

Going beyond the digitalization and servitization paradoxes: the role of network capabilities for industrial SMEs¹

Tinhinane Tazairt

Lumière Lyon 2 University, Coactis Laboratory, 16 Avenue Berthelot 69363, Lyon Cedex 07,
France

tinhinane.tazairt@univ-lyon2.fr

Catherine Viot

Claude Bernard Lyon 1 University, SAF Laboratory, 50 Avenue Tony Garnier
69366 Lyon Cedex 07, France

catherine.viot@univ-lyon1.fr

Isabelle Prim-Allaz

Lumière Lyon 2 University, Coactis Laboratory, 16 Avenue Berthelot 69363, Lyon Cedex 07,
France

isabelle.prim-allaz@univ-lyon2.fr

Abstract:

This research examines network capabilities as a catalyst for the effects of servitization and digitalization on the financial and non-financial performances of industrial SMEs in France. We use a partial least squares structural equation (PLS-SEM) model to test the research hypotheses. The results show that network capabilities positively impact servitization, digitalization, and non-financial performance. It also has a direct effect on the financial performance of industrial SMEs. Servitization has no direct effect on financial performance but has a significant indirect effect via digitalization. The results show that non-financial performance has a positive effect on financial performance. The originality of this article is in taking the interest in addressing the network capabilities as an antecedent and facilitator of servitization and digitalization at the same time. This proposal helps SMEs overcome both the servitization and the digitalization paradoxes.

Keywords: Network capabilities, Servitization, Digitalization, Non-financial firm performance, Financial firm performance.

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1. Introduction

Manufacturing firms need to change their offering to deal with competition and defend and/or increase their market share. Two options are open to them: they can either develop complementary offers or fundamentally transform their value proposition by moving towards an offer integrating services. Such phenomenon is named servitization (Vandermerwe & Rada, 1988), which is a shift in the value proposition of manufacturing firms from a product-centric offer to a combined product and service offer, or use or result-centric offer (Baines et al., 2009).

Companies perceive servitization as a way to improve both their competitiveness (Vandermerwe & Rada, 1988) and their profitability (Gebauer et al., 2011). Due to their limited comparability, service offerings are more likely to provide competitive advantages and higher margins and profitability (Frambach et al., 1998; Neu & Brown, 2005; Oliva & Kallenberg, 2003), and preserve manufacturers from price competition (Malleret, 2005).

Undertaking servitization has not always fulfilled its promise in terms of financial performance. The literature highlights the so-called service paradox (Gebauer et al., 2005; Neely, 2007) whereby “*substantial investment in extending the service business [in manufacturing firms] leads to increase service offerings and higher costs, but does not generate the expected correspondingly higher returns*” (Gebauer et al., 2005).

One way to overcome this dilemma is to explore the potential of servitization through digitalization. Literature has stressed the potential interaction between both concepts trying to explain the failure or success of manufacturing firms that engage in this journey (Kohtamäki et al., 2020).

Vendrell-Herrero et al. (2017) pinpoint that underperformance risk could increase when companies simultaneously develop their degrees of servitization and digitalization. Others warn about the existence of the digitalization paradox, which could reinforce the service

paradox. According to the digitalization paradox, the revenues resulting from digitalization are much lower than the costs engaged (Sjödin et al., 2020).

In addition to the financial challenges, manufacturing companies may face many other challenges: organizational, strategic, and operational. One way to address them is considering the interaction (convergence) between the potentials of servitization and digitalization (Paiola, 2017), which allows higher margins and/or increased revenues.

Kohtamäki et al. (2013) argue that the mixed findings may reflect the lack of taking into account firms capabilities. Among these capabilities, they stress the interest of network capabilities. The authors define it as the “capability to manage, use and exploit inter-organizational relationships” (p.1376). To create value and promote improved performance, scholars showed the relevance of the development of organizational capabilities, such as network capabilities, in conjunction with the service offering (Kohtamäki et al., 2013).

Indeed, implementing servitization and digitalization demands better addressing of the relationships between the company and its stakeholders (providers, service delivery partners, customers, original equipment manufacturers, etc.), and leveraging network capabilities can facilitate the implementation of a comprehensive and active service offering (Håkansson & Snehota, 2006). By doing so, manufacturing SMEs can also overcome the digitalization paradox.

The purpose of this research is to demonstrate the potential of manufacturing SMEs’ network capabilities in capturing the financial and non-financial potentials of servitization and digitalization by answering the following research question: What are the main effects of network capabilities as a driver of servitization and digitalization on SMEs firm performance?

The following section addresses the theoretical development part of this research. We discuss the interaction between servitization, digitalization, network capabilities and financial and non-financial performances of industrial SMEs. We then present the research model and

hypotheses. This research is based on a close-ended questionnaire, which aligns with the call for more quantitative studies in the field. Primary data were collected from a survey with 142 French manufacturing SMEs. To analyze the collected data, assess the model and test the research hypotheses, we used Partial least squares structural equation modeling (PLS-SEM). The research design, results and discussion are presented in section 3.

2. Theoretical development and background

Since servitization literature has evolved into a discussion on the articulation of servitization and digitalization, the understanding of this concept seems to be a key element to ensure the success of both servitization and digitalization in manufacturing firms.

The literature posits a promoting effect of strategic and competitive benefits of servitization (Story et al., 2017), and digitalization (Kohtamäki et al., 2020), but servitization' financial benefits remain a controversial issue depending on certain conditions, context factors, and firm capabilities (Kohtamäki et al., 2013). This is reflected in the way the performance manifests itself depending on the size of the firm, sector activity, digital and/or service maturity, etc.

2.1. Servitization of Industrial SMEs and digitalization

Servitization of SMEs

Servitization reflects a transformation of a manufacturing firm from product to service orientation (Kohtamäki et al., 2020), and is considered a way to preserve or reinforce competitiveness (Gebauer et al., 2011).

A literature review shows that servitization is a rather complex concept and that it is not that easy to propose a widely accepted definition (Kohtamäki et al., 2013). Service provision refers to “*a manifestation of an industrial service strategy*” (Gebauer et al., 2006; Kohtamäki et al., 2013; Ambroise et al., 2018). Firms going to servitization tend to develop integrated solutions. This may go along with more customized products and a wide range of services (Mathieu, 2001).

