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Supply chains and ecosystems for servitization: a systematic review and future research agenda

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Supply chains and ecosystems for servitization: a systematic review and future research agenda

Abstract

Purpose: Recent research has recognised the importance of supply chains and ecosystems as key drivers of successful servitization strategies, especially in the context of inter-organizational relations (IOR). The body of knowledge has, however, become increasingly fragmented and diverse due to different disciplinary roots of both servitization and inter-organisational relations research. The purpose of this paper is to take stock of current knowledge and to generate a set of future research directions for servitization-related supply chain and ecosystem research.

Methodology: A systematic review methodology was applied. A thematic analysis was conducted on a sample of 34 papers in the period 2010-2021 to identify the key themes within the servitization-related supply chain and ecosystem literature.

Findings: The review revealed a limited, but expanding, knowledge base for servitization-related supply chain and ecosystem research. The findings provide insight into current trends across four thematic areas: theoretical orientation, methodological approaches, research context and research content. Within these themes, it was found that four main areas of research content have been studied (supplier relationships, risk perception and uncertainty, capability development and resource integration), with most research adopting case-based methodologies within three main industrial contexts: manufacturing, industrial and software. Finally, a broad range of theoretical orientations have led to an increasingly fragmented and diverse literature base.

Originality: This study is the first to review servitization-related supply chains and ecosystems. It contributes insights through an IOR lens to categorise and organise a core set of themes and concepts for servitization-related supply chain and ecosystems research. It identifies research gaps within the extant literature and presents a set of future research directions.

Keywords: servitization, supply chain, ecosystem, digital servitization, systematic literature review

1. Introduction

Over the last three decades, scholars have increasingly studied the concept of 'servitization' (Lightfoot *et al.*, 2013) and service infusion (Kowalkowski *et al*., 2012), which reflect the strategic transition from selling products to selling services (Baines *et al.*, 2017). As part of the transition, manufacturing firms seek to offer after sales services ranging from base services supporting products to advanced services supporting customers (Baines & Lightfoot, 2014). To deliver these services, organisations develop product service systems (PSS), sometimes referred to as hybrid offerings (Ulaga & Reinartz, 2011), complex product and systems (Raddats *et al.*, 2016) or solutions (Johnson *et al.*, 2021), that deliver value-in-use to the customer (Smith *et al.*, 2014). Early literature recognised that this shift from selling products to selling services required the creation and development of intra-firm capabilities (Baines *et al.*, 2009) as increased service content led to a higher degree of customer activities being outsourced to the provider (Ng *et al.*, 2013). As the literature has developed, however, more contemporary research has recognised that manufacturers need to develop inter-firm relationships if they are to be successful in servitization (Kreye *et al.*, 2015; Story *et al.*, 2017).

Recognition of the importance of these inter-firm relationships has led researchers to focus on supply chains and ecosystems (e.g., Bastl *et al.*, 2012; Sklyar *et al.*, 2019a; Kohtamäki e*t al.*, 2019), making it an important research stream within servitization. It is now widely recognised that successful design and management of supply chains or ecosystems supports superior financial and non-financial performance for servitized manufacturers. For example, Shah *et al* (2020) and Li *et al* (2021) find greater customer integration within advanced services leads to improved firm performance, and Karatzas *et al* (2017) found that relational relationships have a positive impact on firm performance. These results support Raddats *et al.*, (2017) proposition that the resource-based view (RBV), often used within early servitization research, is insufficient for understanding and explaining competitive advantage from servitization. This is because manufacturers do not possess all the resources required for sustained competitive advantage (Green *et al.*, 2017) and therefore alternative theories for studying inter-organisational relations (IOR) within servitization are needed (Raddats *et al.*, 2017; Kohtamäki *et al.*, 2019).

To study supply chains and ecosystems for servitization, many scholars have drawn on a variety of theories commonly associated with IOR, such as resource dependency theory (Shah *et al.*, 2020), transaction cost economics (Kohtamäki *et al.*, 2019), organisational power (Vendrell-Herrero *et al.*, 2017) and social exchange theory (Bastl *et al.*, 2012). Whilst the literature is, however, loosely connected through its exploration of servitization using the IOR lens, the body of knowledge has become increasingly fragmented and diverse. This is not surprising given both servitization and IOR research are rooted in different disciplines that seek to address different types of research questions and problems through the application of different theoretical and methodological approaches (Raddats *et al.*, 2019; Cropper *et al.*, 2008). Given this, the time is right to produce the first review of supply chain and ecosystems within servitization research. Therefore, the aim of this research is to provide the first focused, systematic literature review (SLR) of this emergent area of enquiry by taking stock of the current knowledge base and identifying what the future research directions should be for this important field.

To achieve this aim, this study adopts an IOR lens and a SLR methodology to address the following research questions:

RQ1: What has research established about supply chains and ecosystems within servitization research?

RQ2: What areas should future research prioritise within the supply chain and ecosystem research within the domain of servitization?

By utilising a SLR, a comprehensive synthesis of existing servitization-related supply chain and ecosystem research is provided. In addressing RQ1, the review revealed a limited, but expanding, knowledge base for servitization-related supply chain and ecosystem research. The findings highlighted four main trends: 1) a range of theoretical orientations had been adopted, leading to an increasingly fragmented and diverse literature base, 2) case studies were the most common research design, 3) servitization-related supply chains and ecosystems were almost exclusively studied within three main industrial contexts: manufacturing, industrial and software, and 4) four main areas of research content have been studied: supplier relationships, risk perception and uncertainty, capability development and resource integration. After categorising and analysing the literature, research gaps were discussed in the context of the findings, and future research opportunities were identified to harmonise and strengthen the field moving forward (RQ2).

The article is structured as follows. First, the methodology is presented. Second, the findings of the research are presented in two sections: descriptive overview and the thematic analysis. The findings are followed by a discussion of the primary research gaps and a set of future research directions, before the research concludes with a general summary, managerial implications, and limitations of the study.

2. Methodology

To address the research questions, a SLR methodology was adopted. This methodology was chosen following guidance from Fan *et al.*, (2022) who compare and contrast systematic, narrative, integrative and meta-analysis reviews. According to Fan *et al.*, (2022), narrative and integrative reviews are suited to more established areas with very large literature bases, where they can pull on 'representative' literature. A limitation of these approaches is that narrative and integrative reviews introduce researcher bias. The third type of review, meta-analysis, focusses on quantitative analysis of effect sizes based on a given set of variables and the relationships between them within the literature (Tranfield *et al.*, 2003; Farley & Lehman, 2001). Given the aim of this research is to focus on an emergent area that has a small research base through qualitative synthesis, a SLR was chosen. Furthermore, a SLR helps to minimise biases associated with narrative and integrated review through the adoption of a robust set of procedures that support validity, reductions in researcher bias and improved review quality (Wang & Chugh, 2014). We follow the SLR process created by Wang & Chugh (2014), modifying it with respect to content (e.g., search terms) for this study. An overview of the process is presented in figure 1.

