Paradoxes and coping mechanisms in the servitisation journey

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ABSTRACT

Servitisation is conceptualised as product manufacturers' transition towards bundling products and services to offer customers enhanced value. Scholars have raised concerns regarding the potential challenges that firms face during servitisation, often termed *servitisation paradoxes*. Limited studies have explored the paradoxes experienced during the servitisation journey and the associated coping mechanisms. We utilise the open-ended essay methodology to unravel various paradoxes and coping mechanisms to address the gap. We collected data in two stages—from 69 participants in the first stage and 32 in the second stage. The study's findings reveal three broad paradoxes: the paradox of organising (autonomy and control, efficiency and flexibility, formal and informal information flow, and employee and customer needs), the paradox of learning (prior knowledge and new knowledge), and the paradox of performance (short-term and long-term performance). In addition, we identify four coping practices: change management, open communication, training programmes and digitalisation. The study augments the prior literature by developing a conceptual framework that elucidates the coexistence of numerous paradoxes and coping mechanisms.

1. Introduction

Manufacturing organisations have increasingly adopted a services-led strategy to enhance the value of their product offerings (Yeniaras, Di Benedetto, & Dayan, 2021). For instance, organisations such as ABB, Caterpillar, General Electric, IBM, Rolls-Royce and Xerox have transitioned to a services-led strategy to remain competitive (Oliva & Kallenberg, 2003). These companies have shifted their focus from manufacturing-only offerings to more integrated service-oriented offerings (Kamal, Sivarajah, Bigdeli, Missi, & Koliousis, 2020). Scholars have termed this transformation towards a services-led business model *servitisation* (Vandermerwe & Rada, 1988). Servitisation implies providing customers with a bundled package of products, services and support (Dmitrijeva, Schroeder, Ziaee Bigdeli, & Baines, 2022; Raddats,

Naik, & Ziaee Bigdeli, 2022). Customised solutions allow firms to satisfy changing customer demands and avoid the commoditisation trap (Neely, 2008). Servitisation offers manufacturing firms several potential benefits, including increased profits, reduced cost of knowledge acquisition, increased customer satisfaction, and improved performance (Oliva and Kallenberg, 2003).

Recent research has also noted potential servitisation hurdles (e.g., culture, managerial cognition and business model) that may ultimately decrease performance (Benedettini, Neely, & Swink, 2015; Luoto, Brax, & Kohtamäki, 2017). The literature suggests that firms transitioning to a services-led business strategy often face competing and contradictory choices, ranging from refining existing products to exploring new products and services (Yeniaras et al., 2021). While traditional product offerings are a source of revenue, service offerings may increase costs

and consume more resources (Suarez, Cusumano, & Kahl, 2013). Servitisation brings about competing needs or goals, such as customisation and efficiency (Visnjic Kastalli & Van Looy, 2013). These competing needs create paradoxical choice situations in which management cannot always afford to choose one goal over another, but rather must find a way to embrace conflicting goals (Jay, 2013; Lewis, 2000; Schreyögg & Sydow, 2010). Paradoxes are conceptualised as 'contradictory yet interrelated elements that exist simultaneously and persist over time' (Smith & Lewis, 2011, p. 382). Lewis (2000, p. 761) further posits that paradoxes are 'cognitively or socially constructed polarities that mask the simultaneity of conflicting truths'. In essence, paradoxes incorporate contradictory concepts that coexist and persist over time (Schad, Lewis, Raisch, & Smith, 2016; Smith & Lewis, 2011; Cunha & Putnam, 2019). Scholars have noted that manufacturing firms cannot leverage the benefits of servitisation due to inherent conflicts, such as product and customer orientation (Brax, Calabrese, Levialdi Ghiron, Tiburzi, & Grönroos, 2021). The consensus holds that no simple solution exists to address manufacturing firms' conflicting goals and the difficult choices that must be made during the servitisation journey. We recognise the scarcity of insights into the various paradoxes that firms face when transitioning from a *product-centric* to a *service-oriented* business model as a noteworthy gap and thus examine the following research questions: (**RQ1**) What paradoxes do manufacturing firms encounter during the early stages of servitisation? and (**RQ2**) What coping mechanisms do manufacturing firms adopt to respond to these paradoxes?

We employed qualitative research design to answer these research questions and unravel the various paradoxes experienced by firms. Our qualitative research design consisted of multi-stage open-ended essays, a popular research method increasingly adopted by management researchers (Dhir, Chen, & Chen, 2017). Open-ended essays offer rich qualitative insights into organisational phenomena that researchers cannot derive via direct observation or quantitative methods (Bradding & Horstman, 1999). Apart from the inherent benefits of this method, the COVID-19 pandemic impelled us to adopt open-ended essays and collect responses digitally. The study design consisted of two stages of data collection. A total of 69 respondents employed in US and UK manufacturing firms participated in Stage 1 of the study, which was conducted in February 2021. Respondents were asked a set of predefined questions regarding their experiences during their company's servitisation journey. The follow-up study was conducted in December 2021 to validate the findings that emerged during Stage 1. Stage 2 (a follow-up) consisted of 32 respondents with similar functional areas, skill sets and work experience profiles as those of the Stage 1 participants. The findings revealed the simultaneous manifestation of three types of paradoxes: paradoxes of organising, performing and learning (Chou & Zolkiewski, 2018; Gilbert & Sutherland, 2013; Yeniaras et al., 2021). In addition, our findings identified four types of coping mechanisms: change management, open communication, training programmes to facilitate knowledge exchange and digitalisation. This study contributes to the servitisation literature by (a) unravelling the various paradoxes that firms face during and after transitioning from a manufacturing-led to a servitisation-led business model and (b) uncovering various coping practices that enable firms to succeed after deciding to offer services in addition to or instead of products. Thus, the present study directly addresses calls in the prior literature for further research on the paradoxes that emerge during the various stages of servitisation and the mechanisms that firms employ to cope with these paradoxes (Dmitrijeva et al., 2022; Sousa & da Silveira, 2019; Zhang & Banerji, 2017).

This paper is divided into five sections. First, we provide a brief theoretical background on servitisation and paradox theory. Second, we explain the methodology adopted to unravel the various paradoxes. Next, we highlight the study's findings regarding the paradoxes extracted from the data and the various coping mechanisms that firms utilise to overcome such contradictions. Finally, we detail the study's theoretical and managerial contributions.

2. Theoretical background

2.1. Servitisation

Increased external environmental pressures are driving firms to synchronise their offerings to meet rapidly changing customer demands while exploiting economies of scale (Baines & Lightfoot, 2015; Parida, Sjödin, Lenka, & Wincent, 2015). To cope with environmental pressures, manufacturing firms might adopt a *product-service system* (PSS) (Baines, Lightfoot, Benedettini, & Kay, 2009), which requires customer involvement and calls for necessary changes in organisational structures (Zou et al., 2019). Vandermerwe and Rada (1988) coined the term *servitisation* to explain firms' transition from manufacturing to services by offering customer-focused packages of manufactured products, services, support, training and self-service knowledge (Parida, Sjödin, Wincent, & Kohtamäki, 2014; Rabetino, Harmsen, Kohtamäki, & Sihvonen, 2018). Servitisation involves delivering advanced solutions that enable customised offerings in the form of goods, services, training, self-service and knowledge (Lee, Yoo, & Kim, 2016). The transition to a business model that enables integrated manufacturing and services allows firms to satisfy customers' idiosyncratic needs (Yeniaras et al., 2021). This shift carries numerous benefits, including differentiation, improved customer loyalty and increased product reliability (Visnjic Kastalli & Van Looy, 2013). The basic premise of servitisation literature is that servitisation positively impacts financial and product performance (Rabetino et al., 2018), but we found that the extant literature has overemphasised the benefits (Vargo & Lusch, 2008). A potential reason for negative performance is firms' lack of experience in the services domain, which may increase their costs and offset the benefits of servitisation (de Blok, Luijkx, Meijboom, & Schols, 2010; Yan, Cheng, Li, & Wei, 2021). For example, Neely (2008) raised questions about leveraging the positive aspects of servitisation, noting that servitisation requires firms to extend and replace their existing product portfolios. In doing so, manufacturing firms incur high labour costs due to management and operational issues (Kharlamov & Parry, 2021). In addition, manufacturing firms lack service-related capabilities, which may weaken firms' expected performance. In short, a review of the extant literature reveals that the relationship between servitisation and firm performance may be more complex than a direct relationship and contingency models might suggest (Eggert, Hogreve, Ulaga, & Muenkhoff, 2014; Wang, Lai, & Shou, 2018). As firms pursue services to enhance revenue, their returns may be lower than those of pure manufacturing firms—an experience termed the servitisation paradox (Wang et al., 2018).

2.2. Servitisation and paradox

We observed a growing scholarly interest in investigating different paradoxical tensions in the servitisation context to better understand the substantial challenges that manufacturers face when developing and providing outcome-based services (Kohtamäki, Rabetino, & Einola, 2018).