In addition to this lack of a consensual definition, unrolling servitization in practice seems to need more comprehensive work. Focusing on the nature of the service business, various classifications exist in the literature. Baine et al. (2009) propose to categorize services into basic (e.g., goods and spare parts), intermediate (e.g., help desks, training, maintenance, repairs), and advanced services (e.g., customer support agreements and outcome contracts).

Regarding SMEs, Kohtamäki et al. (2013) consider that the nature of service business can be represented through three dimensions: operational services, R&D services, and consulting services, *“small and medium-sized manufacturing firms often limit their service offering to maintenance, R&D and customer services owing to a greater need for specialization and a lack of internal resources”* (Kohtamäki et al., 2013: p.1376).

Despite the risks and challenges met, many potential profits still attract industrial companies (Baines et al., 2009). Implementing servitization can be especially complex and difficult for industrial SMEs conversely to large companies (Rapaccini et al., 2019). Industrial SMEs may face many barriers before succeeding in changing their traditional product-centric culture (Rapaccini et al., 2019).

This limitation in the extending of service businesses of SMEs is first explained by a lack of explicit formulation of the service strategy (Brax & Visintin, 2017). When large companies assume going toward servitization, SMEs seem to have an emergent approach of servitization without considering and addressing the instruments needed for running this ambitious strategy (Kowalkowski et al., 2017).

Given their vulnerability to competition and their sensitivity to price competitiveness, SMEs would be probably more positively impacted by the development of differential services (Rapaccini et al., 2019). But they suffer from a lack of strategic orientation (Kowalkowski et al., 2017), even if Ambroise et al. (2018) show that SMEs' success doesn't depend on a unique servitization strategy or approach, but rather on a coherent one.

Literature highlights other servitization issues related to SMEs: i) the organizational ones, when orchestrating the needed processes to deliver services (Confente et al., 2015), ii) the investment ones to finance the development of structural service-orientation business (Chen & Zhang, 2021), iii) strategic capability issues with more limited resources and capabilities (Kohtamaki et al., 2013), especially in managing industrial tools and chain, selling and customer relationship management or creating service culture and innovation (Coreynen et al., 2017; Dahmani et al., 2016; Dubruc et al., 2014; Hernandez-Pardo et al., 2013).

Facing these problems, in addition to those faced by large companies, scholars question the importance of reaching a critical level of services in the turnover to be profitable. On one hand, for Kowalkowski, Witell, et al. (2013), SMEs cannot achieve the critical mass necessary to reach profitability in service activities, and do not have the necessary financial and management resources (Gebauer et al., 2012). On the other hand, Queiroz et al. (2020) find that it is not necessary to reach a critical mass of services to be profitable. These contradictory results indicate that other factors can help to achieve service transition success.

Rapaccini et al. (2019) assume that better service business outcomes correspond to better mastery of the capabilities and skills required to compete in service activities. If they met these conditions, servitized SMEs have a lower risk to meet the service paradox (Gebauer et al., 2005), which is a misalignment between the service strategy, servitization scope, investments required, and organizational processes of servitized SMEs, and their combined potential returns.

Scholars address the emergent trends of digitalization to help manufacturing firms to overcome the service paradox arguing that extending services is a business innovation linked to the development of digital technologies (Martín-Peña et al., 2019). Developing servitization more intensively -volume and complexity- entails more use of digitalization, and redesigning the service activity needs to invest in digitalization to implement a servitization strategy (Martin-Pena et al., 2019).

Digitalization and SMEs

Many scholars use the terms “digitalization”, “digitization” and “digital transformation” interchangeably (Singh et al., 2019). Gartner (2016) provides a glossary to clarify the concepts: i) digitalization is a process to move to a digital business, towards the use of digital technologies. Digitalization underpins business model changes that enable new ways to create value and revenue, ii) digitization is “*the process of changing from analog to digital form*”, and iii) digital transformation is linked to anything from IT modernization.

Digitalization allows new strategies and business opportunities (Brennen & Kreiss, 2016), while digitization is identified as a process that allows companies to capture, process, and organize marketing knowledge to enhance customers' analytics and insights, operational efficiency, and marketing learning. Digital transformation includes digitalization that requires mobilization of digitization (Ramaswamy & Ozcan, 2018).

Lachiewicz et al. (2018) suggest that servitization is a promising way of handling industrial SMEs developments'. Prior research is consistent with the fact that SMEs can successfully become a service providers by moving from product-orientation to service-orientation through digitalization (Coreynen et al., 2017). Digitalization is one of the factors that drives and facilitates servitization (Brehmer & Kowalkowski, 2008; Lenka et al., 2017; Paiola, 2017).

More information and control are needed to develop a servitization strategy, which can be promoted by digital technologies (Coreynen et al., 2017). Digitalization can help to move to a product-service system (Frank et al., 2019), where digital capabilities are needed to interact and create value with customers (Lenka et al., 2017). Digital technologies enable servitization strategies through increasing service orientation (Coreynen et al., 2017) and allow manufacturing firms costs reduction and internal efficiency (Kowalkowski, Kindström, et al., 2013). Martin-Pena et al. (2019) showed that a low degree of digitalization can enable servitization, when at a high degree, digitalization became a driver of servitization that enable the creation of new opportunities.

However, current scholars argue for a digitalization paradox (Kohtamäki et al., 2020, 2019): manufacturing firms are struggling to fulfill the performance promised by digitalization due to a lack of servitization capabilities. Besides, implementing digitalization needs high investments.

Servitization and digitalization are often considered as both having a linear and positive relationship with financial firm performance. Scholars challenge this finding by testing the relationship under other conditions: SMEs rather than global businesses, simultaneously rather than independently, integrating new parameters such as technological orientation antecedents. Indeed, for instance, Fang et al. (2008) and Kohtamäki et al. (2020) demonstrate a non-linear U-shaped effect of digitalization on firm performance.

Martín-Peña et al. (2019) indicate that achieving performance goals, when engaging in servitization, needs the creation of synergy with digitalization. The authors call for more investigation into whether and under what conditions the effectiveness of this articulation is observed. Scholars suggest that the development of organizational capabilities can have an indirect association with performance (Czakoń et al., 2020). Previous research showed that network capabilities improve the effect of the service offering on sales growth (Kowalkowski et al., 2017; Parida et al., 2016). We believe that, when running both servitization and digitalization -which is such an ambitious and challenging journey-, network capabilities can play the role of a driver enhancing performance and helping to overcome the servitization and digitalization paradoxes.