<insert figure 1>

Figure 1. Overview of the SLR process adapted from Wang & Chugh (2014).

2.1 Conceptual Boundaries

This section defines the reviews conceptual boundaries in line with the RQs (Akter *et al.*, 2021). First, servitization has been studied under a variety of headings, each with different motivations (Smith et al., 2014). For example, hybrid offerings, solutions, and product-service systems (PSS) are commonly used terms instead of servitization (e.g., Tukker, 2004; Davies, 2004; Ulaga & Reinartz., 2008). Whilst semantic differences exist and motivations behind servitization research differ, there is consensus that servitization is competitive strategy organisations pursue by transitioning from selling product to selling service and in doing so, the way in which customers attain value, via a PSS, hybrid offering or integrated solution, will shift from ownership of the product to the benefits associated with its use (Smith et al., 2014). Given our study's aim, articles considering servitization under a different heading (e.g., PSS, hybrid offerings) are included and seen as analogous for the purpose of our study. Finally, whilst servitization is commonly studied within manufacturing and software industries, there is evidence of servitization within the entertainment (Vendrell-Herrero et al., 2017), healthcare (Hughes et al., 2021) and publishing industries (Kharlamov & Parry, 2020). Given this, we do not restrict our conceptual boundaries to the manufacturing industry.

Second, it is important to consider the level at which the analysis takes place. To do this, it is important to consider definitions of supply chains and ecosystems within the literature (Table 1).

Key concept	Definition(s)	Reference
Platform/digital ecosystems	"The system comprising a platform and its stakeholders (users, complementary goods developers, suppliers) in which all entities have some degree of mutual dependence" (pp.1554).	Rietveld & Schilling (2021)
	"products, services, or technologies that act as a foundation upon which external innovators, organized as an innovative business ecosystem, can develop their complementary products, technologies, or services." (pp. 417).	Gawer & Cusumano (2014)
Service ecosystem	"a service ecosystem is a relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange" (pp.10).	Vargo & Lusch (2016)
Business ecosystem	"an economic community supported by a foundation of interacting organizations and individuals—the organisms of the business world" (pp.26).	Moore (1996)
Supply chains	"A set of three of more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances and/or information from a source to a customer" (pp. 4).	Mentzer *et al.*, (2001)

Table 1. Definitions of supply chains and ecosystems

From these definitions, chains reflect a string of organisation passing materials or information from a source organisation to their customer upstream and downstream, whilst ecosystems, regardless of whether they are digital, platform, business or service ecosystems, are interconnected webs of organisations cooperating and competing around a central 'hub' that can be a product, service, digital platform or organisation. Whilst distinguishable by definition, both supply chains and ecosystems views resonate with our IOR perspective that is interested in *"relationships between and among organizations"* (Cropper *et al.*, 2008, pp. 2). This is represented in the definitions in table 1, where terms such as "a set of three or more entities", "an economic community" and "system of resource integrating actors" reflect interest in IORs and in the broader literature that studies the key concepts from table 1. For example, Wang & Wei (2007) study supply chains to understand how interorganisational governance can create value for supply chains with respect to visibility and flexibility. Their research is grounded in IOR theories; resource-based view and transaction cost economics. Bastl *et al.*, (2012) study servitized supply chains using social exchange theory commonly associated with IOR. Finally, Shipilov & Gawar (2020) partially integrate ecosystem and network research, underpinning their conceptual article with an IOR lens. Therefore, not only can we use table 1 to differentiate between supply chains and ecosystems, we can view table 1 from the IOR perspective to identify commonalities across the key concepts with respect to theoretical underpinnings and analysis of relationships between and within organisations.

However, neither the definitions for ecosystems or supply chains provides clarity on dyadic relationships between just two organisations, often studied within the servitization literature (e.g., Raddats *et al.*, 2017). Given this, we adapt Johnsen *et als.*, (2008) 'levels of networks' to further define the conceptual boundaries of our research. These levels are:

- Level 1: Inter-organisational networks. At this level, networks consist of an interconnected web of business relationships organised around a central hub.
- Level 2: inter-organisational chains. At this level, chains are a string of organisations.
- Level 3: inter-organisational relationships. At this level, relationships are one-to-one dyadic relationships.

These levels are consistent with broader supply chain management and ecosystem literature. For example, Harland (1996) describes four levels of research in supply chain management, the internal level, the dyadic level, the external level and the network level, where the latter three are analogous with the three levels proposed by Johnsen *et al* (2008). Wilhelm (2011) draws on Johnsen *et als* (2008) definition of levels to theorise links between the dyadic and network levels for managing coopetition within supply chains. Finally, a recent guest editorial in the International Journal of Operations and Production Management highlighted the need for further research on the value of relationships and the nature of interdependencies within and between different levels of supply chains (e.g., dyadic and network levels) (Scholten *et al.*, 2020).

Given the historic and contemporary focus on supply chain and ecosystem levels and their roots in IOR, we consider Johnsen *et al's* (2008) levels to be consistent with the wider literature and with the aim of our research, allowing the research to restrict its conceptual boundaries to articles that analyse relationships at one or more of these levels[1].

2.2 Data Collection and Analysis

[1] Papers focussing on platforms (i.e., the technological platform) and not the platform ecosystem will be excluded as they focus on intra-firm research.

Databases, keywords, and timeframes relevant to the research aim were first identified. Similar to other studies (e.g., Chakuu et al., 2019), Proquest, Science Direct, Web of Science and Scopus were identified as the databases. Given different search field options, the abstract and title were searched in Proquest, and the abstract, title and author specified keywords in Science Direct, Web of Science and Scopus.

Following the guidance of Rabetino *et al.*, (2018), we developed our search strategy and search strings. We followed their advice for search string development to ensure key literature was not missed through the execution of narrow searches. Selected articles must contain at least the primary keyword (e.g., servitization) in either the title, abstract or author provided keywords to be included in the initial sample. Selected articles must then include one of the supplementary keywords (e.g., service network). Therefore, our final sample includes articles that have at least one primary keyword and one supplementary keyword. The primary search terms were servitization OR product service system OR service infusion OR hybrid offering OR integrated solutions OR complex products and systems, and the supplementary terms were service dyad OR service triad OR supply chain OR buyer-supplier relationship OR ecosystem OR service network OR distribution OR platform. The keywords were informed by the literature and driven by our RQs. Full Inclusion and exclusion criteria are shown in Table 2.