The foundations of paradox theory can be seen in both Eastern and Western philosophies, which posit that human existence is imbued with paradoxical tensions between good and evil (Lewis, 2000; Schad et al., 2016). The term *paradox*, which refers to contradictory tensions that have the potential to influence organisational outcomes, is sometimes used interchangeably with the terms *dilemmas* and *dualism* (Gilbert & Sutherland, 2013; Lewis, 2000). While *dualism* implies a clear-cut decision-making situation with well-defined boundaries and no overlap (Farjoun, 2010), a *dilemma* refers to a situation in which one can evaluate the pros and cons of a particular decision and then decide accordingly *either-or* (Lauritzen & Karafyllia, 2019; Smith, 2014). The paradox theory posits that paradoxes represent coexistence, interrelation and contradiction within and between organisations, and that organisations cannot rely on any simple solution to such challenges, but

must instead embrace the conflicting situation (Smith, 2014). Paradoxes refer to tensions between interdependent opposites that are resolved through a *both-and* strategy (Smith & Lewis, 2011). Unlike a dilemma, a paradox involves two sides of the same coin (Lewis, 2000). It emerges when contradictory but interrelated elements coexist and persist over time (Huq, Reay, & Chreim, 2017). Managing paradoxes does not entail the resolution of tensions; rather, it requires interpreting and embracing them, and finding ways to leverage synergies between them (Putnam, Fairhurst, & Banghart, 2016; Smith & Beretta, 2021).

There is an agreement in the literature that servitisation requires complex organisational change involving organisational processes and capabilities. Servitisation generates contradictory stimuli that cannot be resolved due to lack of clear boundary conditions (Brax et al., 2021). Servitisation entails transition from product focus to service focus (Brax, 2005), and must consider the views of multiple stakeholders (Gebauer, Fleisch, & Friedli, 2005) who need to put more focus on services but simultaneously integrate products and services. Firms undergoing servitisation cannot afford to choose between customisation and efficiency, and need both to differentiate and standardise (Kowalkowski, Windahl, Kindström, & Gebauer, 2015). These complexities may cause failure of servitisation initiatives (Kamal et al., 2020) and calls for coping strategies to resolve inherent paradoxes, for example, resolving conflicts between stakeholders, misalignment between strategic plan and execution, and balancing stability and change (Khanra, Dhir, Parida, & Kohtamäki, 2021; Kohtamäki, Parida, Patel, & Gebauer, 2020).

3. Methodology

Aiming to delve deeply into the challenges and organisational practices involved in the servitisation journey, we utilised a qualitative research design comprising open-ended essay questions presented in two stages. Open-ended essays are popular in social science and management research as qualitative data provide rich insights (e.g., Nasution et al., 2020; Talwar, Dhir, Kaur, & Mäntymäki, 2020; Talwar, Dhir, Singh, Virk, & Salo, 2020). We adopted open-ended essays for two main reasons. First, drawing data from multiple respondents enabled the varied interpretation of servitisation phenomena and augmented the validity of our findings. Second, consistent with our objective to capture insights regarding tensions that servitised firms face, the open-ended essay approach enabled us to gather narratives conveying respondents' varied experiences in different contexts (Dhir et al., 2017; Ray, Dhir, Bala, & Kaur, 2019).

We approached firms that were operating in different manufacturing industries during the early stages of their servitisation journeys (Lenka, Parida, Sjödin, & Wincent, 2018). In particular, we were interested in firms whose offered services at this stage were based on existing products and core technologies (Brax, 2005; Lütjen, Tietze, & Schultz, 2017; Oliva & Kallenberg, 2003). In the first round, conducted in February 2021, there were 69 participants working in manufacturing units across various industries in the UK. Participants in this round held managerial positions in manufacturing firms operating in sectors including high-tech electronics, aerospace, automotive, medical equipment manufacturing and defence. Due to their levels in their firms, participants had accumulated first-hand experience of the servitisation journey.

We developed the essay questions based on a comprehensive review of the literature on servitisation (e.g., Kohtamäki et al., 2018; Rabetino, Kohtamäki, & Gebauer, 2017). The respondents received a set of predefined questions that encouraged them to share their experiences regarding challenges they had encountered during the servitisation journey. The questions focused on several issues, such as challenges, conflicts and coping strategies. We requested that the participants provided detailed responses to the predefined questions, which focused on the challenges organisations faced during their normal course of business, the coping mechanisms they adopted during servitisation and the challenges that emerged following the transition. We drew upon

paradox theory as a theoretical lens to investigate these issues.

3.1. Data coding and analysis

We applied deductive analysis to analyse the qualitative data (Smith & Lewis, 2011), incorporating the following steps to ensure objectivity. First, we independently analysed the data sentence by sentence during open coding and assigned a code to represent data chunks (Smith & Beretta, 2021). Following Andriopoulos and Lewis (2009), we identified the tensions and challenges the interviewees described by paying attention to language that indicated contradictions. For example, we used indicator terms such as 'challenge*', 'difficult*', 'tension*', 'problem*', 'ambiguity*', 'unclear', 'conflict*', 'confusion*', 'coping' and 'balance'. To identify coping strategies, we focused on the mechanisms that organisational members implemented to cope with the identified tensions and related challenges.

First-order and second-order codes emerged from our data analysis and formed the basis of our data structure, showing the progression from respondent data to respondent-centric terms and, finally, theory-based second-order codes. First, based on the respondents' narratives, we identified numerous first-order codes (Gioia, Corley, & Hamilton, 2013) derived from respondent-centric terms (Gehman et al., 2018). During this step, we looked for similarities among emerging labels and respondent-centric terms. In the next step, we aggregated the open codes into second-order themes based on the identified links (Smith & Beretta, 2021). Axial coding allowed us to consolidate the data generated during open coding. During this step, we attempted to identify links between first-order codes (Lenka et al., 2018) and generate theoretical explanations for the phenomena of interest (Gligor, Holcomb, & Stank, 2013). We consulted the relevant literature on paradoxes to generate second-order codes and thereby identify evidence of conflicts encountered and coping mechanisms adopted (Smith & Lewis, 2011).

To ensure intercoder reliability, we met via Zoom to discuss and compare the codes. Following the recommendation of Gilgor and Autry (2012), we analysed any discrepancies and reached a consensus on the optimal code, primarily via theoretical memos, which clarified why certain concepts were interpreted and coded a certain way.

After the preliminary analysis, we reinvited respondents to participate in the second round in December 2021. We conducted this round of analysis for two reasons. First, the second stage helped us validate that our interpretation of the data was consistent with the participants' lived experiences. Second, this approach allowed us to further refine the insights gained during the first stage. In this round, 32 respondents participated, resulting in a final data set of 101 responses. In the second stage, we asked questions based on the themes generated during the first stage of data collection (see Appendix B). Following a similar process to the one described above, the follow-up data collection further probed tensions that emerged in the first study (Dmitrijeva et al., 2022). This allowed us to replicate the results in Stage 1, with Stage 2 data collection predicting similar outcomes (Yin, 2003). Appendix A presents the questions utilised during the first stage, while Appendix B presents the questions utilised during the second stage.

4. Results

Based on the qualitative analysis of the collected data, we noted several paradoxes that firms encounter and coping practices that managers adopt in response to them. The findings revealed three types of paradoxes during the transition from manufacturing to servitisation: the paradoxes of organising (Radu-Lefebvre & Randerson, 2020), the paradox of learning (Ho & Wang, 2015) and the paradox of performing (Adler, Goldoftas, & Levine, 1999; Chou & Zolkiewski, 2018; Morales, 2020; Yeniaras et al., 2021). Fig. 1 elucidates these three types of servitisation paradoxes.

