evidence implies that in addition to strategic "planning" functions, IT leaders need to acknowledge the importance of the execution side of digital transformation. A clear understanding of the practical aspects of the large-scale digital transformation projects and familiarity with tools and mechanisms facilitating their execution are important for achieving digital maturity and extracting value from digital transformation initiatives. To sum up, whereas developing business acumen and strategic vision are necessary at the planning stage of digital transformation, building effective governance mechanisms and performance control systems become crucial at the implementation phase.

Conversely, we found that companies in which CIOs perceive providing operational support to business as their primary responsibility exhibit lower levels of digital maturity. That is, by adhering to a legacy of "backroom support" mindset, CIOs continue operating in silos and instilling cultural values which thwart the success of transformational initiatives. Surprisingly, we found no empirical evidence for the importance of activities from either technological development or IT enablement categories for digital maturity. As for the former, the possible explanation is that technical development of applications and related coding work has been procured from specialized providers even in the periods preceding digital era, and so whether or not these capabilities are retained important by CIOs remains irrelevant for digital transformation. Regarding the latter, the possible explanation is that IT enablement activities require the involvement of other organizational functions (e.g. procurement, HR) and therefore CIOs' individual beliefs about their respective importance do not directly affect digital maturity.

Our second set of results emphasizes the role of digital maturity in involving third parties in digital transformation projects. We find that digitally mature companies are more likely to co-create new products and services jointly with other companies within the industry ecosystem. The explanations of the observed results are several.

First, digitally mature companies have a clear vision of how to use technology for business value creation. As a result, they have an understanding of why external sourcing is required and which capability gaps they seek to address (Capron and Mitchell, 2009). Second, they nurture the type of

behaviour among their employees that emphasises the value of learning, sharing and collaboration thus facilitating the absorption of new knowledge (Rothaemel and Alexandre, 2009). Third, digital enterprises have more nimble governance structures and work processes in place that help to eliminate inefficiencies in communication and coordination of activities across two or more external stakeholders. As a result, they are more likely to reduce waste and obtain tangible outcomes. Last but not least, digitally mature companies have technology and infrastructure systems that enables them to test innovative solutions in a quick and responsible manner without making large investments up-front. Doing so also allows the company to obtain user feedback early on and reduce the risk of failure of a digital innovation.

Finally, with regards to the relationship between CIOs' priorities and the decision to source competences externally we have uncovered a more complex mechanism. That is, when it comes to digital transformation, the CIOs' beliefs of what capabilities are more or less important for the IT function seem to not directly affect the degree of third-party involvement in digital innovation. Instead, this relationship is contingent on the type of capability prioritized within IT and is mediated by the degree of digital maturity the company has managed to achieve.

## REFERENCES


Arkhipova, D., Vaia, G., DeLone, W. and Braghin, C., 2016. IT Governance in the Digital Era. Department of Management, Università Ca' Foscari Venezia Working Paper No. 2016/12. Available at SSRN: http://ssrn.com/abstract=2847809

Aubert, B.A., Kishore, R. and Iriyama, A., 2015. Exploring and managing the "innovation through outsourcing" paradox. *The Journal of Strategic Information Systems*, 24(4), pp.255-269.

Bassellier, G. and Benbasat, I., 2004. Business competence of information technology professionals: Conceptual development and influence on IT-business partnerships. *MIS quarterly*, pp.673-694.

Blank, S., 2013. Why the lean start-up changes everything. *Harvard business review*, 91(5), pp.63-72.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. V. (2013). Digital business strategy: toward a next generation of insights. MIS Quarterly, 37 (2), 471-482.

Bullen, C.V., Abraham, T., Gallagher, K., Kaiser, K.M. and Simon, J., 2007. Changing IT skills: The impact of sourcing strategies on in-house capability requirements. *Journal of Electronic Commerce in Organizations*, 5(2), p.24.

Carr, N. G. (2003). IT doesn't matter. *Harvard Business Review*, 38, 24-38.

Capron, L. and Mitchell, W., 2009. Selection capability: How capability gaps and internal social frictions affect internal and external strategic renewal. *Organization Science*, 20(2), pp.294-312.

Catlin, T., Scanlan, J. and Willmott, P., 2015. Raising your digital quotient. *McKinsey Quarterly*.

Chin W.W. (1998) "The partial least squares approach to structural equation modeling", *Modern methods for business research*, 295(2), 295-336.

Chen, D.Q., Preston, D.S. and Xia, W., 2010. Antecedents and effects of CIO supply-side and demand-side leadership: A staged maturity model. Journal of Management Information Systems, 27(1), pp.231-272.

Chesbrough, H., 2003. The logic of open innovation: managing intellectual property. *California Management Review*, 45(3), pp.33-58.

Corso, M., Giovannetti, G., Guglielmi, L. and Vaia, G., 2018. Conceiving and Implementing the Digital Organization. In CIOs and the Digital Transformation (pp. 181-203). Springer, Cham.