2.2. Network capabilities and SMEs performance

The interest of this research is not concerned with studying the network-firms and their performances. A network-firm refers a vertical network of legally autonomous firms. This form of productive organization goes beyond the realm of the contract and generates intense power relations between its members (Baudry, 2004; Chassagnon, 2008).

The network concept is already mentioned in many different forms (Ebers & Jarillo, 1997) that integrates all recurrent collaborative relationships (ex. buyer-seller, strategic alliances, stakeholders, shareholders, etc.) among a set of organizations in a market (Chung et al.,

2004). It is considered as a set of links that integrates as well as resources, friendships, or information that can be shared in a set of relationships (Fombrun, 1982).

Håkansson and Snehota (2006) summarize some key points of the network model. Companies are dealing with a few peers in a shared business environment, where each of them pursues its own goals. This environment leads to building a continuous relationship with these organizations that allows mutual access, and exploitation of resources of each other's, to link their activities. Enhancing these interactions lead companies to develop and maintain distinctive and collaborative capabilities. Indeed, since the companies are operating under similar conditions, "an organization's performance is conditioned by the totality of the network as a context, i.e. even by interdependencies among third parties" (Håkansson and Snehota, 1989: p. 261).

Furthermore, Rönnberg Sjödin et al. (2016) investigate the network management capabilities of manufacturing firms and recognize that ensuring advanced services offering needs a co-creation process, dealing with their network partners as strategic partners, with necessary incentives alignment, can enhance advanced services delivery. A lack of network management capabilities in higher levels of advanced service offerings is likely to result in longer lead times, quality problems, and an unsatisfactory customer experience, which would ultimately make advanced service offerings unsustainable (Rönnberg Sjödin et al., 2016).

Kohtamäki et al. (2013) investigate the role of organizational capabilities in moderating the effect of service offering on firm performance. This research is especially relevant because it participates in understanding the non-linear effect of service offering on sales growth, and argues for the need for organizational capabilities to enhance service value creation. The authors show how different levels of network capabilities and service offerings can create synergies and partially overcome the service paradox by a non-linear relationship on sales growth.

Indeed, Coreynen et al. (2018) address the need to build and coordinate network management that promotes service development. Especially in the context of SMEs, valuable networks are

useful in such key steps of service development, for example, when a new service is being developed. A valuable network is defined as “a system of stakeholders, either from the same or another industry, collaborating on key activities”(Dentoni et al., 2016).

Attitudes towards networks may determine the success of servitized SMEs. Scholars have investigated the role of cooperation in business development. Companies have to identify their partners to co-deliver value to customers (Parry, 2018; West et al., 2018). Indeed, manufacturing firms need to address the ecosystem issues to understand the role of each partner to support customers or end-users (West et al., 2018). To contribute to the discussion on network capabilities and their relevance for the service provider, more investigation is needed to show how industrial SMEs succeed in servitization and digitalization thanks to their network management and relationships.

Scholars have recently proposed a conceptual framework to help manufacturers capture the potential of the articulation between servitization and digitalization (Favoretto et al., 2022). The authors called to investigate strategic, organizational, structural, environmental, and network levels, they provided several relevant research propositions. We propose to contribute by analyzing one of the organizational research propositions: the need for network capabilities in industrial SMEs to overcome both the service and digitalization paradoxes.

Kohtamaki et al. (2013) report that, in large firms, the level of network capabilities moderates the effect of service offering in the sales growth. Beyond a certain threshold of network capabilities, the effect of service offering becomes positive. In the SME context, network capabilities are necessary to address servitization and digitalization goals and achieve performances (financial, non-financial). Running servitization and digitalization requires changes in network capabilities that are needed to resist to “*resources restrictions, size limitation, and low of service revenue*”(Queiroz et al., 2020). Network capabilities can drive servitization and digitalization potentials on SMEs performance.

2.3.Servitization, digitalization, network capabilities, and performance

The theoretical approach of servitization widely hypothesizes that it should have a positive impact on firm performance (Gebauer, 2005). However, empirical evidence indicates that the servitization of manufactured companies has not always fulfilled this promise (Gebauer et al., 2012; Neely, 2008). Recently, Lexutt (2020: p. 105) reported that “*much servitization research is ambiguous regarding its conceptualization of servitization success and the results are often inconclusive or even contradictory*”.

To better understand its conditions of success, scholars have stressed the potential interaction between the development of servitization in industrial firms as well as of digitalization in explaining the success or the failure of companies (Kohtamäki et al., 2020). Commonly, the direct objective of servitization is to achieve higher returns by offering profitable services (Eggert et al., 2014; Oliva et al., 2012).

When attempting to measure services success, we noted that financial measures, such as profitability, are not sufficient because servitization can trigger less direct and less financial performance implications (Raddats et al., 2015). Therefore, studies investigating servitization success have to consider the financial and the non-financial performance that can both operate at a service-specific level and the company level (Raddats et al., 2015).

Crozet & Milet (2017) carried out comparative cross-sectional studies and their results indicate that implementing servitization impacts positively the revenues levels and employment in SMEs. Servitization contributes also to the scope of goods production. According to the authors, the positive effect is less notable than expected in large companies. Canon, Rolls-Royce, Caterpillar, and General Electric have been largely investigated. Lachiewicz et al. (2018) indicate that despite many implementation challenges, servitization can still be a specific source of benefits development for SMEs, that rely on new conditions of success that are different from a large company's context.

Scholars demonstrate that there is a complex indirect relationship between servitization and firm performance (Kohtamäki et al., 2020; Martín-Peña et al., 2019). One way to overcome these controversial results (the manifestation of servitization paradox) is going toward digitalization that may facilitate the incorporation of services, mostly in a form of support

services. Martín-Peña et al. (2019) showed that digitalization is necessary condition for servitization to have a positive effect on performance.

Empirical studies have explored the non-linear relationship between servitization and firm performance (Martín-Peña et al., 2019; Kohtamäki et al., 2013) showing that this relationship will be positive only if firms achieve a critical mass of services (Fang et al., 2008; Gawer & Cusumano, 2014). But, not all successful servitized firms reach this critical mass, which is dependent on industry sector, service characteristics, and level of innovation, as well as other factors (Eggert et al., 2014; Ambroise et al., 2018).

Regarding market orientation -through innovation-, previous research examines its link to performance and shows a positive relationship with both “*judgmental measures of performance – service quality, customer satisfaction, and employee satisfaction*” (Agarwal et al., 2003), and “*objective measures of performance - occupancy rate, gross operating profit, and market share-*” (Agarwal et al., 2003).