	Inclusion/Exclusion criteria	**Justification**
Selection of articles	Only articles published in journals listed under the CABS disciplinary headings: Marketing, Operations and Technology Management, Innovation, General Management, Sector Studies, Finance, and Accounting. Articles were not excluded based on CABS journal ranking. Only peer reviewed articles in written English. Grey literature were excluded.	Articles outside these disciplines are not considered to be active within servitization research (see Lightfoot et al., 2013; Raddats et al., 2019). Some key research on servitization has been published lower ranked journals. This did not affect the outcome of the SLR as conference papers, books and book chapters have often been translated into journal outputs.
Timeframe	January 1st 2010 to April 30th 2021 (10 years 4 months).	This timeframe was considered appropriate as prior to 2010 the field of servitization was emerging as a distinct domain and supply chain and ecosystem related research emerged later.
Article selection	Only empirical articles were included. Only articles aligned to our conceptual boundaries were included.	This research intends to consider the way in which empirical research has evolved over time. This research focuses on supply chain and ecosystem research within servitization from the perspective of IOR. If a study does

		not investigate at least a relationship between two organisations (e.g., a dyad) it is not considered to be studying supply chain and ecosystem research from this review's perspective.

Table 2. Inclusion and exclusion criteria.

Next, we built a comprehensive database of research articles. The execution of our key search terms resulted in an initial sample of 405 papers, and 327 after removing duplicates. After application of the inclusion and exclusion criteria to the abstract, title and keywords, 72 articles were left. Three researchers then reviewed the remaining 72 articles in full and excluded any that did not meet the criteria from Table 2. This left 33 papers. Finally, we conducted a backward and forward snowballing method (Christofi *et al.*, 2021) by reviewing the reference lists of the 33 papers remaining. One additional paper was identified, leaving a final sample of articles at 34.

We triangulated our results from our primary search using Google Scholar to mitigate the risk of article exclusion (Wang & Chugh, 2014). On Google Scholar, the following keywords were searched 1) servitization and supply chain and 2) servitization and ecosystem between 2010-2021. 7,840 results for search string one and 5,500 for the string two were retrieved. Comparing the top 100 items with our sample, we found 11 and 3 of the papers in the analysis were present for search string one and two respectively (a 41.17% match with our primary search). The remaining papers in the top 100 Google Scholar returns were outputs previously excluded. It was concluded that our search identified and included the relevant population of papers.

To support validity and reliability, we followed best practice in SLR (Transfield *et al.*, 2003; Castañer & Oliveira, 2020; Williams *et al.*, 2021). First, given servitization research focussed on the focal firm emerged between 1980-2010 (Green *et al.*, 2017) and did not see a significant upward trajectory until 2007 (Lightfoot *et al.*, 2013), the timeframe of 2010-2020 was seen as appropriate to capture all relevant literature for this review. Notably, Bastl *et al.*, (2012) is seen a seminal paper for supply chain research within servitization and is captured within our search period. This curbs retrieval bias. Second, Table 1 was developed pre-sample retrieval and is clearly presented and justifies the inclusion and exclusion criteria, curbing both retrieval and selection bias. Third, this review used a data extraction sheet. Data extraction sheets general contain descriptive information of the articles, such as journal outlet, theoretical orientation, methods used, as well as providing a basis from which emergent themes that emerge from the analysis of the sample can be placed. In sum, data extraction sheets provide a transparent, historical representation of decisions made during the review process and provides a basis from which analysis can be conducted, presented and stored (Tranfield *et al.*, 2003), curbing selection and expectancy bias.

Within our research, the following thematic codes were used to code the articles: 1) author names; 2) journal name; 3) journal discipline; 4) publication year; 5) theoretical orientation(s); 6) research questions/aims/primary topic; 7) service(s) studied; 8) research context; 9) research design and strategy; 10) sources of data (e.g., respondents/participants); 13) what actors and relationships were studied; 14) network level. In addition to these thematic codes, data was also collected about the overarching purpose of the study and a summary of the study's contributions. Manual coding against these pre-defined themes was conducted because articles required careful and focussed reading to capture the relevant information. To code the articles, three researchers independently read an evenly distributed

number of the articles included in the review. To further ensure validity and reliability of the coding process, each researcher then read a sample of one another's articles and coding to ensure accurate representation of the articles against the pre-defined codes. Where differences between the authors emerged, articles were re-visited until agreement was reached. Following this process ensured a high level of inter-coder reliability (Wang & Chugh 2014).

3. Findings

To begin, a descriptive overview of the data collected is presented.

3.1 Descriptive overview

This section reports on the thematic codes: 1) name of the journal; 2) discipline of the journal; 3) year of publication.

Journal title (ordered alphabetically)	**CABS ranking**	**Number of papers included in the review**	**CABS Discipline**
International Journal of Operations and Production Management (IJOPM)	4	9	OTM
Journal of Supply Chain Management	4	1	OTM
Production and Operations Management	4	1	OTM
International Journal of Production Economics (IJPE)	3	4	Operations and Technology Management (OTM)
Industrial Marketing Management (IMM)	3	4	Marketing
International Journal of Production Research (IJPR)	3	1	OTM
Journal of Business Research (JBR)	3	3	General Management
Journal of Marketing Management (JMM)	3	1	Marketing
Journal of Service Research (JSR)	4	1	Sector Studies
Production Planning and Control (PP&C)	3	2	OTM
Supply Chain Management: an International Journal (SCM:IJ)	3	3	OTM
Technovation	3	1	Innovation
International Journal of Physical Distribution and Logistics Management (IJPDLM)	2	2	OTM
Journal of Service Management (JoSM)	2	1	Sector Studies
Total		34	

Table 3. Overview of selected paper for review.

Table 3 shows IJOPM contains the highest number of supply chain or ecosystem articles (n=9). Four other journals have published 3 or more papers (IMM 4 papers; IJPE 3 papers; JBR 3 papers SCM:IJ 3 papers).

Most papers belong to 'OTM' journals (n=23), 'Marketing' journals produced 5 and 'General Management' produced 3. 'Sector Studies' produced 2 outputs, whilst 'Innovation' produced 1. This distribution highlights that research into supply chains and ecosystems for servitization has remained within the confines of disciplines that have traditionally studied servitization (Lightfoot et al., 2013; Raddats et al., 2019). Not surprisingly, the topics studied are dominated by OTM journals.

<insert figure 2>

Figure 2. Distribution of supply chain and ecosystem research within servitization (2010-2021).

<insert figure 3>

Figure 3. Distribution by topic within servitization (2010-2021).

Figure 2 shows clear growth in the number of articles published. Since 2012 there has been a steady increase in the number of publications focussing on supply chains and ecosystems, and figure 3 highlights a small, but noticeable, increase in ecosystem research from 2018 onwards.

