REVERSE KNOWLEDGE TRANSFER IN DIGITAL SERVITIZATION: A GLOBAL APPROACH TO SERVICE PROVISION

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ABSTRACT

Purpose: Digital servitization provides new opportunities for manufacturers to compete across multiple markets. However, global digital service provision is complex and knowledge intensive, as it requires alignment with subsidiaries to ensure adaptation to local customers' needs. The purpose of this study is to understand how manufacturers engaging in digital servitization can leverage reverse knowledge transfer (RKT) from subsidiaries to achieve global competitive advantages.

Design/Methodology/Approach: A qualitative multiple-case study including 43 interviews is used to investigate the RKT in three manufacturer-subsidiary cases taking place during the provision of digital servitization solution packages in progressive global markets.

Findings: This study identifies three crucial types of subsidiary generated knowledge namely, digital knowledge, customer knowledge, and needs analysis knowledge. Leveraging such knowledge, manufacturers are able to mitigate the operational challenges of global digital service provision, and realise the benefits in the forms of financial performance, efficient rollout of the digital servitization solution, and the expansion of the digital service portfolio.

Originality/Value: Even though there has been increasing interest of scholars towards global digital service provision, there is limited knowledge about how manufacturers manage knowledge flows beyond the boundaries of a single market. This study extends current knowledge by focusing on manufacturers' digital service provision in multiple global markets. In addition, by focusing on subsidiaries' perspective, this study brings forward their critical role and impact on the achievement of global competitive advantages. This study introduces the concept of RKT in digital servitization literature exploring the role and impact of the subsidiary, actor that has received scant attention in the servitization literature.

KEYWORDS: digital servitization, global markets, subsidiary, reverse knowledge transfer.

1. INTRODUCTION

Increasingly interconnected and evolving markets are forcing manufacturers to develop new strategies and transform its business models to remain competitive. Digital servitization – the integration of products and digital services – represents a promising avenue to compete and expand in such global markets (Paschou et al., 2020). In particular, manufacturers are investing in opportunities to expand the provision of digital services across multiple markets. Digital services allow the dematerialisation of resources and automation of processes, reducing the time and financial investment for managing global operations (Reim et al., 2016). It also enables agility to anticipate global needs building on the cumulative data of a wide variety of customers (Parida et al., 2015). However, manufacturers' global digital service provision requires the alignment of cross-border actors (Parida and Jovanovic, 2021) and the adaptation to local needs (Gölgeci et al., 2021), increasing the complexity to succeed.

A particularly relevant aspect of cross-border alignment refers to the coordination and integration required between manufacturers' headquarters and subsidiaries. Scholars have highlighted the relevance of customers (Kamalaldin et al., 2020, Raja et al., 2018) and ecosystem actors (Alghisi and Saccani, 2015, Kohtamäki et al., 2019, Kapoor et al., 2021) for manufacturers engaging in digital servitization. However, little is known about the role of subsidiaries in global markets, where adaptation to local needs is required to facilitate long-term growth and expansion (Hakanen et al., 2017).

In this context, reverse knowledge transfer (RKT) from subsidiaries to headquarters arises as a crucial aspect for manufacturers' global digital service provision. Manufacturers need to proactively enforce and leverage locally generated knowledge not only to overcome operational challenges, but as a way of strengthening its position in the global competitive landscape (Ambos et al., 2006, Jiménez-Jiménez et al., 2014). Understanding RKT is, thus, a promising avenue to untangle manufacturers' ability to balance the global and local aspects of digital servitization to successfully compete in global markets.

The purpose of this study is to understand how manufacturers engaging in digital servitization can leverage RKT from subsidiaries in global markets. In particular, we explore relevant subsidiary generated knowledge in specific progressive markets and the benefits of RKT for global digital service provision. In doing so, we expand our understanding of an underexplored actor in the digital servitization literature, the manufacturer's subsidiary. Understanding the relevance of subsidiary generated knowledge opens the path for future research to better assess the success in global digital service provision.

2. THEORETICAL BACKGROUND

2.1 Digital Servitization: Global digital service provision

Digital servitization solutions represent an avenue for manufacturers to compete in global markets. For instance, Hartwig et al. (2021) highlights how the emerging data from digital services enables manufacturers to engage in multiple activities with cross-border partners in an efficient manner. Similarly, Vendrell-Herrero et al. (2021) argue that the use of specific digital technologies, such as sensors, in service provision allows to significantly reduce coordination costs in global markets. However, global digital service provision is also associated with higher complexity and risks, where the need for local adaptation coexists with the goal of feasible and cost-effective cross-border expansion.