At the best of our knowledge, only one previous study was interested to investigate the link between servitization and both financial -measured as sales growth- and non-financial performances - measured both customer satisfaction, image and competitive differentiation - (Queiroz et al., 2020). In line with this work, some scholars call to investigate new benefits of digital-servitization as the financial ones still remain confused. Based on Ramani & Kumar (2008), we consider two types of performance: a non-financial one, based on the relationship with customers, and a more classic one, based on financial indicators.

Financial performance of servitization. Reporting profitability and revenue at the service level is sometimes problematic, in that many manufacturers do not measure services profitability and revenue independently from that of products (Gebauer *et al.*, 2009). In some studies, a high percentage of service revenue (in the overall corporate revenue) is considered a measure of success (Oliva *et al.*, 2012). At a company level, manufacturers might measure overall company profitability (Homburg *et al.*, 2003; Gebauer, 2007) or financial performance relative to competitors (Gebauer *et al.*, 2011), but the impact of services on both measures is often hard to judge. We consider both service revenues independently of product revenues

and the impact of services on product performance, this measure is less contestable (Anticio *et al.*, 2008).

Non-financial performance of servitization. In prior literature, the measure of service quality is considered the main non-financial performance indicator, at a service-specific level (Oliva *et al.*, 2012). Service quality is a bi-dimensional construct including ‘technical’ and ‘functional’ service quality. Technical quality refers to the outcome of the service, whereas functional quality relates to the process by which the outcome is achieved (Grönross, 1984). At a company level, services may be helpful to manufacturers in that services can enhance customer satisfaction, which in turn can convey customer retention and loyalty (Homburg *et al.*, 2003; Oliva *et al.*, 2012).

These varied facets of service success are reported in Table 1.

	Financial performance	Non-financial performance
Service level	<ul style="list-style-type: none"> • Services profitability • Services revenue • Percentage of services revenue in overall corporate revenues 	<ul style="list-style-type: none"> • Technical service quality (the outcome of the service) • Functional service quality (the process by which the outcome was achieved)
Company level	<ul style="list-style-type: none"> • Overall revenue • Overall profitability 	<ul style="list-style-type: none"> • Customer satisfaction • Customer loyalty • Customer retention

Tableau 1: Service success

As consequence of previous paragraphs, we posit the following hypothesis:

H1(a, b). Servitization has a positive effect on (a) non-financial and (b) financial performance of SMEs.

H2(a, b). Digitalization has a positive effect on (a) non-financial and (b) financial performance of SMEs.

H3. The effect of servitization on performance is mediated by digitalization.

H4. Non-financial performance has a positive effect on the financial performance of SMEs.

Some scholars pinpointed the importance of networks and the relational aspect when dealing with both servitization and digitalization (Galvani et al., 2022). Narver and Slater (1990) propose an original scope of market orientation which was expanded by Evanschitzky (2007). SMEs must rely on their networks, which is a collective level of analysis and refers to an “organizational culture that creates the necessary conditions for efficient and effective creation of superior customer value, through an exchange of resources in a network of partners” (Evanschitzky 2007, 354). In addition, Sorenson et al. (2008) contribute to the discussion about the collaborative network that enables extending knowledge and resources, which are key points for creating mutual interdependence, and this is valued and recognized within the network actors. By doing so, companies have greater access to resources compared to those actors who refrain from engaging in networks (Sorenson et al., 2008). Empirical research highlights the positive and supplementary effect on the performance of such alliance orientation (Wilson et al., 2014). Indeed, Carraresi et al. (2016) demonstrate that network capabilities have a positive effect on firm performance. Indeed, they enhance the capacity of SMEs to acquire more market and customer-related information with then enhancing financial performance.

H5(a, b). Network capabilities has a positive direct effect on (a) non-financial and (b) financial performance of SMEs.

H6 (a, b). Network capabilities has a positive effect on (a) servitization and (b) digitalization

H7 (a, b). Servitization (a) and digitalization (b) mediate the effect of network capabilities on firm performance

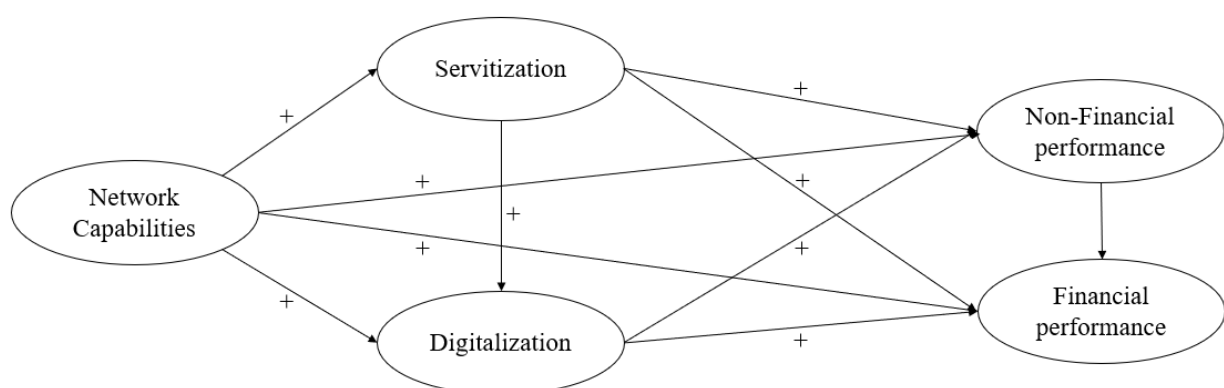


Figure 1: Conceptual model

3. Research design and results

This research is based on a close-ended questionnaire, which aligns with the call for more quantitative studies in the field. Primary data were collected from a survey with 142 french manufacturing SMEs. To analyze the collected data, assess the model and test the research hypotheses, we used Partial least squares structural equation modeling (PLS-SEM). The research design, results and the discussion are presented in this section.

3.1. Sampling and data collection

Data collection was conducted with a panel supplier between January and May 2021. Data were obtained from 142 French Industrial SMEs (response rate 5.14 percent). We used several screeners to have a purposeful sampling approach to identify only CEOs/Senior managers who provided information for the variables under study. An online survey with closed-ended questions was given to theses CEOs/Senior managers. We used check questions to ensure the reliability of the responses. Table 2 shows the descriptive statistics of the SMEs in the final sample.