The analysis revealed four paradoxes of organising: autonomy and control, efficiency and flexibility, formal and informal information flow,
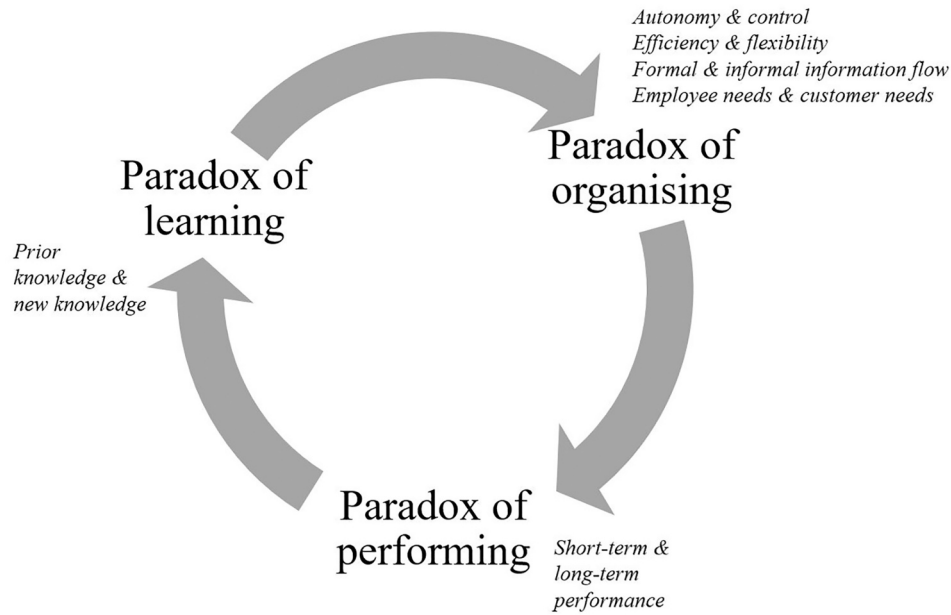
Autonomy & control
Efficiency & flexibility
Formal & informal information flow
Employee needs & customer needs

Paradox of organising

Paradox of learning

Prior knowledge & new knowledge

Paradox of performing

Short-term & long-term performance

Fig. 1. Three types of servitisation paradoxes.

and employee and customer needs. The paradox of performing represents the tensions between short-term and long-term performance goals, and the paradox of learning refers to the tensions between prior knowledge and new knowledge. In addition, our analysis revealed that manufacturing firms apply several coping mechanisms to manage these paradoxes. Next, we detail these coping mechanisms.

4.1. Paradoxes of organising

The paradoxes of organising consist of four types of paradox (see Fig. 2), which we present in detail below.

4.1.1. Autonomy and control

The first paradox of organising is that of autonomy and control, representing a tension between controlling employees' actions and allowing employees to execute tasks without supervision. Autonomy is

Paradox of organising	
'Yes, I think it gives us more freedom than before, we do not feel obliged to carry on with the status quo; if new sales opportunities come up in an area we haven't dealt with before, we can freely market our services.'	**Autonomy**
'Somewhat - there has been greater focus on service which has meant when this is not met there is less autonomy in what you can and cannot do and feels like you need to do things a certain way to meet service levels.'	**Control**
'...keeping costs under control, as some transition was new and costs could have runaway.'	**Efficiency**
'I would say it has definitely become messier - we are still trying to manage product alongside service so we have added complexity to our day-to-day operations. With new team members and structures people are also less clear of their remit and what they need to do so sometimes jobs are done twice and sometimes missed.'	**Flexibility**
'It is very formal, and this can be an issue at times and a lot of red tape. Tickets have to be raised, processes followed etc. rather than just speaking to someone and asking/asking them to do something. This can be challenging and slow the process down.'	**Formal information flow**
'There is more willingness to help each other out than there was previously. I think people need each other more and are therefore more willing to share info and insights.'	**Informal information flow**
'Employees were worried about what it meant for them and their future in the business, but we have worked with people to develop their roles and turn our workforce into a services-oriented workforce. It is important to work with your people and be open and honest to maintain trust.'	**Employee needs**
'We designed and developed some very high product ranges which customers wanted but due to complexities we underestimated the assistance that our customers would need to apply the design and place full and accurate orders. Therefore, mistakes were being made with resultant extra work and incomplete orders being supplied.'	**Customer needs**

Fig. 2. The paradox of organising.

defined as the experience of freedom by individuals and teams (Deci & Ryan, 1987) and also refers to employees' discretion in scheduling work-related tasks (Hackman & Oldham, 1975), such as setting their own work hours. Employees with greater autonomy are more likely to take ownership of decisions, experience greater job satisfaction and achieve organisational goals (Baard, Deci, & Ryan, 2004). Such employees often manage to work longer hours (Kelliher & Anderson, 2010) and better manage work-life conflicts (Putnam, Myers, & Gailliard, 2014). Among the potential organisational benefits of granting autonomy is cost savings, because it better enables employees to set their own rules, achieve performance goals and determine how to best meet customers' needs. In short, giving employees the autonomy to make decisions creates an organisational environment in which the rigidities of a manufacturing organisation do not constrain employees.

The participants reported that they were given more freedom to set their own rules during the transformation journey. Following the decision to add services, employees were granted independence to make decisions based on customer demands and consistent with organisational goals. Specifically, organisations implemented processes that allowed them to make decisions without consulting superiors and take ownership of their decisions. Autonomy allowed them to assume ownership of processes and better enjoy their jobs. Giving employees increased autonomy also enabled manufacturing firms to explore new market opportunities, better satisfy customers and reduce organisational costs.

Consider the following interview excerpts from the participants:

… Autonomy has allowed us to make decisions more freely and opened up a new area of detail for us. It has allowed more conversations and ideas to be thrown around the table, which I think people are enjoying. It feels like there is real growth. (P82, Male, 28, UK, Electronics).

The transformation has given us a lot more freedom since we now operate under our own rules. We also now don't have to worry about service-based companies overcharging for simple reparations. This has increased our savings when our machines break down also. (P19, Male, 26, UK, Engineering Goods).

Myself and my team need to do whatever is best for the customer, and since that is what the business as a whole would want, we do have the autonomy to judge situations and make the final decision. (P46, Female, 26, UK, Food and Beverage).

Interestingly, the study participants also reported that autonomy decreased when there was a greater need for coordination and collaboration within a matrix structure. The respondents reported that providing employees with a high level of autonomy occasionally resulted in coordination problems, such as conflicts concerning service delivery between the newly created departments and existing departments, indicating that a balance between autonomy and control is crucial (Smith & Beretta, 2021). As a result of the continuous changes, employees felt overburdened and confused (Davis & Lawrence, 1978). In their efforts to facilitate alignment, organisations designed control mechanisms. Our study participants revealed that following the transition, their organisations instilled controls in the workplace to align employees' actions with broader organisational goals (Kunda, 1995; Yoo, Boland, Lyytinen, & Majchrzak, 2012). While employees had the freedom to make operational decisions, supervisors made the final decisions regarding strategic implementation.

The following interview excerpts are illustrative:

The focus is more on meeting internal customers as well as influencing them to meet the overall objectives of the company. (P27, Female, 31, UK, Aircraft Manufacturing).

Our company is corporate, and all major decision-making is done by the senior management team in the corporate HQ office location. Branches don't make such major decisions themselves. [They are made] only on a local level. (P17, Female, 45, UK, Medical).

We have strict rules and procedures to follow and can make our decisions based upon those… (P116, Female, 55, UK, Food and Beverages).

4.1.2. Efficiency and flexibility

Firms following an efficiency strategy generally provide only a few products as their core offerings, which, combined with predictable demand, allows for simpler production scheduling, inventory control and delivery (Ebben & Johnson, 2005, p. 1252). While servitisation enhances customer value, organisations must be efficient enough to survive in a competitive environment (Kohtamäki, Parida, et al., 2020). Post transition, they require new resource capabilities both to manage governance and information processing and to increase their responsiveness to customer needs. In particular, additional resources are required to adapt to new organisational elements (e.g., structure, human resources and performance evaluation) (Gebauer et al., 2005). Thus, coordination costs typically increase with more customised and flexible offerings (Kowalkowski et al., 2015). In short, tensions can emerge between two contrasting goals: achieving efficiency in the manufacturing of products and exhibiting the flexibility to offer customised solutions (Kohtamäki et al., 2018). This is the second paradox of organising.

The participants noted that the transition to services calls for the adoption of efficiency and flexibility in order to achieve operational expertise, but many reported a decrease in efficiency due to tensions between various departments. In addition, they observed that the transition from a product orientation to a customer orientation necessitated the development of proactive and flexible relationships with customers (Kowalkowski et al., 2015). Agile teams were required to build and deliver effective customer solutions and thus meet both flexibility and efficiency goals (Magnusson, Boccardelli, & Börjesson, 2009). Accordingly, firms employed a flexible structure encompassing additional management layers to explore and exploit new opportunities proactively.

The following interview excerpts illustrate the crucial role of both efficiency and flexibility:

I would say it has become messier; we are still trying to manage products alongside services, so we have added complexity to our day-to-day operations. With new team members and structures people are also less clear of their remit and what they need to do, so sometimes jobs are done twice and sometimes missed. Over time and with experience, I expect it to improve and maybe even become more efficient, and we can apply learnings to the product side of the business. (P128, Male, 33, Beverages).

There are times that feel like a total mess for day-to-day operations, especially when not getting enough time to repair/replace manufacturing machinery on time. (P13, Male, 56, UK, Engineering).

No, it has allowed efficiencies to appear, which has improved the firm's operational expertise and allowed additional profit exposure. (P48, Male, 28, UK, Medical).

As a result of the service-orientation change, our company has become more agile…[more] responsive, more efficient, leaner [and] more focused, and [it makes] more fact-based decisions backed up by large volumes of data turned into actionable outcomes. (P119, Male, 56, UK, Engineering).

Manufacturing requires sophisticated management processes and strong resources, but we need to be service centric to maintain sales, so we need

to balance the demands on resources in the company. (P24, Male, 62, UK, Aircraft Manufacturing).