3.2 Thematic Analysis

The thematic analysis of the reviewed articles focussed on four main areas: 1) theoretical orientations, 2) methodological approaches, 3) research context and 4) research content.

3.2.1 Theoretical orientations

This section focusses on articles theoretical orientations. Four dominant theoretical orientations were found within our sample. First, Cannon & Perreault's (1999) relationship framework made up of 'relationship connectors' that are defined as "*dimensions that reflect the behaviours and expectations of behaviours in a buyer-seller relationship*" (pp. 441) received attention (n=4). Within the studies analysed (Bastl *et al.,* 2012; Saccani *et al.,* 2014;

Karatzas *et al.*, 2016; 2017), this framework is used to understand how buyers and suppliers are connected, how the relational connectors operate in a servitized environment and how they influence and/or contribute toward servitization success. Second, a relational view was found to be popular within servitization research (n=4). Relational theory states that successful outcomes for both members of the relationship is dependent upon the development of joint capabilities and joint input from partners in the relationships (Dyer & Singh, 1998). The use of this theory is in line with the broader servitization literature that has begun to consider servitization success as dependent on strong intra-firm relationships (Sjödin et al., 2019). Our review found that this theory is used to understand relation uncertainty, relationship transformation and relational governance. Service-dominant logic (SDL), an alternative lens used to view the nature of exchange and resource integration between actors (Chakkol et al., 2014), was the third most used orientation (n=3). Papers adopting SDL focussed on understanding the changing nature of resource integration between actors and the impact this has upon value co-creation for members of the supply chains and/or ecosystems studied. Fourth, Motivation Opportunity and Ability (MOA), which hypothesises that performance can be improved if an organisation is able to successfully leverage and align MOA of actors within the system (Raja & Frandsen, 2017), received some attention (n=2). Only one study using MOA explicitly addressed performance implications of different actors MOA (Karatzas et al., 2020), whilst the other investigates the challenge of providing services and aligning motivations in international markets using external partner networks (Raja & Frandsen, 2017). Finally, resource dependency theory (RDT) received some attention (n=2). Mosch *et al.,* (2021) investigated power structures within supply chains, whilst Shah *et al.,* (2020) apply it from the perspective that servitized manufacturers do not possess all the resources needed to deliver services, and therefore rely upon others within the supply chain who have access or ownership to the necessary resources to deliver services. Other notable theoretical orientations include: agency theory, contingency theory, stakeholder theory, organisational learning theory, organisational information processing theory, dynamic capabilities, and the resource-based view. Some articles were not clear in their theoretical orientation (n=4). With some exceptions (e.g., SDL), there is a clear focus on inter-organisational theories to address research questions within the servitization-related supply chain and ecosystems literature.

3.2.2 Methodological approaches

This section reports on the analysis of the thematic codes: 1) research design (e.g., qualitative), 2) research strategy (e.g., case study), 3) research purpose (e.g., theory building) and 4) whether the focal firm/actor of the study was the only source of data collection.

Qualitative case studies are the most frequently used methodology (n=21). The use of case studies is then followed by quantitative surveys (n=8). The least popular approaches were quantitative studies based on archival data (n=2), fuzzy set Qualitative Comparative Analysis (fsQCA) (n=2) and design science (n=1).

For research purpose, we categorised our articles against the four categories outlined by Voss et al., (2002); theory elaboration, theory building, theory testing, theory extension. Most studies were theory building (n=24), followed by theory testing (n=10). This finding highlights a significant amount of theory testing, suggesting the domain is not stuck in a period of problem driven, case-based research (Kowalkowski et al., 2017; Rabetino et al., 2021), but has progressed toward the use of other research strategies to progress the field beyond nascent, theory building research.

Finally, the analysis coded papers as YES/NO with respect to whether they collect data from more than one member of the supply chain/ecosystem they are analysing. The findings

show that most studies (n=20) collect data from two or more actors within the relationships they are studying. 14 do not collect data from more than one member of the supply chain/ecosystem they are analysing. Of those that do not collect data beyond a single member of the supply chain/ecosystem they are studying, 8 use surveys.

3.2.3 Research context

This section reports on the outcomes derived from the analysis of the thematic codes: 1) services studied; 2) industry(ies) studied; and 3) what actors and relationships within the supply chain/ecosystem were studied.

First, we analysed service types studied using Baines & Lightfoot's (2014) categorisation of base, intermediate, and advanced within which, specific services are detailed (e.g., performance-based). This analysis revealed many articles do not state what type of service they analyse beyond generic descriptions. For example, some simply state the companies they study 'offer services' or a 'range of services' without giving specifics as to what type. Those that did make it explicit (e.g., performance contracting) commonly studied advanced services (e.g., Raja & Frandsen, 2017; Karatzas et al., 2017; Ziaee Bigdeli et al., 2018).

Second, we analysed the industry(ies) studied by the articles. Most articles study industrial, manufacturing and service management companies (n=32). Only two studied industries outside of these (music and publishing). These findings conform with the broader servitization literature where industrial, manufacturing and software sectors within the private sector are studied in great depth.

Third, we analysed the types of relationships studied by the articles. From our analysis, we identified three primary relationships studied: dyads, triads and ecosystems/networks. Most studies stated they analysed dyadic relationships (n=21), focusing on supplier-provider, provider-service partner or provider-customer relationships. Nine studies analysed triadic relationships, with specific triads studied including supplier-provider-customer, provider-service partner-customer, provider-subsidiary-service partner. Finally, two studies analysed sets of relationships consisting of four or more actors. These varied but commonly consisted of the provider, supplier, customer and other services providers such as technology companies, distribution partners and/or dealers. Three studies were not explicit in the relationship they studied. A typology of these relationships is presented in figure 4.

<INSERT FIGURE 4>

Figure 4. Relationships studied within servitized supply chains and ecosystems.

3.2.4 Content of the research

A range of different topics and RQs across a range of industries within our sample. Whilst the volume of research has remained moderate, topics explored are heterogenous. This section aims to identify the most prevalent topics and issues within the supply chain and ecosystem servitization literature. We therefore analyse the thematic codes 1) research

questions/research aims and objectives; and 2) research topic. In addition to these thematic codes, we analyse the two additional columns within the data extraction sheet that provide an overview of the purpose of and key contributions of the study. The analysis identified four main groups: 1) supply relationships; 2) risk perception and uncertainty; 3) capability development; and 4) resource integration. Whilst certain papers may fall into more than one group, they were allocated to a single group that they most aligned to. Groups were created when 2 or more articles fell into them. Four studies that did not fall into any of the groups presented.