The survey included two sections: the first one was dedicated to the descriptive variables and the screeners needed to identify the target respondents, and the second one included the measurement items (manifest variables) of the constructs shown in the conceptual model (Figure 1). The survey included a cover letter motivating the purpose of the study and guaranteeing anonymity and compliance with the General Data Protection Regime (GDPR).

Variables	Categories	(%)
Firm size (employees)	Very small [10-50]	23,94
	Small [51-250]	21,83
	Medium [251-1000]	22,53
	Big [1001-5000]	31,69
The main activity	Only manufactured products	16,19
	A combination of products and services, with a predominance of manufactured products	64,78
	Services completed by some products	9,85
	Only services	9,15
Main offer	A single type of product/service	7,04
	Several types of products/services within the same sector	73,23
	Several types of products/services from different sectors of activity	19,71
Respondents' profiles	CXO (CEO, CTO, CFO...)	17,60
	Vice president	2,11
	Unit director	21,12
	Senior manager	26,76
	Manager	32,39

Table 2: Descriptive statistics for the final sample and respondents' profiles

3.2. Constructs and variable measurement

The antecedent, mediating and dependent variables are represented in the constructs (Table 4) that are composed of multiple-dimensions scales (7 points Likert) and all these measurement scales come from literature. We used an existent measurement scale of servitization (SER) as the literature in the field of SMEs has identified SMEs' servitization dimensions' and associated variables, as well as its operationalization, thus we used the scale from Kohtamäki et al. (2013). The network Capabilities (NC) measurement scale is adapted from Kohtamäki et al., (2013). The digitalization (DIG) measurement scale comes from Kohtamäki et al., (2020) and is inspired by Jayachandran et al., (2005). Financial performance and non-financial performance (FP, NFP) are adapted from Ramani and Kumar (2008). All the items have been

translated, back-translated (English-French-English), and discussed by three researchers to confirm translation equivalence.

All the variables are reflective second-order constructs. The network capability is a 14-item scale with 4 dimensions: internal communication, coordination, relationship skills, and partner knowledge. The servitization is a 22-item scale based on 3 dimensions: operational services, research and development services, and consulting services. The digitalization is a 16-item based on 4 dimensions: sales support, service support, data integration & access support, and digital analysis support. The performance is a 6-item scale. It consists of 2 dimensions: financial servitization performance and non-financial servitization performance.

We proceeded with SEM to test the structural and conceptual models, and the hypotheses, using IBM SPSS Amos 28 software, which provides the partial least squares approach to perform SEM. Several iterations were necessary to develop a model with satisfactory methodological rigors. In each iteration, we addressed the reliability and validity concerns by eliminating items with the lowest loading factor in the construct with the lowest variance extracted, such as SER_OP4, SER_OP5, SER_OP6, SER_RD3, SER_RD6, SER_RD9, DIG-SS1, DIG-ServS 1-4, DIG-DAS1, NO_C1, and NO_C3. (a) Diagonal elements in bold are square root of AVE, (b) Off-diagonal elements are correlations

Table 3 shows satisfying convergent validity and reliability indicators. To assess the internal consistency reliability, Cronbach's alpha and composite reliability were calculated and the values of Cronbach's alpha varied from 0,67 to 0,90.

	Composite reliability	Convergent validity (AVE)	Discriminant validity		
			DIG	SERV	NC
DIG	0,912	0,775	0,880		
SERV	0,801	0,669	0,767	0,818	
NC	0,887	0,726	0,795	0,562	0,852

(a) Diagonal elements in bold are square root of AVE, (b) Off-diagonal elements are correlations

Table 3: Constructs validation

Constructs	Main dimensions	e.g. of the question (item)	Code	Main references used for the construct
Network capabilities	Internal communication (3 items)	<i>“In our company employees develop in-formal contacts among themselves”</i>	NC_IC	Kohtamäki et al., (2013)
	Coordination (5 items)	<i>“In our company, we discuss regularly with our partners how we can support each other”</i>	NC_CO	
	Relationship skills (3 items)	<i>“In our company, we can deal flexibly with our partners”</i>	NC_RS	
	Partner knowledge (3 items)	<i>“In our company, we know our partners' markets”</i>	NC_PK	
Servitization	Operational services (6 items)	<i>“Service for operating the product sold to the customer”</i>	SER_OP	Kohtamäki et al., (2013)
	R&D services (9 items)	<i>“Prototype development and testing”</i>	SER_RD	
	Consulting services (7 items)	<i>“Business consulting”</i>	SER_CS	
Digitalization	Sales support (4 items)	<i>“Provides sales force in the field with customer information”</i>	DIG_SS	Kohtamäki et al., (2020) inspired by Jayachandran et al. (2005)
	Service support (4 items)	<i>“Allows customer support personnel to access data on customer interactions with all functional areas”</i>	DIG_ServS	
	Data integration & access support (3 items)	<i>“Enables assessment of channel performance”</i>	DIG_DIS	
	Digital analysis support (5 items)	<i>“Combines customer transaction data with external source data”</i>	DIG_DAS	

Performance	Financial performance of servitization (3 items)	<i>“A large fraction of our total profit is generated by our service business”</i>	FSS	Ramani and Kumar (2008)
	Non-financial performance of servitization (3 items)	“Services enables my company to win business with new customers”	NFSS	
Table	4:	Constructs	and	manifest variables

3.3. Results and discussion

The results of the conceptual model that test the hypothetical propositions are depicted in Figure 2.

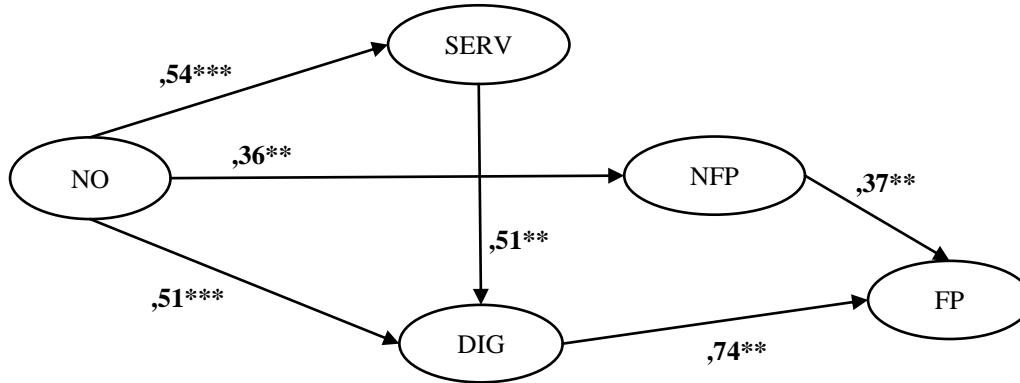


Figure 2: Going beyond the digitalization and servitization paradoxes: the role of network capabilities for industrial SMEs

Servitization has no direct effect on non-financial performance nor on financial performance but has a significant indirect effect on financial performance via digitalization. This is contradictory to previous research of Queiroz et al. (2020) that shows that servitization influences financial performance. Network capabilities has a significant direct effect on

P-value = 0,000; RMSEA = 0,071; SRMR = 0,0724; khi2/df= 1,718
 *** p≤0,01; 0,01<***≤0,05; *≤0,1

servitization, digitalization, and non-financial performance and an indirect effect on financial performance (NC-SERV-DIG-FP, NC-DIG-FP, and NC-NFP-FP).