4.1.3. Formal and informal information flows

The third paradox of organising identifies information flows in the service unit as either formal or informal. Because manufacturing units must acquire new knowledge to upgrade existing knowledge during servitisation, new knowledge generated must be applied uniformly across the organisation to create a customer-oriented mindset. To manage information flow issues, manufacturing firms must ensure that the flow of information across various departments is systematic (Smith & Beretta, 2021).

Our findings revealed that manufacturing organisations cope with the need to maintain systematic and transparent knowledge flows in the early stage of servitisation by creating central information portals and online platforms to facilitate rapid formal information flows across manufacturing and service units. Specifically, the participants reported that these information portals were used to upload queries about errors in the service delivery process and to facilitate cross-functional coordination between the manufacturing unit and service department personnel. The participants revealed that the organisational structure became more formal following servitisation, with weekly briefings, the launch of an information portal to share information and the framing of policies to facilitate knowledge flows. In addition, the firms held regular meetings within and between departments to disseminate information and maintain coordination among all employees. New policies were framed, and periodic reviews were conducted to ensure compliance. The following interview excerpts illustrate these insights:

We have become more formal, and there is a lot more structure—weekly briefings, more updates via email and corporate presentations. Our knowledge is good, but we are being more formal and grown up with it. (P82, Male, 28, UK, Electronics).

Knowledge has become more formal with the company recently launching an online learning platform where colleagues can share expertise and gain new skills and have this recognised. (P56, Female, 30, UK, Automotive).

Knowledge flow has become much more formal since the service-centric industry is new to the organisation. Training and re-education have been conducted by outside consultants and vendors. (P127, Male, 55, US, Automotive).

There are policies and standards in place that need to be met for the goals of the stakeholders, including sales and bad debt maximums. These are continually reviewed during the year, and if they come close to not meeting these standards, changes are made, meetings are set to make decisions and changes [and] then these decisions and changes are announced, explained and followed company-wide. (P118, Female, 53, US, Utility).

There was re-organisation to centralise and streamline some of the processes and services provisions. This involved redundancies and new hires. New hubs were opened that now work with customers directly in languages that those customers speak. (P17, Female, 45, UK, Medical).

More formal. There are now strict policies and procedures in place for the tasks to be completed. More work is now required to complete certain tasks. (P85, Male, 29, UK, Medical).

Interestingly, the employees in the firms' service units also noted that despite formalisation, the flow of knowledge and information was inadequate. Employees felt overburdened as stricter policies were formulated. The participants reported that they often had to go beyond the parameters of their role to extract information, especially from their

firms' manufacturing units. Servitisation imposes a more hierarchal structure with additional layers, and so the participants created informal networks to gather information and facilitate knowledge sharing beyond the formal information flow. In addition, informal information sharing occurred because participants considered it essential to achieve the desired performance and task coordination (Sosa, Gargiulo, & Rowles, 2015). Consider the following interview excerpts:

The knowledge flow has become more formal due mainly to the expansion and intricacies of a service offering. This has been done through additional processes. Yes, I think more needs to be done informally to ensure that all employees are sharing knowledge in the same way. (P72, Female, UK, Food Packaging).

Sometimes questions do come up that no one can answer, and you get sent on a wild goose chase with various people to ask…which can be very time consuming and frustrating… which can make the communication flow more rigid. (P46, Female, 25, UK, Beverage).

Put simply, there is no 'perfect' method of communication. We noted that the simultaneous roles of formal and informal information flows are a component of the paradox of organising, which must be balanced (Smith & Beretta, 2021). While formal information sharing facilitates the efficient transfer of relevant knowledge, informal information sharing based on individual-level initiatives and motivations allows the transfer of tacit knowledge.

Weirdly, it has become both more formal and informal! Although there are now prescribed IT tools to capture and move knowledge around, there are also pseudo-social media platforms for sharing knowledge informally between employees (Google Currents—previously Google +) used in some countries. (P108, Male, 63, UK, Paints).

At first, it was quite formal as many changes needed to happen, including changes with employment. Now it's quite informal as we are all trained in the systems and know what we are doing. I don't think more needs to be done at the moment; we are always looking at our competitors and keeping an eye on the markets to see if people's needs change. (P50, Female, UK, Household Goods).

4.1.4. Employee and customer needs

A central tenet of servitisation is the call for a revised focus on the value-creation and value-delivery processes (Khanra et al., 2021). Following the decision to transition to a service orientation, manufacturing firms face the conflicting demands of two important stakeholders: customers and employees (Yan et al., 2021). The transition from manufacturing to service requires understanding customer needs, product usage and intended outcomes, and the firm's internal capabilities (Smith, Maull, Ng, & I., 2014). The emphasis thus shifts from manufacturing products to building relationships and offering tailored solutions (Baines et al., 2009). This process involves customers as co-creators of unique and difficult-to-imitate offerings (Oliva & Kallenberg, 2003). Thus, firms must invest in new capabilities to deliver customer value.

Servitisation poses further challenges for manufacturing firms, because they must simultaneously address employees needs as well as customer needs. Employees are responsible for meeting customers' requirements and collaborating with customers to create new services, but they are often also responsible for building internal capabilities and responding to the diverse—often divergent—needs of other internal stakeholders and customer interests. Accordingly, employees encountered role conflicts while attempting to manage the ambiguity of simultaneous product-oriented pressures and the pressures of transitioning to a service orientation (Lenka et al., 2018).

The participants reported that while manufacturing firms established

new facilities to support customers, employees struggled to cope with novel requests, which required them to work harder and adapt to new expectations. Organisations faced intra-team tensions as employees' responsibilities were altered to meet customers' needs, leaving employees dissatisfied. Unreasonable customer demands, unreliable suppliers and overly optimistic production estimates placed employees under increasing stress as they coordinated with multiple stakeholders. In addition to these stresses, employees fear the loss of their positions to redundancy and so must engage in training to keep pace with the changes required by servitisation (Baines & Lightfoot, 2015). The participants in our study were thus required to undergo training and reskill themselves, fearing that their current roles would be phased out. In short, tensions arose and persisted due to the conflicting goals of customers and employees. Despite training, many employees struggled to adapt to the changes, which in turn increased pressure on other team members and resulted in heavier workloads.

Consider the following insights from participants:

Unreasonable customer demands…Unreliable supplier delivery lead times…Substandard products from suppliers…Overly optimistic production estimates. (P6, Female, 53, UK, Consumer Products).

There have been some tensions, not least because of firing some people, which leads to friction and resentment among those who remain. Also, existing members of the workforce who stay and don't have service expertise sometimes find it hard to take orders and suggestions from some of the new service experts who are brought in, which can lead to a culture of friction as opposed to collaboration. (P128, Male, 33, US, Wine Manufacturing).

I would say the company is mildly successful as it is currently in a transition process, so we are yet to see the final results. There is a very large emphasis on the needs of the consumer. (P53, Female, 31, UK, Automotive).

If we have a breakdown on production, then we are under pressure to meet our customer expectations, [and] then management puts pressure on us to get up and running quickly to ease [the] tension between them and customers. (P49, Male, 50, UK, Corrugated Boards).

The primary problem in this regard has been in knowledge transfer between historic sales support staff who have been trained in selling physical products and constituted service-oriented teams. There have also been threats of job loss as most sales support staff feel very insecure with their jobs and may not be willing to be part of the transformational process. (P3, Male, 30, UK, Consumer Products).

4.2. The paradox of learning

The paradox of learning entails only one tension—the tension between prior knowledge and new knowledge (see Fig. 3), which we discuss in detail below.

4.2.1. Prior knowledge and new knowledge

The learning paradox category captures potential conflicts between the simultaneous and competing goals of exploiting established knowledge and exploring new knowledge (Lewis, 2000). The extant research posits that prior knowledge significantly influences a firm's ability to gain new knowledge (Paiola, Schiavone, Khvatova, & Grandinetti, 2021). However, while organisations must refine existing knowledge and explore new knowledge in order to increase their service capabilities, they may struggle to find a balance. They must decide whether to prioritise delivery of the core product based on prior knowledge or make investments in new service offerings. They thus face constant tension between refining core products and developing new services, and between the proven utility of existing knowledge and potential benefits of new knowledge.

In particular, the tension between prior knowledge and new knowledge is likely to intensify as service-based outcomes are tested and developed (Dmitrijeva, Schroeder, Ziaee Bigdeli and Baines, 2022). Participants across industries reported these tensions between prior knowledge and new knowledge (see Fig. 3). The transition towards services occurred slowly because older employees were not ready to change, and the manufacturing firms undergoing transition often suffered a loss of prior knowledge as more experienced personnel left the organisations. The participants further reported that while prior knowledge was sufficient in core manufacturing operations, the transition to servitisation required amassing and building new knowledge resources and capabilities. They noted that as their firms slowly increased their services offerings, the risk of failure also increased due to organisational rigidities based on prior knowledge. They encountered conflicts regarding the investment of resources in existing competencies, product development and new competencies for translating physical products to digital products and services. Finally, although prior knowledge helped organisations develop new capabilities, participants faced time lags while developing new knowledge. The following interview excerpts illustrate these points:

Absolutely, there has been constant tension between the product innovation and service development teams. Most often, it is in translating physical products to digital products and services. (P3, Male, 30, UK, Consumer Products).