3.2.4.1 Supply relationships

The first group received most attention (n=21). Ten articles (Li et al., 2021; Freije et al., 2021; Shah et al., 2020; Vendrell-Herrero et al., 2017; Bustinza et al., 2013; Kamaladin et al., 2020; Mosch et al., 2021; Benedettini & Neely., 2019; Boehmer et al., 2020; Zhou et al., 2020) address the topic of supply chain integration and supply chain interdependencies. Li et al., (2021); Freije et al., (2021); Shah et al., (2020), Benedettini & Neely (2019) and Zhou et al., (2020) all investigate the role supply chain integration plays in either enabling or improving servitized firm performance. Zhou et al., (2020) address this from the perspective of tie strength and structural holes and Benedettini & Neely (2019) address it from the perspective of relational embeddedness. Vendrell-Herrero et al., (2017) and Mosch et al., (2021) investigate power structures and interdependencies within servitized supply chains. Bustinza et al., (2013) investigate the integration of supply chain management and demand chain management strategies to understand how firms manage both product and service offerings. Finally, Kamaladin et al., (2020) study how organisations and customers transform their relationships within digital servitization, noting the need to develop four relational components to improve performance. Three articles investigate the challenges and success factors for servitized companies and their supply chains when providing services (Kreye & van Donk., 2021; Raja & Frandsen., 2017; Weigal & Hadwich., 2018). The challenges and success factors identified vary considerably. For instance, Kreye & van Donk (2021) investigate challenges facing manufacturers and their supply chain partners within a B2C context, finding two prerequisites for servitized manufacturers, which are moderated by institutional settings, such as local and regional regulations. Raja & Frandsen (2017) acknowledge limited research has taken place across geographies and investigate the challenges of aligning MOA when expanding service provisions into other countries through an external service partner network. Finally, Weigal & Hadwich (2018) focus on key success factors in selecting service network partners to support servitization implementation. Four studies (Saccani et al., 2014; Karatzas et al., 2016; 2017; Bastl et al., 2012) take the approach of investigating the differences in relationship connectors, defined by Cannon & Perreault (1999), when servitizing. All three studies find differences in these connectors between product and service provision, with a consensus that there is more open exchange of information and a strengthening of operational linkages within servitization. Bastl *et al.*, (2012) sought to investigate the differences between product and service providers specifically, Karatzas *et al.*, (2016; 2017) investigated the relational connectors' impact on performance, whilst Sacanni *et al., (*2014) studied the differences in connectors across different service types. One article (Finne & Holmström., 2013) uses design science to investigate network positioning by studying the context of how a sub-system supplier can servitize, after being dislodged by a system integrator. They implement a solution that fills a structural hole within the servitized supply chain, allowing the sub-system supplier to successfully servitize when the customer is no longer under their control. Chakkol *et al.*, (2018) investigated the role of boundary spanners in servitized supply chains. Their study

found that several roles, practices and functions of boundary spanners, such as strategic communication and dissonance reduction, facilitated effective communication between supply chain members and led to improved service delivery for the customer. Ayala et al., (2019) sought to understand how service suppliers moderated the success of servitization and the configuration of three key business indicators that need to be aligned to the servitization strategy. Finally, Formann et al., (2017) took a business model approach to study driver configurations for servitization success within service dyads, with a notable finding being that customer resources are more important for servitization than those of the providers.

3.2.4.2 Risk perception and uncertainty

The second group containing five articles was labelled 'Risk Perception and Uncertainty'. Kreye (2017a; 2017b; 2018) focus on uncertainty, with key topics explored including uncertainty evolution and emergence, interactions between uncertainty types and responses to, or mitigation strategies against, uncertainty within dyadic and triadic relationships. With respect to risk, Ziaee Bigdeli et al., (2018) and Selviaridis & Norrman (2014) both explore risk perception and exposure within servitized supply chains or ecosystems. Ziaee Bigdeli et al., (2018) sought to understand how members of the servitized supply chain calculated risk and the implications said risk had on network positioning whilst Selviaridis & Norrman (2014) investigated risk management within a servitized supply chain to understand how risk was allocated and managed throughout the supply chain in the provision of an advanced service.

3.2.4.3 Capability development and resource integration

The third and fourth groups, 'Capability Development' and 'Resource Integration', received comparatively little attention compared to other groups; both containing 2 articles. For 'Capability Development', Raddats et al., (2017) investigate the joint development of capabilities in supplier-provider and provider-customer dyads. In the context of ecosystems, Lütjen et al., (2019) found that twelve ecosystem capabilities were needed for the organisations they investigated to be successful within a servitized ecosystem. The intensity of these capabilities varied, depending on whether the organisation had high or low service-innovation intensity. Two articles adopting a SDL view focussed on 'Resource Integration'. Chakkol et al., (2014) found that servitized supply chains require greater resource contributions from each actor within the chain, whilst Sklyar et al., (2019a) found that resource integration between actor's changes within a digital servitization ecosystem. They also found that technology increases the complexity of resource integration, whilst simultaneously enabling actors to coordinate and manage said complexity.

The four groups identified, combined with our analysis of the methodological approaches adopted, provide insight into the nature of research in this domain. From Table 4, dyads have been the most heavily studied through both qualitative and quantitative methods. Only 10 articles studied triads, where qualitative research remained dominant. Finally, ecosystem/networks have received comparatively little attention with just two qualitative studies found within our analysis. Mixed methods remain an underused approach. To ensure accuracy of Table 4, Johnsen *et als*., (2008) levels of networks were applied to ensure the methodological approach and unit of analysis specified matched the relationship that was claimed to be studied or whether those claiming to study triads (level 2) and ecosystems (level 1), were in fact a collection of dyadic relationships taken as representative of a complex ecosystem/network. In all cases, it was found they matched.

	Dyad			Triad			Ecosystem/Network			Subtotal
	Qual	**Quan**	**Mixed**	**Qual**	**Quan**	**Mixed**	**Qual**	**Quan**	**Mixed**	
Supply Relationships	5	6	1	4	3	1	1	-	-	**21**
Risk Perception and Uncertainty	3	-	-	1	-	-	1	-	-	**5**
Capability Development	1	-	-	1	-	-	-	-	-	**2**
Resource Integration	1	-	-	-	-	-	1	-	-	**2**
Not Grouped	2	1	-	1	-	-	-	-	-	**4**
Subtotal 1	12	7	1	7	3	1	3	-	-	**34**
Subtotal 2	20			11			3			**34**

Table 4. Content group, methodological approach and relationship studied.

4. Discussion and Future Research Directions

This study has reviewed the literature on supply chains and ecosystems for servitization. This review represents the first attempt to consolidate relevant research on this topic. The thematic analysis categorised and organised the literature across four main variables of interest (theoretical orientations, methodological approaches, research context and research content) to identify research gaps and provide a platform from which future research directions can be put forward. This section now discusses those findings, with respect to the state of the art and the research gaps and presents several future research directions (see Table 5).