The findings demonstrate that one way to overcome both servitization and digitalization paradoxes is to rely on network capabilities that enable the value of the investments, help better meeting the market needs, and capture potential benefits.

Indeed, the anchoring of a SME in its environment does have an impact on the characteristics of such servitization and digitization offerings. Manufacturing companies consider their relationships and address their needs more coherently. Network capabilities are also so effective to enhance non-financial performance, and then, financial performance. In this

research, we consider a bi-dimensional measure of performance highlighting that success in the servitization journey can manifest in other forms than a financial one. We confirm the relevance of considering this bi-dimensional approach to firm performance (FP and NFP) to capture the potential of servitization, and even more the potentials of both servitization and digitalization, especially in the context of SMEs.

We contribute to a better understanding of the relationship between servitization and performance, digitalization and performance, and also network capabilities and performance. Our results show that the potential of servitization is captured by digitalization, and both are enabled by network capabilities.

In this research, we consider a bi-dimensional measure of performance highlighting that success in the servitization journey can manifest in other forms than a financial one. Indeed, the results show that non-financial performance supported by network capabilities enhances financial performance.

For SME managers, this research encourages ambitious servitization and digitalization combined journeys in collaboration with their networks. We provide insights into the complex relationship between servitization, digitalization, and network capabilities. Doing so reduces financial failures and increases success chances globally. Indeed, the literature demonstrates that heavy and complex investments are needed to run servitization, and digitalization can support its investments by reducing costs and enabling performant services. We encourage industrial SMEs to have an explicit approach to servitization, capitalizing on their network capabilities, this improves the performance of the services they offer. Digitalization can be a support to both services and sales.

This research suffers from a few limitations. Firstly, the context of French SMEs is a specific one where, for example, cultural aspects can interfere with the servitization-digitalization performance interaction. A replication study in different economic and cultural contexts would address this limitation. Secondly, our work doesn't consider the levels of servitization and digitalization as done by Kohtamäki et al. (2020) who discussed the moderate to high levels of digitalization on the effect of high servitization effect on firm performance, which

can be extended to a discussion around servitization and digitalization maturities. Indeed, the article can be complemented with future longitudinal research.

4. References

- Agarwal, S., Krishna Erramilli, M., & Dev, C. S. (2003). Market orientation and performance in service firms: Role of innovation. *Journal of Services Marketing*, 17(1), 68- 82. <https://doi.org/10.1108/08876040310461282>
- Ambroise, L., Prim-Allaz, I., & Teyssier, C. (2018). Financial performance of servitized manufacturing firms : A configuration issue between servitization strategies and customer-oriented organizational design. *Industrial Marketing Management*, 71, 54- 68. <https://doi.org/10.1016/j.indmarman.2017.11.007>
- Baines, T. S., Lightfoot, H. W., Benedettini, O., & Kay, J. M. (2009). The servitization of manufacturing : A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, 20(5), 547- 567. <https://doi.org/10.1108/17410380910960984>
- Baudry, B. (2004). La question des frontières de la firme. Incitation et coordination dans la firme-réseau. *Revue économique*, 55(2), 247- 273. <https://doi.org/10.3917/reco.552.0247>
- Brax, S. A., & Visintin, F. (2017). Meta-model of servitization : The integrative profiling approach. *Industrial Marketing Management*, 60, 17- 32. <https://doi.org/10.1016/j.indmarman.2016.04.014>
- Brehmer, P., & Kowalkowski, C. (2008). Technology as a driver for changing customer- provider interfaces : Evidence from industrial service production. *Management Research News*, 31(10), 746- 757. <https://doi.org/10.1108/01409170810908507>
- Brennen, J. S., & Kreiss, D. (2016). Digitalization. In K. B. Jensen, E. W. Rothenbuhler, J. D. Pooley, & R. T. Craig (Éds.), *The International Encyclopedia of Communication Theory and Philosophy* (1^{re} éd., p. 1- 11). Wiley. <https://doi.org/10.1002/9781118766804.wbiect111>
- Carraresi, L., Mamaqi, X., Albisu, L. M., & Banterle, A. (2016). Can Strategic Capabilities Affect Performance? Application of RBV to Small Food Businesses: APPLICATION OF RBV TO SMALL FOOD BUSINESSES. *Agribusiness*, 32(3), 416- 436. <https://doi.org/10.1002/agr.21451>
- Chassagnon, V. (s. d.). *Qu'est-ce qu'une firme (-réseau)?* 26.
- Chen, S., & Zhang, H. (2021). Does digital finance promote manufacturing servitization : Micro evidence from China. *International Review of Economics & Finance*, 76, 856- 869. <https://doi.org/10.1016/j.iref.2021.07.018>
- Chung, W. W. C., Yam, A. Y. K., & Chan, M. F. S. (2004). Networked enterprise : A new business model for global sourcing. *International Journal of Production Economics*, 87(3), 267- 280. [https://doi.org/10.1016/S0925-5273\(03\)00222-6](https://doi.org/10.1016/S0925-5273(03)00222-6)