We have lost much good staff. This has led to issues with knowledge transfer between those that have left and those that have stuck with us. (P30, Male, 31, UK, Aircraft Manufacturing).

Being an organisation that has been in existence for many years, change does come slowly. The old guard is not too keen, and senior management appears sometimes to have only half an appetite for pushing through with the change.

There are certain aspects that work well in these early days, such as the manufacture of components to display screens and such, which are the traditional aspects of the company, whereas the new aspects, such as

Paradox of learning	
'*Again we have a technical divide, between older workers who aren't used to technology and the younger workers who are. We have provided training for the older workers, but most seem disinterested. We're quite an informal company anyway.*'	**Prior knowledge**
'*We had to broaden our scope of skills, so we hired new technicians to add to our crews. Up-skilling our existing employees to not only make the products but to be able to service them was a challenge. We thought it was going to be a lot easier than it actually was.*'	**New knowledge**

Fig. 3. The paradox of learning.

system design and integration and best products, will require some further time to perfect. (P15, Male, 35, UK, Advertising).

The participants noted the relevance of new knowledge, agreeing that existing knowledge is not sufficient for the transition and that firms must respond by hiring individuals with new skillsets and employing better technologies. While prior knowledge worked well in product manufacturing, new knowledge is required to integrate novel services. Consider the following participant comments:

Given we have so much expertise in product-based manufacturing, and many people have been working at the company for years with this expertise, we have had to hire new talent with service expertise, and these [hires] have led to some tensions from an organisation perspective between leaders experienced in the company and leaders experienced in service. We have also had challenges around determining the value of the services we offer, such as pricing, and have had to make some adjustments. (P128, Male, 33, US, Wine Manufacturing).

The existing knowledge wasn't enough, so we upskilled our employees and hired more (P136, Male, 46, US, Electronics).

I think there is room for me and my company to improve our knowledge of changing scenarios; even though we are moving to new service formats, we often still use too much internally developed knowledge to make decisions. We are collecting external knowledge, but by some leaders in the business, this isn't conceived as valuable internal knowledge, when in my perspective, it should be more valuable. (P128, Male, 33, US, Wine Manufacturing).

4.3. The paradox of performance

The paradox of performance also includes a single tension—the tension between achieving short-term and long-term performance goals, which we detail below (see Fig. 4).

4.3.1. Short-term performance and long-term performance

The most significant issue manufacturing firms face following the decision to add services is the lack of immediate success. During the transition, manufacturing firms' initial returns decrease relative to their returns before servitisation; this is termed the performance paradox (Gebauer et al., 2005). In particular, the servitisation decision produces tension between efforts to achieve short-term and long-term performance goals (Dmitrijeva et al., 2022). Therefore, because initial investments may not be aligned with immediate business demand, manufacturing firms must convince internal and external stakeholders that generating profits may require considerable time (Neely, 2008; Kharlamov & Parry, 2021). Firms undergoing servitisation must invest substantially in new resources and capabilities, which may initially offset the benefits of transitioning to services (Yan et al., 2021).

The study participants reported that their firms' service efforts and integration of product and services affected their established processes,

which had previously focused on the product business. They also observed that the financial resources their firms derived from existing products provided resources necessary for servitisation. In addition, they mentioned a lack of initial demand for new services offered as another reason for the decline in firms' short-term performance. Furthermore, the participants noted that the prior success of the product business could limit their firms' commitment towards servitisation. Consider the following participant insights:

The biggest issue has been the lack of immediate success in the first market launched into. The start-up costs and timescale were not in line with the business demand, and thus, the first launch has not been incredible. Ultimately, these things take time, energy and momentum to build up to success; there are no shortcuts. (P121, Male, 42, UK, Engineering).

Margins are being squeezed. On the one hand, physical supplies are becoming more expensive; on the other hand, customers (the general public) have less money they are willing to spend so prices cannot rise. The physical supply chain is also currently a problem and will be in the foreseeable future. (P 138, Female, UK, Garments).

Each department must recognise its goals—whether service or manufacturing. Each has its management orientation, and each has its own KPIs [key performance indicators] to meet. Delivering at contract and quality is what is important; whether it is for manufacturing or service provision, it is the same. (P24, Male, 62, UK, Aircraft Manufacturing).

The main tensions are particularly within production, where it always feels like they are more KPI-focused than service-focused. This causes quite a lot of tension within the supply chain, which then echoes across different functions and causes tension between us and sales/marketing. (P51, Female, 25, UK, Beverage).

Nonetheless, the study participants were convinced of servitisation's long-term benefits. Noting that product demand is projected to decline in the future, they asserted the need for service offerings to support performance in the long term. In other words, adopting a service-oriented business thus has long-term value with a massive unrealised potential to help manufacturing firms realise long-term success. For example, consider the following participant stories:

Adopting a service-oriented strategy has confirmed hidden value, [which] we have always suspected and [were] advised to pursue historically; now the company has realised such huge potentials [that] it [has] never [before] realised. (P3, Male, 30, UK, Retail).

No, offering a service rather than a product would help save the company as the product market has collapsed. (P5, Female, 59, UK, Advertising).

4.4. Coping mechanisms

Firms have adopted various coping mechanisms to manage the

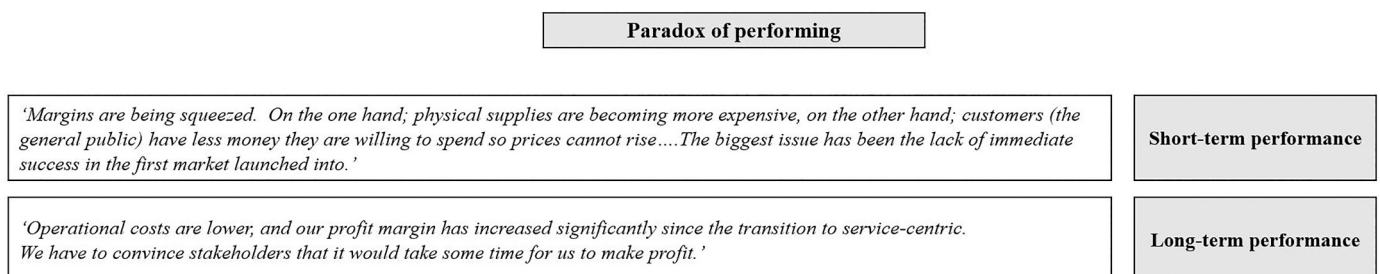| Paradox of performing	
'Margins are being squeezed. On the one hand; physical supplies are becoming more expensive, on the other hand; customers (the general public) have less money they are willing to spend so prices cannot rise….The biggest issue has been the lack of immediate success in the first market launched into.'	**Short-term performance**
'Operational costs are lower, and our profit margin has increased significantly since the transition to service-centric. We have to convince stakeholders that it would take some time for us to make profit.'	**Long-term performance**

Fig. 4. The paradox of performing.

paradoxes of organising, performing and learning. These coping mechanisms include a) change management, b) open communication, c) training programmes and d) digitalisation. This section discusses the various paradoxes encountered and the coping mechanisms suggested by the analysis (see Fig. 5).

4.4.1. Change management

Servitisation necessitates business model transformation, which entails inherent paradoxes due to the shift from product-focused to service-focused processes (Brax, 2005; Brax et al., 2021; Gebauer et al., 2005). Achieving the strategic objectives of servitisation requires successfully managing organisational changes to achieve the goals set for the service strategy. Successful servitisation is characterised by a concerted organisational effort to implement structural changes, which are likely to meet resistance from internal stakeholders within the organisational subunits where service strategy may not be well understood (Mathieu, 2001).

The participants reported that firms undergoing servitisation made structural changes to create new areas of knowledge. They reported necessary changes in business models to align with customers' requirements and create new value propositions for customers. New employee positions were added to accommodate additional employees and improve customer service. New departments and new positions were created to attract required talent. Current employees were moved to new positions to facilitate cross-functional knowledge flows. In addition to structural changes, cultural changes were initiated to successfully manage conflicts arising during servitisation. Consider the following insights from participants regarding the change management process adopted:

Previously, we were organised around the platforms we produced. In recent years, we have reorganised to align with the geographical location of the countries we work within in the hope that our service offerings become more consistent across platforms and within regions. Breaking up old areas of knowledge to create new ones had its challenges, but this was mostly just typical resistance to change. (P60, Male, 31, UK, Aircraft Manufacturing).