In this context, subsidiaries acquire a relevant role in manufacturers' global digital service provision. Gölgeci et al. (2021) points to the need of closer relationships with local partners who act as intermediaries between the manufacturer and the customer. Indeed, customer and market knowledge arises as a pre-requisite to build credibility and design new global services (Hakanen et al., 2017). Thus, manufacturers' ability to leverage on subsidiaries' position and experience in specific markets represents an opportunity to achieve global competitive advantages. In particular, this paper introduces the concept of RKT from subsidiaries to headquarters to explore its impact on global digital servitization.

2.2 Leveraging Reverse Knowledge Transfer (RKT)

Digital servitization literature has discussed the impact of knowledge as a key asset in the design and implementation of service solutions (Valtakoski, 2017). Knowledge becomes even more relevant when expanding the provision to global markets, where the manufacturer lacks experience and understanding of local customers. In this context, RKT can be conceptualised as the extent of knowledge and skills that flow from cross-border subsidiaries to headquarters at home (Nair et al., 2016). An adequate RKT represents a catalyst to achieve global competitive advantages, where specific subsidiary generated knowledge is leveraged to minimise complexity while enabling cross-border alignment.

The relevancy and attractiveness of knowledge varies according to the goals and characteristics of headquarters. Internationalization literature has highlighted several subsidiary generated knowledge types, among which the classification of Gupta and Govindarajan (2000) has been widely recognised and adopted. Scholars agree on the relevance of subsidiaries' procedural knowledge, such as product designs and marketing *know-how*, over that of declarative knowledge, such as financial reports and other operational information (Najafi-Tavani et al., 2015). In other words, the knowledge sought from subsidiaries is that intrinsic to their local expertise and experience in the specific global market. Being digital servitization an underexplored area for RKT, it remains unclear what type of subsidiary generated knowledge would be more relevant for global digital service provision.

RKT may occur implicitly, be neglected, or be intentionally deployed, with the latest one being the most effective way of leveraging RKT to benefit from subsidiary generated knowledge (Kumar, 2013). Leveraging RKT has several benefits for global operations, with headquarters known to improve its cross-border alignment (Najafi-Tavani et al., 2015), coordination of global strategies (Ambos et al., 2006), and innovation capacity (Jiménez-Jiménez et al., 2014), among others. This study explores the benefits of RKT from subsidiaries to headquarters in the context of digital servitization.

3. METHOD

3.1 Multiple Case Study

An exploratory qualitative multiple case study of three Swedish-headquartered manufacturers (mining and forestry industries) pursuing digital servitization in global markets is the chosen method for this study. Each manufacturer is assessing the provision of selected digital servitization packages in specific progressive markets by wholly owned subsidiaries. The aim is to examine the RKT taking place between headquarters and its subsidiary in the real-life and unaltered context of global digital service provision (Yin, 2014).

3.2 Data Collection and Analysis

Semi-structured interviews with key informants in the Swedish headquarters and their subsidiaries are carried out to uncover the underlying relevance and benefits of RKT in global digital service provision. Table 1 provides a summary of informants and number of interviews. Data triangulation is accomplished through secondary data and validity is enhanced through the presentation of insights to informants demonstrating the trustworthiness and foundations of the findings. Data analysis follows an interpretive and iterative process identifying patterns in the data within and across cases. Several coding strategies are used to refine and combine the information regarding RKT from subsidiaries to headquarters. As a result, three subsidiary generated knowledge types and three main benefits for global provision are identified as described in the following section.

Table 1. Key informants and interviews

Case A	Case B	Case C
Headquarters	**Headquarters**	**Headquarters**
▪ Connected Products Manager (5) ▪ Business Development Manager (2)	▪ Digital Services Commercialisation (3) ▪ Business Development Manager (3) ▪ Head of Connectivity (2) ▪ Engagement Manager (1) ▪ Customer Integration (1) ▪ Project Manager (1) ▪ Head of Digital Operation Services (1)	▪ Digital Products Portfolio Vice President (5) ▪ Product Director (2) ▪ Digital Product Development Manager (1) ▪ Head of Interoperability (1) ▪ Global Portfolio Manager (2) ▪ Digital Services Commercialisation (2)
Subsidiary	**Subsidiary**	**Subsidiary**
▪ Implementation Coordinator (1) ▪ General Managing Director (1) ▪ Head of Global Markets Support (1)	▪ Digital Services Implementation (1) ▪ General Managing Director (1)	▪ Business Line Manager (1) ▪ Head of Implementation Centre (2) ▪ Business Line Manager (2) ▪ Customer Centre General Manager (1)

4. FINDINGS

This section describes the three main types of subsidiary generated knowledge, namely digital knowledge, customer knowledge and needs analysis knowledge, identified during the data analysis as being of relevance for manufacturers' digital servitization efforts in global markets. In addition, a discussion on the main benefits found of RKT for an effective global digital service provision, namely financial performance, efficient digital servitization solution rollout and expansion of digital service portfolio, is provided (Figure 1).