- Confente, I., Buratti, A., & Russo, I. (2015). The role of servitization for small firms : Drivers versus barriers. *International Journal of Entrepreneurship and Small Business*, 26(3), 312. <https://doi.org/10.1504/IJESB.2015.072394>
- Coreynen, W., Matthyssens, P., De Rijck, R., & Dewit, I. (2018). Internal levers for servitization : How product-oriented manufacturers can upscale product-service systems. *International Journal of Production Research*, 56(6), 2184- 2198. <https://doi.org/10.1080/00207543.2017.1343504>
- Coreynen, W., Matthyssens, P., & Van Bockhaven, W. (2017). Boosting servitization through digitization : Pathways and dynamic resource configurations for manufacturers. *Industrial Marketing Management*, 60, 42- 53. <https://doi.org/10.1016/j.indmarman.2016.04.012>
- Crozet, M., & Milet, E. (2017). The Servitization of French Manufacturing Firms. In L. Fontagné & A. Harrison (Éds.), *The Factory-Free Economy* (p. 111- 135). Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780198779162.003.0005>
- Czakon, W., Kawa, A., & Scott, S. (2020). Network orientation of logistics service providers : The construct, dimensionality and measurement scale. *International Journal of Logistics Research and Applications*, 23(5), 474- 492. <https://doi.org/10.1080/13675567.2019.1705260>
- Dahmani, S., Boucher, X., Peillon, S., & Besombes, B. (2016). A reliability diagnosis to support servitization decision-making process. *Journal of Manufacturing Technology Management*, 27(4), 502- 534. <https://doi.org/10.1108/JMTM-06-2015-0044>
- Dentoni, D., Bitzer, V., & Pascucci, S. (2016). Cross-Sector Partnerships and the Co-creation of Dynamic Capabilities for Stakeholder Orientation. *Journal of Business Ethics*, 135(1), 35- 53. <https://doi.org/10.1007/s10551-015-2728-8>
- Dubruc, N., Peillon, S., & Farah, A. (2014). The Impact of Servitization on Corporate Culture. *Procedia CIRP*, 16, 289- 294. <https://doi.org/10.1016/j.procir.2014.01.028>
- Ebers, M., & Jarillo, J. C. (1997). Preface : The Construction, Forms, and Consequences of Industry Networks. *International Studies of Management & Organization*, 27(4), 3- 21. <https://doi.org/10.1080/00208825.1997.11656716>
- Fang, E. (Er), Palmatier, R. W., & Steenkamp, J.-B. E. M. (2008). Effect of Service Transition Strategies on Firm Value. *Journal of Marketing*, 72(5), 1- 14. <https://doi.org/10.1509/jmkg.72.5.001>
- Favoretto, C., Mendes, G. H. S., Oliveira, M. G., Cauchick-Miguel, P. A., & Coreynen, W. (2022). From servitization to digital servitization : How digitalization transforms companies' transition towards

- services. *Industrial Marketing Management*, 102, 104- 121.
<https://doi.org/10.1016/j.indmarman.2022.01.003>
- Fombrun, C. J. (1982). Strategies for Network Research in Organizations. *Academy of Management Review*, 7(2), 280- 291. <https://doi.org/10.5465/amr.1982.4285594>
- Frambach, R. T., Barkema, H. G., Nooteboom, B., & Wedel, M. (1998). Adoption of a service innovation in the business market: An empirical test of supply-side variables. *Journal of Business Research*, 41(2), 161- 174. [https://doi.org/10.1016/S0148-2963\(97\)00005-2](https://doi.org/10.1016/S0148-2963(97)00005-2)
- Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change*, 141, 341- 351. <https://doi.org/10.1016/j.techfore.2019.01.014>
- Galvani, S., Carloni, E., Bocconcelli, R., & Pagano, A. (2022). From After-Sales to Advanced Services: A Network Analysis on the Impacts of Digital Servitization Evolution. *Sustainability*, 14(14), 8308. <https://doi.org/10.3390/su14148308>
- Gawer, A., & Cusumano, M. A. (2014). Industry Platforms and Ecosystem Innovation. *Journal of Product Innovation Management*, 31(3), 417- 433. <https://doi.org/10.1111/jpim.12105>
- Gebauer, H., Fleisch, E., & Friedli, T. (2005). Overcoming the Service Paradox in Manufacturing Companies. *European Management Journal*, 23(1), 14- 26. <https://doi.org/10.1016/j.emj.2004.12.006>
- Gebauer, H., Gustafsson, A., & Witell, L. (2011). Competitive advantage through service differentiation by manufacturing companies. *Journal of Business Research*, 64(12), 1270- 1280. <https://doi.org/10.1016/j.jbusres.2011.01.015>
- Gebauer, H., Worch, H., & Truffer, B. (2012). Absorptive capacity, learning processes and combinative capabilities as determinants of strategic innovation. *European Management Journal*, 30(1), 57- 73. <https://doi.org/10.1016/j.emj.2011.10.004>
- Håkansson, H., & Snehota, I. (2006). No business is an island: The network concept of business strategy. *Scandinavian Journal of Management*, 22(3), 256- 270. <https://doi.org/10.1016/j.scaman.2006.10.005>
- Hernandez-Pardo, R. J., Bhamra, T., & Bhamra, R. (2013). Exploring SME Perceptions of Sustainable Product Service Systems. *IEEE Transactions on Engineering Management*, 3(60), 483- 495. <https://doi.org/10.1109/TEM.2012.2215961>
- Kohtamäki, M., Parida, V., Patel, P. C., & Gebauer, H. (2020). The relationship between digitalization and servitization: The role of servitization in capturing the financial potential of digitalization.

- Technological Forecasting and Social Change*, 151, 119804.
<https://doi.org/10.1016/j.techfore.2019.119804>
- Kohtamäki, M., Partanen, J., Parida, V., & Wincent, J. (2013). Non-linear relationship between industrial service offering and sales growth: The moderating role of network capabilities. *Industrial Marketing Management*, 42(8), 1374- 1385. <https://doi.org/10.1016/j.indmarman.2013.07.018>
- Kowalkowski, C., Gebauer, H., & Oliva, R. (2017). Service growth in product firms: Past, present, and future. *Industrial Marketing Management*, 60, 82- 88. <https://doi.org/10.1016/j.indmarman.2016.10.015>
- Kowalkowski, C., Kindström, D., & Gebauer, H. (2013). ICT as a catalyst for service business orientation. *Journal of Business & Industrial Marketing*, 28(6), 506- 513. <https://doi.org/10.1108/JBIM-04-2013-0096>
- Kowalkowski, C., Witell, L., & Gustafsson, A. (2013). Any way goes: Identifying value constellations for service infusion in SMEs. *Industrial Marketing Management*, 42(1), 18- 30. <https://doi.org/10.1016/j.indmarman.2012.11.004>
- Lachiewicz, S., Matejun, M., Pietras, P., & Szczepańczyk, M. (2018). Servitization as a Concept for Managing the Development of Small and Medium-sized Enterprises. *Management*, 22(2), 80- 94. <https://doi.org/10.2478/manment-2018-0024>
- Lenka, S., Parida, V., & Wincent, J. (2017). Digitalization Capabilities as Enablers of Value Co-Creation in Servitizing Firms: DIGITALIZATION CAPABILITIES. *Psychology & Marketing*, 34(1), 92- 100. <https://doi.org/10.1002/mar.20975>
- Malleret, V. (s. d.). *LA RENTABILITE DES SERVICES DANS LES ENTREPRISES INDUSTRIELLES, ENQUÊTE SUR UN POSTULAT*. 26.
- Martín-Peña, M.-L., Sánchez-López, J.-M., & Díaz-Garrido, E. (2019). Servitization and digitalization in manufacturing: The influence on firm performance. *Journal of Business & Industrial Marketing*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/JBIM-12-2018-0400>
- Mathieu, V. (2001). Service strategies within the manufacturing sector: Benefits, costs and partnership. *International Journal of Service Industry Management*, 12(5), 451- 475. <https://doi.org/10.1108/EUM0000000006093>
- Neely, A. (2007). Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, 1, 103- 118. <https://doi.org/10.1007/s12063-009-0015-5>