We have had a new management structure that is key to the new changes. This has been about changes to a culture, which not everyone took to initially. (P116, Female, 52, UK, Food Products).

We have increased our staff horizontally and vertically to accommodate the increased demand and provide better service to customers. Change is

always difficult and behaviour also. (P74, Female, 43, UK, Food Products).

We try to offer flexible working times, but with the factory running 24/7, this is hard due to constantly needing employees on-site. (P122 Male, 50, US, Automotive).

4.4.2. Open communication

Scholars have also agreed on the crucial role of open communication in the organisational context. Shifting to a new business model requires employees to be willing to engage in frequent communication so that issues can be recognised and responded to in a timely manner. Employees may fail to recognise the transition's economic potential because they perceive such a shift to entail significant risks, but they may also simply be accustomed to operating on a manufacturing mindset (e.g., efficiency and economy of scale). Shifting this mindset can be quite challenging (Johnstone, Wilkinson, & Dainty, 2014), and so manufacturing companies must implement open communication to achieve the transition (Baines et al., 2009). Enabling employees to express their views about their jobs allows organisations to capitalise on the potential of their employees, and frequent contact between employees and the organisation's management enables them to work together to resolve work-related issues and enact the organisation's goals (Eisenberg & Witten, 1987).

The participants noted that open platforms were designed to gain feedback from employees. Frequent meetings were conducted between employees and higher management in the service units, which helped resolve conflicts within their firms. The leaders spent time with their teams discussing challenges and working together with other departments to address them. These meetings communicated key priorities to employees, ensuring modifications to existing plans to achieve performance goals. In addition, organisations invested time with other stakeholders, including customers. Employees were encouraged to be transparent with customers and seek support from their peers if they faced difficulties in their interactions with customers. Consider the following interview excerpts:

We have a weekly meeting with employees to discuss any tensions or issues and implement any solutions we arrive at. (P26, Male, 49, UK, Lighting).

The strategy that our company uses to resolve conflicting situations at work is to be very clear and open with communication when situations
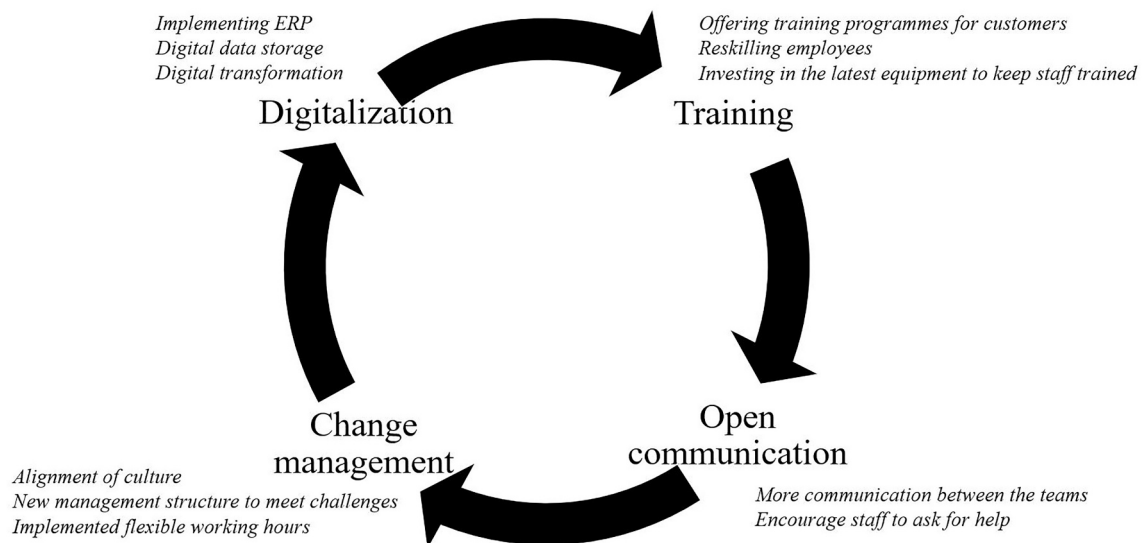

Fig. 5. Coping mechanisms employed to manage paradoxes.

arise. We are very transparent and address things immediately. (P118, Female, 53, US, Heating Oil).

We have encouraged transparency with our customers and feel that being upfront/honest with them is the best approach. We encourage staff members to ask for help/assistance from other members of the team if they encounter any difficult situations. (P114, Female, 33, UK, Electronics).

4.4.3. Training programmes

Extant research has noted the importance of training in the delivery of effective and efficient customer service (Gebauer et al., 2005). The servitisation journey is often associated with changing underlying norms and beliefs, and firms must navigate conflicts between the pre-existing manufacturing culture and the service-related counterculture. Employees must develop new skill sets to adapt to the servitisation transition—for example, service forecasting and service orientation (Johnstone et al., 2014).

The study's participants reported that the servitised units began formal training programmes to transfer critical knowledge and information to their employees and customers, which, in turn, enabled the firms to overcome the challenges associated with high employee turnover. Because senior employees had acquired many skills throughout their tenure, they were also encouraged—and, at times, asked—to impart their skills and knowledge to their junior colleagues and customers. The following interview excerpts provide useful illustrations:

Products are bespoke; however, many of our customers have made errors in their ordering and have had to make replacements or add-on orders, [so] we are enhancing our service levels to improve this process, [and] we have also unrolled training for customers. (P42, Male, 48, UK, Home Products).

We needed to ensure that all sales staff also have a great customer service skill set. They can't just sell sales; they also must create relationships with customers and other businesses. Customer service training is always offered for sales staff in addition to regular employees. (P118, Female, 53, UK, Heating Oil).

4.4.4. Digitalisation

Manufacturers have leveraged digitalisation to improve internal operations and customer processes by providing advice and training services (Coreynen, Matthyssens, & Van Bockhaven, 2017). Digitalisation is considered a business model transformation that involves mechanisms and micro-processes that extend beyond organisational boundaries (Kohtamäki, Rabetino, Einola, Parida, & Patel, 2021) and makes use of digital technologies to connect sub-units, organisations and products, thereby resulting in improved performance. It also implies transforming value chains by altering how manufacturing companies interact with stakeholders, improving customer interactions and supporting data acquisition and analytics (Kohtamäki, Parida, et al., 2020). In addition, digital technologies automate operations, facilitate interdepartment information flows, reduce transaction costs, promote quick decision-making and enable firms to simultaneously standardise and customise offerings (Coreynen et al., 2017; Kohtamäki, Einola, & Rabetino, 2020).

In particular, servitisation requires the usage of digital technologies as manufacturers struggle to improve operations and customer processes (Kohtamäki, Parida, et al., 2020). The participants reported measures including the digital transformation of product and service offerings, cloud adoption, data analytics and robotics, and observed the implementation of new enterprise resource planning (ERP) programmes to link manufacturing and services. These programmes enabled the firms to operate more efficiently and better manage the complexities of servitisation. Furthermore, the participants suggested that digitalisation enabled their manufacturing firms to connect previously unused knowledge within various subunits. In short, the findings revealed that digitalisation allows firms to leverage the complex interplay among digital technologies and mechanisms to cope with the conflicting demands of servitisation (Kohtamäki et al., 2021).

The most visible of such effort is the implementation of a new ERP system that is designed to link our manufacturing, purchasing and service aspects. This has had mixed results to date but, in the long run, promises to deliver a more streamlined business model. (P60, 31, Male, UK, Aircraft Manufacturing).

We are in transition. We have a new planning system, but until this links to the new ERP system, this is stand alone and helps only with the actual manufacturing process. We are way better than we were, so not a total mess, but we have a long way to go before we become effective—from sales orders to packing and despatch. (P62, 58, Female, UK, Oil and Gas).

Knowledge exists in siloes for each purpose. A centralised information management system (SAP) allows for interdepartmental info to be presented and transacted as and when required. (P24, 39, Male, UK, Beverage).

5. Discussion

A gap exists in our knowledge regarding the conflicting goals that arise during servitisation, often termed the servitisation paradox. Our study aimed to build on the extant servitisation research by exploring the paradoxes that manufacturing firms encounter and the coping mechanisms they employ to manage these paradoxes following their decision to add services to their business model (Dmitrijeva et al., 2022; Kohtamäki et al., 2021). We performed a deductive analysis of qualitative data collected through a two-stage open-ended essay collection from managers (Cunha & Putnam, 2019). The findings revealed that firms faced different tensions simultaneously during their servitisation journey. We extracted three main categories of paradoxes: paradoxes of organising, performing and learning (Brax et al., 2021; Niesten & Stefan, 2019; Smith & Beretta, 2021). The paradoxes of organising include tensions between (a) control and autonomy, (b) efficiency and flexibility, (c) formal and informal knowledge flows and (d) employee and customer needs. The paradox of performance involves tensions between short-term and long-term performance, while the paradox of learning involves tensions between the relevance of prior knowledge and the need for new knowledge.