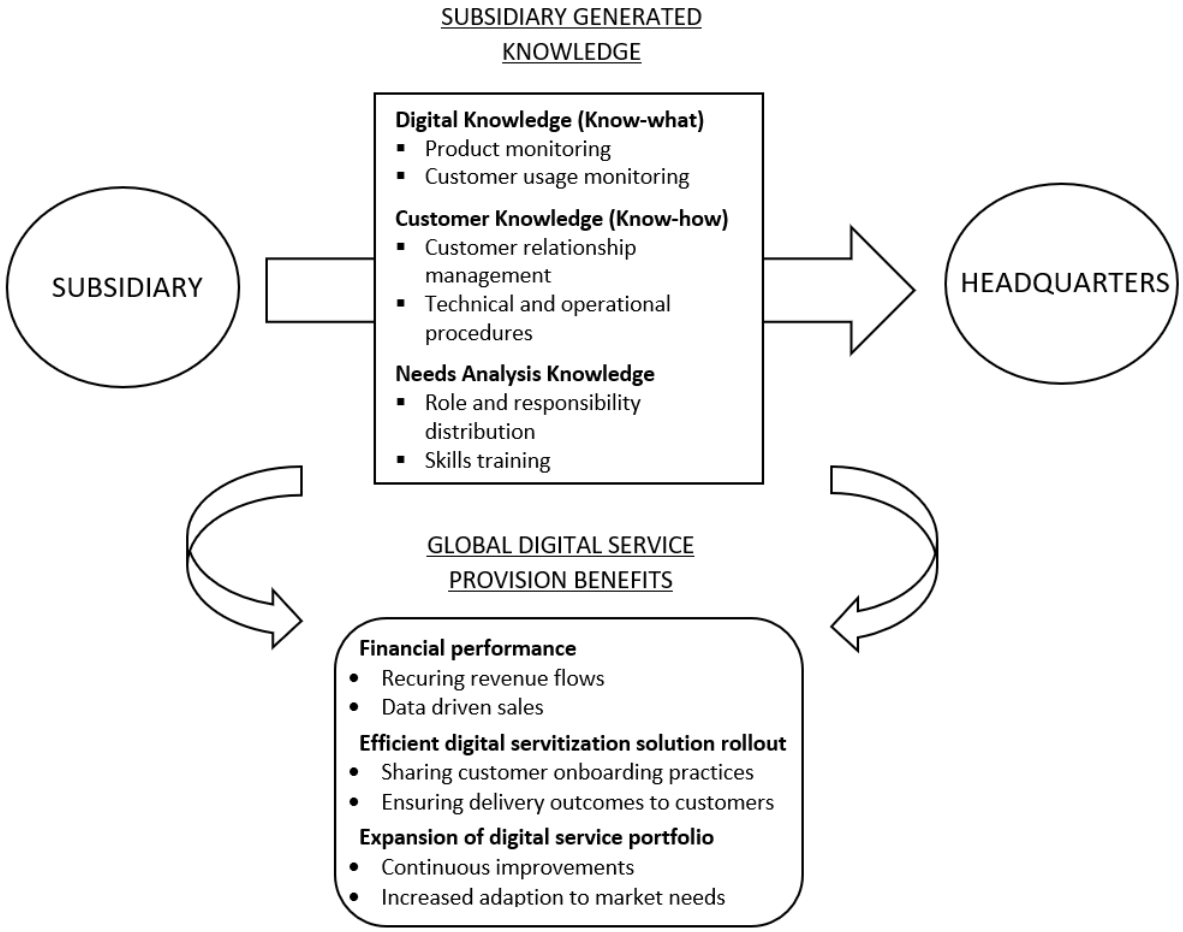

Figure 1. Digital Servitization: Leveraging RKT in Global Markets

4.1 Subsidiary Generated Knowledge

Digital knowledge refers to the raw data and information reports that are digitally generated as a result of the continuous monitoring and analysis of the digital servitization solution. In other words, it represents the *know-what* of the subsidiary with regards to global digital service provision. **Product monitoring** was found crucial for the manufacturer's understanding of key performance indicators (KPIs) as well as the adaptation of parameters to the local infrastructure and site conditions. Similarly, **customer usage monitoring** enables the manufacturer to contrast and compare how specific digital servitization solutions are leveraged by customers across markets, highlighting local habits and routines. For instance, the Digital Product Development Manager from Case C Headquarters referred to the importance of digital knowledge emerging from a pilot project in a global market to assess and identify KPIs:

"The experience from the [global market] team, we had one of the project manager from the [Pilot project] joining us. […] you really need to sort out what you're looking at when it comes to the KPIs.