Variables of interest	Main gaps identified	Supporting data from the analysis	Future research direction
Theoretical orientation	Diverse range of theoretical perspectives used leading to diverse and fragmented knowledge.	More than 20 theoretical orientations are deployed, with 25 papers explicit in the use of only one theoretical orientation.	Future research should initially consolidate around a set of theoretical orientations. Future research should integrate two or more theoretical orientations to develop the field.

Methodological approaches	Lack of methodological diversity	Most studies within this review use qualitative research methods (n= 27). Out of the 10 quantitative studies, a survey methodology (n=8) was most common.	Future research should consider alternative research methodologies to case studies.
	Methodological shortcomings	Quantitative research using surveys (n=8) did not use dyadic research designed, which presents potential for common source bias.	Future research should develop dyadic or multi source (e.g., triadic) research designs to overcome methodological limitations and improve research quality.
Research context	Lack of cross-country studies and acknowledgement of cultural and regulatory differences.	Only 1 article explicitly explores cross-country servitized supply chains.	Future research should focus on under explored areas such as servitization and cross-border supply chain activities.
	Lack of clarity on services studied.	Most studies do not explicitly state what service they are studying beyond stating generic descriptions.	Future research should be explicit in the services studied.
	Lack of research outside the context of industrial, manufacturing and software industries.	Only 2 studies analysed alternative industries.	Future research should expand into other industries and sectors.
	Lack of research analysing relationships beyond generic actors.	No studies address the role of FSPs (FSP) within servitization.	Future research should consider the role of FSPs in enabling and

			constraining servitization.
Research content	Lack of studies addressing joint capability development and resource integration.	Only 5 studies address these two areas.	Future research should consider the dimensions and attributes of inter-organisational processes to further understand interactive relationships that influence innovation, capability development, and resource integration.
	Lack of studies focussing on digital servitization.	Only 8 articles consider digital servitization directly.	Future research should consider the differences in attributes and dimensions of organisations, processes, contexts and relationships (Cropper *et al.*, 2008) between traditional and digital servitization.

Table 5. Primary gaps and future research directions.

Consolidation of theoretical orientations

The first research finding was that the articles reviewed deploy a plethora of theoretical orientations to study supply chains and ecosystems within servitization. Whilst promising that research is grounded in theory, the diversity of perspectives coupled with the lack of volume in their use raises questions. Specifically, our findings question whether the research base is effectively identifying new constructs and explanations that would allow the field to move beyond the development of suggestive theory, toward generalizable theory that can be used to inform and guide managerial practice and decision making. This finding corroborates with Bigdeli *et al.,* (2017) and Rabetino *et al.,* (2021) who suggest servitization-related research needs to be underpinned and driven by more generic theory. This research therefore proposes future research into supply chains and ecosystems within servitization should initially consolidate around a few theories deployed within the articles reviewed and commonly associated with IOR to ensure a stronger theoretical underpinning for the domain.

These include organisational information processing theory (OIPT), relational theory, RDT, and contingency theory. As an example, OIPT has been used within broader supply chain literature (e.g., Srinivasan & Swink, 2017) to explain organisational behaviour by understanding information flows within and between organisations. Within our findings, Kreye (2017) applied OIPT to investigate how relational uncertainty effects the development of relationships between supply chain partners in a dyadic relationship. Through OIPT, Kreye (2017) was able to 1) identify relational uncertainty as distinct from other uncertainty types and 2) and understand organisational responses to relational uncertainty and the relationship between these responses and service quality. This is a particularly interesting approach to understanding constructs and relationships between them within servitization as it is argued that servitization requires stronger intra-organisational relationships and greater information flows between them. Therefore, our findings suggest that it should be expected that servitized firms cannot simply reduce their need for information and rely on mechanistic means through which to process information, but instead they must increase their information processing capacity to support uncertainty reduction in their operations and supply chain relationships. In many ways, Kreye (2017) exemplifies the changing dynamics of inter-organisational relationships within servitization-related supply chains as it highlights changes in the dimensions of relationships. Unpacking Kreye's (2017) work from our IOR lens, we see her work sheds light on the interaction between the content of relationships, with respect to the need more heightened information flows between organisations engaged in servitization, and governance mechanisms that facilitate and manage said information flows between organisations. Providing these micro-level insights into the dimensions of relationships and the interaction between the sub dimensions (i.e., more information flows (content) leads to improved trust (governance mechanism)) shows how an IOR perspective can support the development of the field and shed light on the complex interactions between organisations that develop and unfold overtime. With respect to relational theory, emphasis is placed on investigating how stronger inter-organisational relationships can support servitization success. Relational theory provides a suitable foundation through which relationship transformation can be understood within servitization. Third, RDT has been heavily used within strategy, marketing and operations management literature to date, and based on our findings we believe provides an interesting theoretical perspective through which to analyse supply chains and ecosystems within servitization. For example, within our findings it was clear that resource access, power structures and network positioning in supply chains and ecosystems for servitization were important topics (Shah et al., 2020; Vendrell-Herrero, *et al.,* 2017; Chakkol *et al.,* 2018; Mosch *et al.,* 2020). RDT has the potential to shed further light on these issues. Together, these three theories represent commonly used inter-organisational theories that have been applied and developed in the broader supply chain and ecosystem literature and would support the requests from Bideli *et al.,* (2017) and Rabetino *et al.,* (2021) for the greater infusion of theory into servitization research. Furthermore, it would support the generation of a shared vocabulary and understanding across disciplines studying both servitization and IOR, addressing further calls from the literature (e.g., Lightfoot *et al.,* 2013; Raddats *et al.,* 2019). However, the studies described, and the vast majority of those in our review sample, apply a single theory to study their chosen research problem. In line with IOR research (e.g., Cropper *et al.,* 2008), we are critical of this approach as it restricts contributions to those aligned to the theory used and the community that has developed it. Kamaladin *et al.,* (2020) use of Dyer & Singh's (1998) relational theory as a foundation for their research is an example of this within our review. Integrating two or more theoretical lenses for the study of IORs within servitization provides promising opportunities to break down disciplinary siloes and generate novel insights for the benefit of the wider research community. An example of the integration of different theoretical orientations within our

review is provided by Karatzas *et al.,* (2016) who integrate Cannon & Perraults (1999) relational framework with contingency theory to provide novel insights into contingent factors within triadic relationships that lead to higher service performance.

In sum, initially consolidating supply chains and ecosystems for servitization around inter-organisational theories serves to facilitate the convergence and harmonization of diverse vocabularies and refrain from providing underdeveloped or ill-defined constructs that encourages further work that shy's away from providing generalizable theory.