The findings revealed that no clear and simple solution exists with which to respond to these challenges, and that organisations must learn how to cope with them (Kowalkowski, Gebauer, Kamp, & Parry, 2017; Tóth et al., 2022). In particular, the study finding revealed four coping strategies, that is, change management, open communication, training and digitalisation. By identifying various paradoxes of organising and subsequent coping strategies that were employed, the present study enhances the existing knowledge of how tensions unfold during servitisation at intra-organisational levels during the servitisation journey (Dmitrijeva et al., 2022).

We employed paradox theory to gain understanding on conflicting goals faced by organisations during transition (Smith & Beretta, 2021). The first paradox of organising is the paradox of autonomy and control. The current study findings reveal that servitisation requires both (Radu-Lefebvre & Randerson, 2020). A high degree of autonomy may jeopardise the achievement of long-term strategic servitisation goals, and so controls are necessary to align the operations of various units. Specifically, while employees in the firms we studied enjoyed some autonomy following their firms' decisions to add services, their senior managers

continuously monitored them. This indicates that although autonomy allows employees to work freely and enhances their overall productivity (Kelliher & Anderson, 2010), managers must continue to exert some level of control over their subordinates to maintain coordination across the organisation and achieve efficiency goals (Smith & Beretta, 2021). This paradox persists despite the varied coping mechanisms that organisations adopt.

The second paradox of organising involves the tensions between efficiency and flexibility (Ebben & Johnson, 2005). While an efficient structure improves the reliability of a firm's actions and increases the speed at which those actions are implemented (Eisenhardt, Furr, & Bingham, 2010), a firm operating under an efficient structure may fail to leverage new opportunities. The findings revealed that developing an efficient structure is crucial to the servitisation strategy (Adler et al., 1999), yet manufacturing firms undergoing servitisation face a loss of efficiency. While manufacturing firms need to invest in flexible resources and capabilities to increase their responsiveness, they face challenges in achieving efficiency goals (Magnusson et al., 2009).

The third paradox of organising emerges from firms' dependence on both formal and informal information sharing processes (Diefenbach & Sillince, 2011). The findings revealed that manufacturing firms relied on rigid formal information flows to improve efficiency, but that this rigidity pushed the employees to build internal networks of informal channels for distributing information among themselves and gaining relevant knowledge. The final paradox of organising reveals potential conflicts involved in simultaneously seeking to meet both employee and customer needs (Gebauer et al., 2005). Customer satisfaction is crucial to achieving performance outcomes, but performance also depends upon satisfied internal stakeholders and employees.

In the paradox of learning, manufacturing firms face the competing demands of employing prior knowledge and gathering new knowledge (Lewis, 2000). The manufacturing firms in the study faced the risk of failure due to organisational rigidities, conflicts regarding relevance of existing and new knowledge, and time lags while developing new knowledge. The findings revealed that servitisation results in transition from a well-understood prior knowledge domain to a novel one. During servitisation, these firms transition from relying on well-developed knowledge domains to novel knowledge domains related to services, in turn creating new learning needs (Bustinza, Vendrell-Herrero, & Baines, 2017). However, while prior knowledge and new knowledge may appear contradictory, they are, in fact, interdependent. Manufacturers need to leverage previously accumulated knowledge and combine it with newly acquired knowledge to support the development and delivery of outcome-based service offerings (Dmitrijeva et al., 2022).

Finally, the paradox of performance highlights persistent tensions between efforts to achieve short-term outcomes and efforts to align manufacturing and service businesses to achieve long-term goals (Dmitrijeva et al., 2022). Manufacturing firms face constant pressure to innovate and improve their offerings to enhance long-term performance, but they must simultaneously refine their product offerings in order to remain competitive and achieve short-term performance goals (Tushman, 1997; Tushman & O'Reilly, 1996). The health of a firm's existing business is essential to these efforts because existing revenues support investments in services. While the simultaneous pursuit of short- and long-term goals might seem feasible, firms often struggle to manage these competing endeavours (Wang & Rafiq, 2014).

In addition to identifying the different paradoxes, our findings highlight four coping practices employed across service units: change management, open communication, training programmes and digitalisation. Because servitisation results in transition, change management is crucial for revamping an organisation's structure and achieving performance goals. Servitisation calls for change management to achieve the goals, implement structural changes and overcome resistance from internal stakeholders. However, successful change management is difficult and calls for open communication, as stakeholders may fail to recognise the benefits of transition. The stakeholders need to be prompted to express their views and give feedback (Eisenberg & Witten, 1987). In addition to this, the study findings reveal that employees are prompted to share their concerns during regular meetings. The servitisation journey also involves changing norms and beliefs and gaining new knowledge. We noted that manufacturing firms arranged regular training programmes to impart new knowledge to service unit employees (Tharenou, Saks, & Moore, 2007). Finally, firms pursue digitalisation and create central information portals to facilitate efficiency in information sharing (Tajudeen, Nadarajah, Jaafar, & Sulaiman, 2022). Digitalisation allows manufacturing firms to improve interaction with stakeholders, improve efficiency, support data analytics and customise offerings (Kohtamäki, Parida, et al., 2020).

Overall, the study's findings reveal that these paradoxes persist across manufacturing industries (Smith, 2014) and that resolving them requires not the implementation of one-time solutions but rather continuous adaption (Lewis, 2000) based on accepting and managing these contradictions and engaging in new learning (Lüscher & Lewis, 2008). The main contribution of this study is its explication of the paradoxes that arise during the servitisation process and the coping practices that firms adopt to manage persisting tensions.

5.1. Theoretical contributions

Our study makes several contributions to the theory of servitisation. First, building on the recent literature on servitisation and paradoxes (e.g., Cañibano, 2019; Kohtamäki, Einola, & Rabetino, 2020), we attempt to unravel the conflicting tensions that arise during servitisation in manufacturing firms across industries. We argue that the varied paradoxes illuminate the contradictory choices that firms face in their servitisation journey, which entails a transition from manufacturing-oriented to service-oriented operations (Baines & Lightfoot, 2015; Davies, Brady, & Hobday, 2007; Kowalkowski et al., 2015). Our findings align with the existing literature, which asserts that recognising paradoxes is crucial for managing change (Dmitrijeva et al., 2022).

Second, the study expands the extant body of research on the varied tensions that servitisation creates within organisations. While extant research has predominantly focused on varied organisational paradoxes (Kohtamäki, Parida, et al., 2020), our findings show how tensions may surface in a way that is specific to the servitisation context. Specifically, the current study elucidates the simultaneous manifestation of three paradoxes—the paradoxes of organising, performing and learning—and coping mechanisms for managing these tensions. We show that in pursuing transformation, firms must consider the conflicting goals as they attempt to cope with their daily work. Moreover, firms must acknowledge that paradoxes persist despite varied coping strategies.

Third, our study is based on data collected through a multi-stage open-ended essay approach. In this way, it departs from prior research, which has explored the applicability of servitisation paradoxes primarily via case studies (Tóth et al., 2022). Our findings thus provide broad insights into various manufacturing contexts.

Fourth, we propose a conceptual framework titled 'Paradoxes and coping mechanisms in servitisation', which illustrates the coexistence of three types of paradoxes—the paradoxes of organising, learning and performing—and the coping mechanisms that firms employ to manage these tensions (see Fig. 6). While scholars must consider the simultaneous manifestation of these three tensions, organisations must use coping mechanisms to navigate the perceived contradictions during the servitisation journey. Notably, the emergence of paradoxes is not static, and paradoxes persist despite the deployment of coping mechanisms.