Feeny, D.F. and Willcocks, L.P., 1998. Core IS capabilities for exploiting information technology. Sloan management review, 39(3), p.9.

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

Fichman, R. G., Dos Santos, B. L., & Zheng, Z. E. (2014). Digital innovation as a fundamental and powerful concept in the information Systems curriculum. *MIS quarterly*, 38(2).

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

Grigoriou, K. and Rothaermel, F.T., 2017. Organizing for knowledge generation: internal knowledge networks and the contingent effect of external knowledge sourcing. *Strategic Management Journal*, 38(2), pp.395-414.

Hair J.F., Ringle C.M. and Sarstedt M. (2011) “PLS-SEM: Indeed a silver bullet”, *Journal of Marketing Theory and Practice*, 19(2), 139-152.

Heart, T., Maoz, H., & Pliskin, N. (2010). From governance to adaptability: The mediating effect of IT executives' managerial capabilities. *Information Systems Management*, 27(1), 42-60.

Henderson, J.C. and Venkatraman, H., 1993. Strategic alignment: Leveraging information technology for transforming organizations. *IBM systems journal*, 32(1), pp.472-484.

Henseler J., Ringle C.M. and Sarstedt M. (2015) “A New Criterion for Assessing Discriminant Validity in Variance-based Structural Equation Modeling”, *Journal of the Academy of Marketing Science*, 43(1), 115-135.

Hoang, H.A. and Rothaermel, F.T., 2010. Leveraging internal and external experience: exploration, exploitation, and R&D project performance. Strategic Management Journal, 31(7), pp.734-758.

Jansen, J.J., Van Den Bosch, F.A. and Volberda, H.W., 2006. Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management science*, 52(11), pp.1661-1674.

Kale, P., Dyer, J.H. and Singh, H., 2002. Alliance capability, stock market response, and long□term alliance success: the role of the alliance function. *Strategic Management Journal*, 23(8), pp.747-767.

Kane, Gerald C. "Digital Maturity, Not Digital Transformation." *MIT Sloan Management Review* 1 (2017).

Kiron, David. "Why Your Company Needs More Collaboration." *MIT Sloan Management Review* 59, no. 1 (2017): 17.

Lacity M.C., Khan S., Yan A. and Willcocks L.P. (2010) “A review of the IT outsourcing empirical literature and future research directions”, *Journal of Information Technology*, 25(4), 395-433.

Lacity M.C. and Willcocks L.P. (2013) “Beyond Cost Savings: Outsourcing Business Processes for Innovation”, *Sloan Management Review*, 54(3), 63-69.

Lepak, D. P., & Snell, S. A. (1999). The human resource architecture: Toward a theory of human capital allocation and development. *Academy of management review*, *24*(1), 31-48.

MacKinnon, D.P., Lockwood, C.M. and Williams, J., 2004. Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate behavioral research*, 39(1), pp.99-128.

MacKenzie S.B., Podsakoff P.M. and Podsakoff N.P. (2011) “Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques”, MIS Quarterly, 35(2), 293-334.

Oshri, I., Kotlarsky, J., & Gerbasi, A. (2015). Strategic innovation through outsourcing: the role of relational and contractual governance. The Journal of Strategic Information Systems, 24(3), 203-216.

Parmigiani, A. and Mitchell, W., 2009. Complementarity, capabilities, and the boundaries of the firm: the impact of within□firm and interfirm expertise on concurrent sourcing of complementary components. *Strategic Management Journal*, 30(10), pp.1065-1091.

Pavlou, P. A., & El Sawy, O. A. (2010). The “third hand”: IT-enabled competitive advantage in turbulence through improvisational capabilities. *Information systems research*, 21(3), 443-471.

Ringle, Christian M., Wende, Sven, and Will, Alexander (2005). SmartPLS 2.0.M3. Hamburg: SmartPLS, http://www.smartpls.de.

Rothaermel, F.T. and Deeds, D.L., 2004. Exploration and exploitation alliances in biotechnology: A system of new product development. *Strategic management journal*, 25(3), pp.201-221.

Rothaermel, F.T. and Alexandre, M.T., 2009. Ambidexterity in technology sourcing: The moderating role of absorptive capacity. Organization science, 20(4), pp.759-780.

Smith, K. G., Collins, C. J., & Clark, K. D. (2005). Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Academy of management journal*, *48*(2), 346-357.

Simon, J. C., Kaiser, K. M., Beath, C., Goles, T., & Gallagher, K. (2007). Information technology workforce skills: Does size matter?. *Information Systems Management*, *24*(4), 345-359

Svahn, F., Mathiassen, L. and Lindgren, R., 2017. Embracing Digital Innovation in Incumbent Firms: How Volvo Cars Managed Competing Concerns. *MIS Quarterly*, 41(1).