Diversify and strengthen methodological approaches

The second area of future research considers the methodological approaches. The first call for action is to diversify the methodological approaches used, aligning with a broader call within the servitization literature (Salonen et al., 2021; Rabetino *et al.,* 2021). Within our analysis, qualitative research dominates which, to some degree, supports Kowalkowski et al., (2017) and Rabetino et al., (2021) who state servitization has been stuck in a cycle of problem driven, qualitative research often in the context of a case study research designs. Whilst we do find a reasonable number of quantitative, theory testing research designs, this research urges researchers to adopt alternative methodological approaches to advance supply chain and ecosystem research within servitization. From our analysis, whilst some common themes emerged, it was clear that contingent factors effect servitization success (Karatzas *et al.,* 2016; Reim *et al.,* 2019; Sjödin *et al.,* 2019), suggesting equifinal paths to positive performance outcomes are possible. Given this, we suggest further adoption of fsQCA servitization as it allows scholars to study specific cause-effect relationships and equifinal paths (Sjödin *et al.,* 2019). The benefits of utilising fsQCA to study servitization is reflected in the broader literature and support future research directions we identified in this review. For example, Vendrell-Herrero *et al.,* (2021) study smart product configuration for firms offering product service systems and whilst they find multiple configurations lead to superior firm performance, monitoring capabilities were found to be a necessary capability for all the identified configurations. Second, Bustinza *et al.,* (2021) applied fsQCA to study smart manufacturing and product-service innovation. They found two superior performance configurations for manufacturing firms delivering services, highlighting equifinal paths for success exist. Finally, recognising the benefits of fsQCA, Salonen *et al.,* (2021) encourage the use of fsQCA to allow servitization research to study cause-effect relationships and identify equifinal paths toward superior firm performance in the delivery of service. Whilst these scholars encourage its use from a methodological perspective, we believe it complements our first future research direction of the greater infusion of general theory into servitization-related supply chain and ecosystem research given fsQCA requires a strong theoretical foundation to be conducted. This is exemplified in our review of Karatzas *et al.,* (2016) and the broader literature as described above (e.g., Sjödin *et al.,* 2019; Bustinza *et al.,* 2021; Vendrell-Herrero *et al.,* 2021).

Beyond methodological use, our research also identified some methodological weaknesses that should be addressed to enhance research quality. A consistent weakness was found in study's using quantitative surveys, where authors do not consistently use dyadic research designs. Addressing these limitations would ensure findings are not subject to common source bias. Finally, within the research we evaluated the levels at which analysis took place (Johnsen *et al.,* 2008). All research was found to collect and analyse data at the 'level' they claimed to. This is commendable as it is not uncommon in IOR research to study a collection of dyadic, one-to-one relationships and represent them as a connected ecosystem/network (Johnsen *et al.,* 2008). However, much of the extant research, including those studying levels 1 and 2, was at the 'micro-level'. This means that research to date has generated more actor-

specific managerial outcomes as opposed to more 'macro-level' analysis that gives a more holistic understanding of network interconnections and flows of information, material and services among actors within the supply chains and ecosystems. This is reflected in our findings that primarily provide insight into the development of trust (e.g., Kamaladin *et al.*, 2020), power structures (e.g., Mosch *et al.*, 2020), capabilities (e.g., Raddats *et al.*, 2017) and how relationships and roles of staff have changed over time because of servitization (e.g., Chakkol *et al.*, 2018) at the micro-level. Whilst this reinforces the importance of micro-foundational perspective (Liu, et al, 2022), future research should consider more macro-level contributions that give insight into the management of supply chain and ecosystem positions, understanding ecosystem and supply chain structures and finally, further insight into strategic alliances, mergers and acquisitions and partnerships (Xing, et al, 2017) which remain under studied in current research. For example, when addressing the dimensions and attributes of context for IORs, current topics within servitization could be further explored using an IOR lens to understand the spatial dimensions of IORs for supply chains and ecosystems. Existing research into network positioning and territorial servitization has looked at the role and position of actors within supply chains and ecosystems, but longitudinal studies investigating how these unfold over time or how broader legal, national and international structures, policies and incentives influence the spatial dimensions of IORs and the formation of relationships between organisations delivering service remains scarce. Whilst this future research direction could be considered under research content, it is presented in the methodological approaches as the study of 'levels' requires the research methodology and unit of analysis to match the aim of the research and the 'level' at which the research is to take place.

Diversify the research context

The findings identified that the research generally studies a homogenous set of contexts: industrial, manufacturing and software industries in western economies. There is a need to reinforce research and explore new ideas outside the confines of the industrial, manufacturing and software industries. Exploring supply chains and ecosystems for servitization outside of these contexts provides opportunities for testing the boundary conditions of existing servitization research. This would allow scholars to lift and contrast their findings in novel contexts with those typically studied (e.g., manufacturing). Example industries where further research could be conducted are healthcare, publishing, retail and entertainment industries. Indeed, within the article's analysed, Kreye & van Donk (2021) study servitization within a B2C setting which provides novel insights into the challenges supply chain partners face compared to those in B2B settings.

Second, there was clear evidence that studies do not explicitly state what service type they are studying. This presents pressing challenges to theory development as it becomes difficult to determine whether a theory can be seen as context-dependent or context-free (Voss et al., 2015). Based on the research findings, it is suggested future research is explicit in stating the type of service studied and moves beyond generic descriptions of 'base or advanced services' or even a 'range of services' to 'performance based, condition monitoring, outcome based' and so on. Explicitly stating the type of service studied will open opportunities for future research to understand more granular contingent factors that influence firms' ability to achieve superior financial performance. Within our analysis, Hullova et al., (2019) provide a useful example of why this is important. By explicitly splitting basic and advanced services within their results, they found different resource requirements for each service type are needed from supply chain partners if servitization is to be successful for the focal firm.

Third, a further research direction within research context is to develop further cross-country research such as that conducted by Raja & Frandsen (2017). Cross-country research could lead to a greater understanding as to the facilitating conditions that support or constrain the implementation of a successful servitization strategy within different countries that have different cultural leanings, institutional or regulatory environments. This is particularly important from an IOR perspective as many cross-border activities require collaborative partnerships, mergers and acquisitions, outsourcing and strategic alliances. The importance of this is recognised in the IOR, entrepreneurship and strategic management literature, where recent studies on servitization have identified that during cross-border activities and the internationalisation of service activities, knowledge intensive business services become key partners for manufacturing firms within their broader ecosystem (Lafuente et al., 2017; Liu, et al., 2019). However, whilst the research mentioned has given insight into some of the macro level themes, such as understanding the coordination of key actors, connections between them and understanding the role of actors within groups of firms with a common purpose, micro level analysis of cross-border and internationalised service activities remains scant within the context of supply chains and ecosystems. Therefore, this finding encourages future research that studies these specific contexts, with particular emphasis placed on understanding different types of relationships in cross-border service activities, how boundary spanners operate in international contexts for servitization and the structure within which international actors operate at organisational, supply chain or ecosystem levels.