Finally, the study lays the foundation for future examination of paradoxes in servitisation. By explicitly exhibiting the simultaneous manifestation of varied paradoxes and coping strategies, the study strengthens the longitudinal research examining paradoxes and coping strategies adopted by firms during various stages of servitisation (Dmitrijeva et al., 2022).
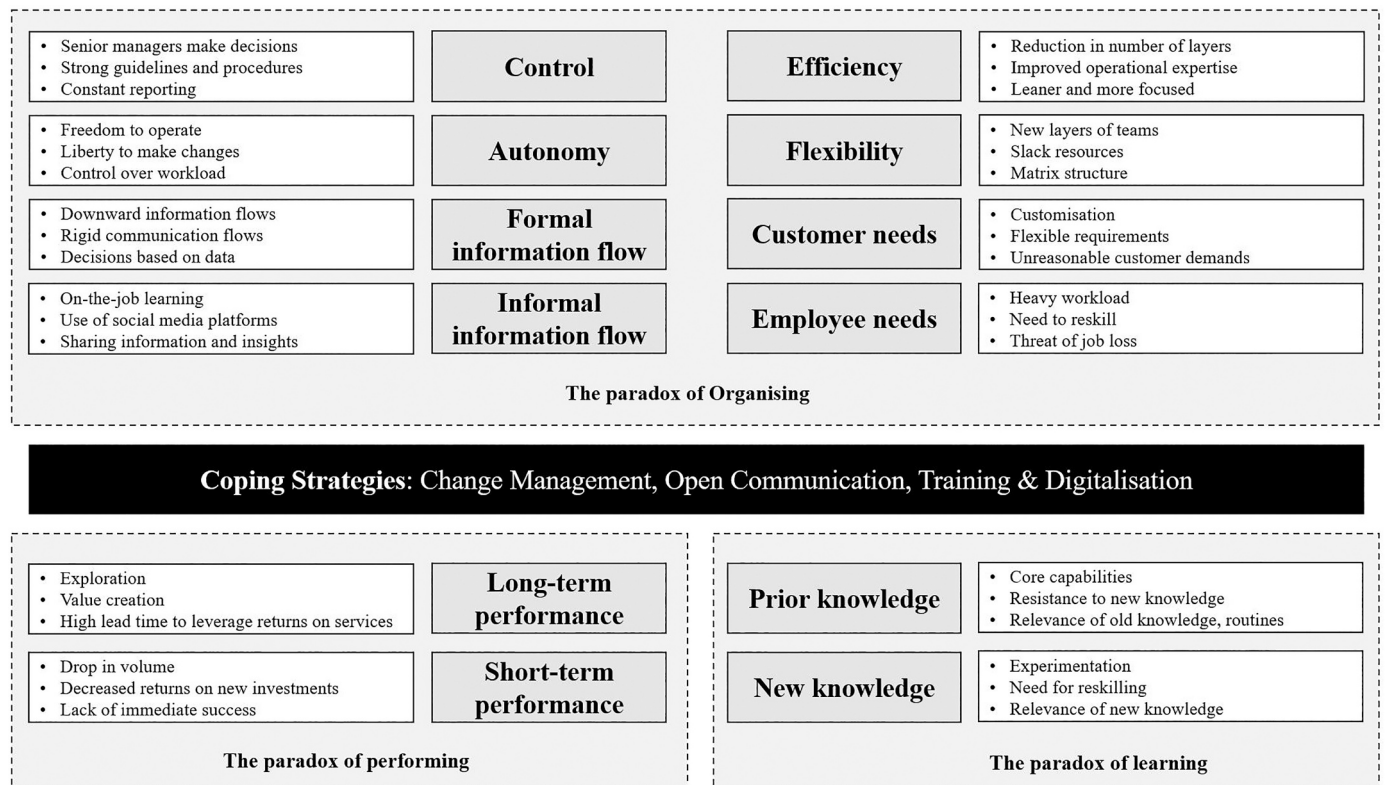
• Senior managers make decisions • Strong guidelines and procedures • Constant reporting	**Control**	**Efficiency**	• Reduction in number of layers • Improved operational expertise • Leaner and more focused
• Freedom to operate • Liberty to make changes • Control over workload	**Autonomy**	**Flexibility**	• New layers of teams • Slack resources • Matrix structure
• Downward information flows • Rigid communication flows • Decisions based on data	**Formal information flow**	**Customer needs**	• Customisation • Flexible requirements • Unreasonable customer demands
• On-the-job learning • Use of social media platforms • Sharing information and insights	**Informal information flow**	**Employee needs**	• Heavy workload • Need to reskill • Threat of job loss

The paradox of Organising

Coping Strategies: Change Management, Open Communication, Training & Digitalisation

• Exploration • Value creation • High lead time to leverage returns on services	**Long-term performance**	**Prior knowledge**	• Core capabilities • Resistance to new knowledge • Relevance of old knowledge, routines
• Drop in volume • Decreased returns on new investments • Lack of immediate success	**Short-term performance**	**New knowledge**	• Experimentation • Need for reskilling • Relevance of new knowledge

The paradox of performing   **The paradox of learning**

Fig. 6. Framework of paradoxes and coping mechanisms in servitisation.

5.2. Managerial contributions

This study's findings enable managers of firms across industries to better understand the various paradoxes they are likely to encounter during the servitisation journey. First, despite the theorised benefits of servitisation, firms must balance the conflicting demands of manufacturing and services as well as the divergent interests of internal and external stakeholders. While selling customised solutions to customers, for example, firms must also meet the needs of employees. Therefore, managers in manufacturing firms may need to reskill their employees to align their capabilities with the firms' servitisation goals. Coaching and mentoring initiatives to help individuals prepare for these changes have proven significant (Maalouf & Gammelgaard, 2016).

Second, while the extant research has shown that servitisation is profitable, coping mechanisms play a significant role in managing servitisation-related challenges (Eggert et al., 2014). Managers can utilise the varied coping practices we uncovered in this study, such as training programmes, frequent meetings, KPIs and digitalisation. Specifically, digital technologies can provide strategic value to manufacturing firms' transformations (Kharlamov & Parry, 2021).

Third, those charged with managing servitisation must acknowledge the persistence of these paradoxes despite their efforts to resolve them via coping strategies. Moreover, when managers seek to address issues related to a particular paradox, they must consider the ramifications of their actions on other paradoxes (Smith & Beretta, 2021). Both managers and employees play an important role in managing servitisation and coping with the associated paradoxes. Even micro-level actions have wide ramifications within organisations. Thus, both autonomy and control are crucial for successfully managing paradoxes involved in servitisation.

Finally, the study's findings provide managers with crucial insights by highlighting the relevance of paradox theory in understanding the challenges servitised firms face. Paradox theory may also help to unravel the capabilities required to cope with the various paradoxes associated with servitisation (Gebauer, Saul, Haldimann, & Gustafsson, 2017; Huikkola & Kohtamäki, 2017; Kindström, Kowalkowski, & Sandberg, 2013).

5.3. Limitations and future research

The findings of this study should be considered in light of the following limitations. First, the paradoxes we identified are not exhaustive; rather, they provide a broader picture of the paradoxes that prevail at the service-unit level at early stages of servitisation, and future scholars must apply grounded theory to explore other potential paradoxes during the advanced stage of servitisation.

Second, while a handful of studies, including this one, have sought to understand the paradoxes involved in servitisation, longitudinal quantitative studies capable of empirically validating paradoxes and coping strategies are required to be conducted during various stages of servitisation. Third, we utilised a sample comprised of participants from the UK and the US. Our sample thus may not be representative of all firms because operational managers may have a different interpretation of servitisation challenges. To address these concerns, future work should determine whether our findings hold true in other geographical contexts. Furthermore, future researchers should examine the paradoxes that may prevail at the upper management level and across teams and functional departments. Finally, we employed deductive analysis using existing paradoxes (Smith & Lewis, 2011). Despite these limitations, the study's key findings regarding the persistence of varied paradoxes and coping mechanisms are essential to both researchers and practitioners. We urge both to adopt a comprehensive rather than piecemeal approach to understanding and coping with such paradoxes.

Declaration of Competing Interest

The authors do not have any competing interests to declare.

Data availability

Data will be made available on request.

Appendix A. Initial questions, Stage 1

(a) How successful is your company transforming from a product-centric manufacturing firm to a service-centric one? What challenges do servitised firms in the manufacturing sector currently face? (b) Can you explain the various organisational tensions relating to the transformation towards offering more services that your firm has encountered? (c) What organisational conflicts did your firm encounter during its transformation towards service? (d) What challenges and tensions do services-oriented firms in the manufacturing sector currently face? What tensions did your firm encounter while switching from expanding sales support staff to a more tailored services-oriented workforce? (e) What coping mechanisms have you adopted to tackle the various challenges created by becoming a services-oriented firm? (f) What changes have been made to the organisational structure in the transition to becoming a service-oriented firm? (g) Since you have transformed into a service-oriented firm, do you have the autonomy to work and make decisions freely? (h) How fluid is the knowledge flow in your firm? Has it become more formal or informal since the service-oriented transformation? (i) Can you explain the various activities of your firm that help you gain new knowledge with respect to the service aspect of your offerings? (j) What are the various challenges that your firm encounters in its acquisition of new knowledge? What steps should be taken to strengthen the knowledge acquisition capabilities of your firm? (k) Can you give a detailed account of the various long-term investments recently made within and outside your firm? What percent do these investments constitute of the total revenue of the firm? (l) How do you see the future of services-oriented firms in the manufacturing sector?

Appendix B. Initial questions, Stage 2

(a) Can you explain the role of internal and external knowledge during and after the transition towards service-oriented business? (b) How do local and global challenges affect your organisation's transition towards service-oriented business? (c) How does your organisation's past success in manufacturing contribute to the transition towards service-oriented business? (d) How does your organisation cope with the diverse goals of stakeholders? Can you elaborate on situations where you are required to meet the competing goals of different stakeholders? (e) As a result of service orientation, has your organisation become more efficient in its day-to-day operations, or has it become less efficient? (f) What challenges do you face as the leader of the unit while handling divergent goals? What mechanisms do you adopt to handle the challenges? (g) What tensions are encountered by your firm while switching from expanding sales support staff to a more tailored services-oriented workforce?

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