Wade, M. and Hulland, J., 2004. The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS quarterly*, 28(1), pp.107-142.

Weeks, M.R. and Feeny, D., 2008. Outsourcing: From cost management to innovation and business value. California management review, 50(4), pp.127-146.

Westerman, G. and Weill, P., 2004. What are the key capabilities of effective CIOs. Center for Information Systems Research, MIT, Cambridge.

Westerman, G., Tannou, M., Bonnet, D., Ferraris, P. and McAfee, A., 2012. The Digital Advantage: How digital leaders outperform their peers in every industry. MITSloan Management and Capgemini Consulting, MA, pp.2-23..

Weill, P., & Woerner, S. L. (2018). Is Your Company Ready for a Digital Future?. *MIT Sloan Management Review*, *59*(2), 21-25.

Wilkerson, J. W. (2012). An alumni assessment of MIS related job skill importance and skill gaps. Journal of Information Systems Education, 23(1), 85.

Wu, S. P. J., Straub, D. W., & Liang, T. P. (2015). How information technology governance mechanisms and strategic alignment influence organizational performance: Insights from a matched survey of business and it managers. *Mis Quarterly*, *39*(2), 497-518.

Zwieg, P., Kaiser, K. M., Beath, C. M., Bullen, C., Gallagher, K. P., Goles, T., & Carmel, E. (2006). The information technology workforce: Trends and implications 2005-2008. MIS Quarterly Executive, 5(2), 47-54.

Yoo, Y., O. Henfridsson and K. Lyytinen (2010). "The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research." Information Systems Research 21(4), 724–735.

## 6. APPENDIX I. EUROPEAN E-COMPETENCE FRAMEWORK

| **Dimension 1**<br>5 e-CF areas<br>(A – E) | **Dimension 2**<br>40 e-Competences identified | **Dimension 3**<br>e-Competence proficiency levels<br>e-1 to e-5, related to EQF levels 3–8 | | | | |
|---|---|---|---|---|---|---|
| | | e-1 | e-2 | e-3 | e-4 | e-5 |
| A. PLAN | A.1. IS and Business Strategy Alignment | | | | ■ | ■ |
| | A.2. Service Level Management | | | ■ | ■ | |
| | A.3. Business Plan Development | | | ■ | ■ | ■ |
| | A.4. Product/Service Planning | | ■ | ■ | ■ | |
| | A.5. Architecture Design | | | ■ | ■ | ■ |
| | A.6. Application Design | ■ | ■ | ■ | | |
| | A.7. Technology Trend Monitoring | | | | ■ | ■ |
| | A.8. Sustainable Development | | | ■ | ■ | |
| | A.9. Innovating | | | | ■ | ■ |
| B. BUILD | B.1. Application Development | ■ | ■ | ■ | | |
| | B.2. Component Integration | | ■ | ■ | ■ | |
| | B.3. Testing | ■ | ■ | ■ | ■ | |
| | B.4. Solution Deployment | ■ | ■ | ■ | | |
| | B.5. Documentation Production | ■ | ■ | ■ | | |
| | B.6. Systems Engineering | | | ■ | ■ | |
| C. RUN | C.1. User Support | ■ | ■ | ■ | | |
| | C.2. Change Support | | ■ | ■ | | |
| | C.3. Service Delivery | ■ | ■ | ■ | | |
| | C.4. Problem Management | | ■ | ■ | ■ | |
| D. ENABLE | D.1. Information Security Strategy Development | | | | ■ | ■ |
| | D.2. ICT Quality Strategy Development | | | | ■ | ■ |
| | D.3. Education and Training Provision | | ■ | ■ | | |
| | D.4. Purchasing | | ■ | ■ | ■ | |
| | D.5. Sales Proposal Development | | ■ | ■ | | |
| | D.6. Channel Management | | | ■ | ■ | |
| | D.7. Sales Management | | | ■ | ■ | ■ |
| | D.8. Contract Management | | ■ | ■ | ■ | |
| | D.9. Personnel Development | | ■ | ■ | ■ | |
| | D.10. Information and Knowledge Management | | | ■ | ■ | ■ |
| | D.11. Needs Identification | | | ■ | ■ | ■ |
| | D.12. Digital Marketing | | ■ | ■ | ■ | |
| E. MANAGE | E.1. Forecast Development | | | ■ | ■ | |
| | E.2. Project and Portfolio Management | | ■ | ■ | ■ | ■ |
| | E.3. Risk Management | | ■ | ■ | ■ | |
| | E.4. Relationship Management | | | ■ | ■ | |
| | E.5. Process Improvement | | | ■ | ■ | |
| | E.6. ICT Quality Management | | ■ | ■ | ■ | |
| | E.7. Business Change Management | | | ■ | ■ | ■ |
| | E.8. Information Security Management | | ■ | ■ | ■ | |
| | E.9. IS Governance | | | | ■ | ■ |