Finally, whilst not picked up in our sample, there is evidence from practice that Financial Service Providers (FSPs) are beginning to engage with servitization (Wood & Godsiff, 2020). However, FSPs were not studied at all in our sample even whilst they might play a key role in enabling or constraining firms servitization strategies (Baines & Lightfoot, 2014). We therefore suggest that the study of FSPs, and with it the broader domain of supply chain finance, within servitization would be a fruitful area of future research. An interesting place to start could be through the exploration of the relationship between the supply chain finance mechanisms, actors, and instruments as put forward by Chakuu et al., (2019) in the context of servitization. However, as noted, enabling factors should not be the only area of research, and the constraining factors, which include risk management and perception, should also be studied. The importance of this is exemplified by recent events such as the Grensill Capital scandal and devastating consequences for the economy.

Further develop capability development and resource integration

The fourth area of future research is derived from the analysis of research content. First, it is clear ‘Capability Development’ and ‘Resource Integration’ have been understudied, yet are important to the success of supply chains and ecosystems for servitization. We therefore suggest that these two areas are studied further. We suggest their study is consolidated using the theoretical perspectives outlined in our first future research direction. This is because the theories presented, such as OIPT, relational theory and RDT, explore topics such as stronger intra-organisational relationships through the development of complementary capabilities and relation specific assets, and whether resource integration practices and requirements differ across service types provided by the focal organisation (e.g., Hullova et al., 2019; Kamaladin et al., 2020). Furthermore, with these theories rooted within IOR research, they can shed light on the dimensions and attributes of contexts, processes, and relationships (Cropper *et al.*, 2008). Our research suggests fruitful areas of future research would be understanding how trust unfolds over time, how organisations jointly innovate or develop capabilities for the delivery of services and how actors within supply chains or ecosystems learn and position themselves dynamically over time.

Finally, in line with the broader servitization literature, we suggest future research pays particular attention to digital servitization. Whilst our analysis shows this is common for ecosystem orientated articles, servitized supply chain research is lacking in this area with only a small sample of studies addressing digital servitization (e.g., Mosch et al., 2021; Vendrell-Herrero et al., 2017; Kamaladin et al., 2020). Our findings suggest future research should consider longitudinal studies to understand how the type of material and information flows between organisations changes in intensity and frequency. This would advance the digital platform literature that suggests digital resources will become the dominant resource in digital servitization, which may have knock on effects for network positions of actors within the broader supply chain or ecosystem (Cenamor *et al.,* 2017).

5. Conclusions, Managerial Implications and Limitations

Research within servitization has moved beyond an early focus on intra-firm capabilities to inter-organisational relationships in the context of supply chains and ecosystems. The study of inter-organisational relationships within supply chains and ecosystems for led to an increased body of knowledge for the servitization domain, but the diversity of theoretical perspectives and disciplinary roots had led to a fragmented and increasingly diverse body of knowledge. The field was therefore in need of consolidation and a clear path forward for future research. As such, the aim of this research was to synthesise current empirical literature from an IOR perspective (RQ1) and provide a set of future research directions (RQ2). To address the two research questions, the research deployed a systematic literature review methodology and analysed 34 articles using thematic analysis. The main findings were organised within four main areas, theoretical orientation, methodological approaches, research context and research content, where the state of the art from the 34 articles was summarised and presented from an IOR perspective, addressing RQ1. In presenting the state of the art of the existing work, we were able to establish and present a set of future research directions to address RQ2. Organised around the four areas described, the core findings highlighted that future research needed to consolidate around a core set of theoretical perspectives to move beyond suggestive theory toward generalizable theory that can be used to inform and guide managerial practice and decision making, diversify the methodological approaches, diversify the research contexts studied and test the boundary conditions of theory developed in the context of manufacturing, software and industrial contexts and finally, further develop work around capabilities and resource integration between partners at different levels (e.g., dyadic, chain and network). The study has therefore summarized the state of the art for supply chains and ecosystems within servitization, providing much needed food for thought for researchers within the field and a clear and coherent set of future research directions for scholars to engage with.

Whilst the research addressed the two research questions set, it must be acknowledged that this research has several limitations. The purpose of this research was clearly limited to taking stock of existing research to address two primary research questions. In doing so, this research provided a clear overview of the state of the art and presented several future research directions. Taking this approach however limits the research to spotting conceptual gaps and organising and categorising existing literature in line with the existing conventions of the field. This limitation means the research does not present more ambitious and creative ideas through the transfer and integration of theories from across disciplinary boundaries that permit the creating of new narratives for the field. Second, we conducted a manual analysis. Although still common amongst SLRs, several new analytic techniques are available that support the consolidation of far greater quantity of information which can be presented in several insightful ways. For example, dynamic topic modelling, model-narratives, and

bibliometric analysis are becoming increasingly popular. As the number of publications studying supply chains and ecosystems for servitization, these methods can become more relevant and applicable. This limitation therefore presents another opportunity for future research.

Finally, the paper also has important managerial implications. Our study shows that servitization is more than just a change in a single firms' business model, and instead requires significant changes across different levels of supply chains and ecosystems (e.g., dyads, chains and networks). A prominent theme was that if managers from the providers organisation simply treat servitization as a change in their intra-organisational capabilities, it is unlikely they will be successful in their transition from selling products to selling managers. Therefore, it is crucial managers pay attention to inter-organisational relationships and capabilities if they are to be successful. Our findings show this is important for several reasons. First, our findings show that servitized manufacturers do not always possess the necessary resources for servitization. This was most notable for advanced services, where studies utilising resource dependency theory and the resource-based view of the firm found that customers and third-party service providers often hold key resources for the success of servitization. Managers therefore need to consider what resources are needed for servitization and who owns and controls those resources. Second, not only do managers need to consider who owns and controls required resource for servitization, but they must also consider the nature of inter-organisational relationships and changes required to make servitization successful. There was clear consensus from studies adopting resource dependency theory and relational theory that greater integration of the customer with the provider is an important antecedent for servitization success. However, to achieve greater integration between provider and customer is a complex process and requires several changes to both the provider and the customers capabilities and governance structures. The findings showed that greater integration of the two parties required increased information sharing, joint capabilities, and relational governance structures, where trust often complemented more formal contractual ties. By providing clear insight into the need for greater integration between the two parties, and highlighting prominent changes (i.e., in capabilities and information sharing) that need to be made should help managers from the providing organisation successfully transition from selling products to selling services.

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