- Neu, W. A., & Brown, S. W. (2005). Forming Successful Business-to-Business Services in Goods-Dominant Firms. *Journal of Service Research*, 8(1), 3- 17. <https://doi.org/10.1177/1094670505276619>
- Oliva, R., & Kallenberg, R. (2003). Managing the transition from products to services. *International Journal of Service Industry Management*, 14(2), 160- 172. <https://doi.org/10.1108/09564230310474138>
- Paiola, M. (2017). Digitalization and servitization : Opportunities and challenges for Italian SMES. *Toulon-Verona Conference « Excellence in Services »*, 0(0). <http://www.toulonveronaconf.eu/papers/index.php/tvc/article/view/482>
- Parida, V., Patel, P. C., Wincent, J., & Kohtamäki, M. (2016). Network partner diversity, network capability, and sales growth in small firms. *Journal of Business Research*, 69(6), 2113- 2117. <https://doi.org/10.1016/j.jbusres.2015.12.017>
- Parry, G. (2018). Enterprise Imaging : Picturing the Service-Value System. In M. Kohtamäki, T. Baines, R. Rabetino, & A. Z. Bigdeli (Éds.), *Practices and Tools for Servitization* (p. 343- 361). Springer International Publishing. https://doi.org/10.1007/978-3-319-76517-4_19
- Queiroz, S. A. B., Mendes, G. H. S., Silva, J. H. O., Ganga, G. M. D., Cauchick Miguel, P. A., & Oliveira, M. G. (2020). Servitization and performance : Impacts on small and medium enterprises. *Journal of Business & Industrial Marketing, ahead-of-print*(ahead-of-print). <https://doi.org/10.1108/JBIM-06-2019-0277>
- Ramani, G., & Kumar, V. (2008). Interaction Orientation and Firm Performance. *Journal of Marketing*, 72(1), 27- 45. <https://doi.org/10.1509/jmkg.72.1.027>
- Ramaswamy, V., & Ozcan, K. (2018). Offerings as Digitalized Interactive Platforms : A Conceptual Framework and Implications. *Journal of Marketing*, 82(4), 19- 31. <https://doi.org/10.1509/jm.15.0365>
- Rapaccini, M., Mauro, S. G., Cinquini, L., & Tenucci, A. (2019). Servitization of SMEs through Strategic Alliances : A Case Study. *Procedia CIRP*, 83, 176- 181. <https://doi.org/10.1016/j.procir.2019.04.010>
- Rönnberg Sjödin, D., Parida, V., & Kohtamäki, M. (2016). Capability configurations for advanced service offerings in manufacturing firms : Using fuzzy set qualitative comparative analysis. *Journal of Business Research*, 69(11), 5330- 5335. <https://doi.org/10.1016/j.jbusres.2016.04.133>
- Sjödin, D., Parida, V., Kohtamäki, M., & Wincent, J. (2020). An agile co-creation process for digital servitization : A micro-service innovation approach. *Journal of Business Research*. <https://doi.org/10.1016/j.jbusres.2020.01.009>

- Story, V. M., Raddats, C., Burton, J., Zolkiewski, J., & Baines, T. (2017). Capabilities for advanced services : A multi-actor perspective. *Industrial Marketing Management*, 60, 54- 68. <https://doi.org/10.1016/j.indmarman.2016.04.015>
- Vandermerwe, S., & Rada, J. (1988). Servitization of business : Adding value by adding services. *European Management Journal*, 6(4), 314- 324. [https://doi.org/10.1016/0263-2373\(88\)90033-3](https://doi.org/10.1016/0263-2373(88)90033-3)
- Vendrell-Herrero, F., Bustinza, O. F., Parry, G., & Georgantzis, N. (2017). Servitization, digitization and supply chain interdependency. *Industrial Marketing Management*, 60, 69- 81. <https://doi.org/10.1016/j.indmarman.2016.06.013>
- West, S., Müller-Csernetzky, P., & Huonder, M. (2018). Ecosystems Innovation for Service Development. In M. Kohtamäki, T. Baines, R. Rabetino, & A. Z. Bigdeli (Éds.), *Practices and Tools for Servitization* (p. 363- 385). Springer International Publishing. https://doi.org/10.1007/978-3-319-76517-4_20

5. Appendices

Table 5: Hypothesis table

N°	Hypothesis	Result
H1a	Servitization has a positive effect on non-financial performance of SMEs.	Rejected
H1b	Servitization has a positive effect on financial performance of SMEs.	Rejected
H2a	Digitalization has a positive effect on non-financial performance of SMEs.	Rejected
H2b	Digitalization has a positive effect on financial performance of SMEs.	Supported
H3	The effect of servitization on performance is mediated by digitalization.	Supported (FP)
H4	Non-financial performance has a positive effect on the financial performance of SMEs.	Supported
H5a	Network capabilities has a positive effect on non-financial performance of SMEs.	Supported
H5b	Network capabilities has a positive on financial performance of SMEs.	
H6a	Network capabilities has a positive impact on servitization.	Supported
H6b	Network orientation has a positive impact on digitalization.	Supported
H7a	Servitization mediates the effect of network capabilities on firm performance of SMEs.	Supported
H7b	Digitalization mediates the effect of network capabilities on firm performance of SMEs.	Supported