That is something that we got help from the [Pilot project], that's how you should collect the data, what's needed. […] We're trying to take advice as much as possible."

Customer knowledge refers to the experience and learnings acquired by the subsidiary as a result of their facing role towards the customer. In other words, it represents the *know-how* of the subsidiary with regards to global digital service provision. **Customer relationship management** was highlighted as crucial to understand and match the local customers' needs, goals and expectations based on the subsidiary's established closeness and trust. **Technical and operational procedures** comprise the working culture, skills, routines and habits deployed by the subsidiary allowing manufacturers to identify global deviations as well as opportunities for improvement. For instance, the Head of Implementation Centre from Case C Subsidiary described the RTK via headquarters' employee immersion in the subsidiary's service provision and posterior application across markets.

"The customer wants a solution. It's hard for the [Headquarters] to have the whole solution because they're not in with the mind and seeing what they want […] We've had people from [Headquarters] come and see our system, so they see it running and they can take that elsewhere, so it's a people thing, spreading that knowledge."

Needs analysis knowledge differs from the previously identified types of knowledge as it does not focus on the digital servitization solution, but rather on the subsidiaries' internal requirements to successfully deliver and implement it locally. **Role and responsibility distribution** addresses the level of risk adoption and readiness in the local market for the manufacturer's planning and prioritisation of activities in the global digital service provision. **Skills training needs** comprises the gaps in subsidiaries' delivery capabilities for the manufacturer's design of adequate training programs. For instance, the Head of Global Markets Support from Case A Subsidiary pointed the need of specific training on the digital servitization package developed by headquarters, as they felt a disconnection between the digital service functionalities available globally and what they were offering to the customers locally:

"We need much more support, that people can ask for practical case examples, how the [digital servitization solution] works, which are the benefits for the customer, what is on offer, what are their goals for 2022. There is a lack of information, we need to be more up to date."

4.2 Benefits of RKT for Global digital service provision

Financial performance refers to the economic benefits that manufacturers can capture through global digital service provision. **Recurring revenue flows** emerge through the commercialisation of long-term contracts following customers' readiness and willingness to adopt digital servitization solutions, leveraging RKT to assess adoption trends in global markets. **Data driven sales** are characterised by the ability of manufacturers to quantify customer value to reduce the uncertainty associated with the intangibility of global digital service provision. For instance, the Global Portfolio Manager from Case C Headquarters described the development of a global benchmark based on RKT of digital knowledge from multiple markets. Such tool allows headquarters to demonstrate the value of digital servitization solutions for specific customers and generate data driven sales:

"I show the behaviour of the machines that are connected and I can also spot different customers and how an average customer would compare to the global average for example. […] I have an information advantage. […] This way I can challenge them by teaching them and showing the differentiation and then move on to tailor a message for them where it resonates. Then finally, we can actually come up with a solution and take control of that sale."

Efficient digital servitization solution rollout refers to the engagement and implementation benefits that manufacturers can capture through global alignment and coordination. **Sharing customer onboarding practices** reflects manufacturers' ability to prioritise successful customer engagement protocols and routines and replicate them across multiple markets, leveraging RKT to assess deviations and identify opportunities for improvement. **Ensuring delivery outcomes** allows manufacturers to match customers' expectations in the implementation of digital servitization solutions, reducing local misalignments and fostering global brand awareness. For instance, the Product Director from Case C Headquarters discussed the development of global digital service

provision projects, addressing the importance of customer knowledge to avoid implementation pitfalls:

"we cannot just jump in and not understand the customer's operation sufficiently enough that we don't specify what is needed and then we end up in these massive projects where there's a huge misalignment with what the customer expected to get versus what they actually got, and it was because we didn't understand enough their operation and specify the system and then explicitly tell the customer what it is we think they need."

Expansion of digital service portfolio refers to the innovation benefits that manufacturers can capture through the design and testing of service functionalities. **Continuous improvements** allow manufacturers to provide incremental product and software upgrades, leveraging RKT to facilitate the adoption of an agile approach to global innovation of digital servitization solutions. **Increased adaptation to market needs** opens the path for the achievement of local customization, increasing the differentiation from competitors and facilitating the integration with local customers' operations. For instance, the Business Development Manager from Case B Headquarters explained the interplay with subsidiaries to better satisfy specific market needs:

"I think we've done a massive job in terms of understanding. Now we're working with them in [global market]. We've done a massive job over the last two years in trying to understand the market, included the [subsidiary units] and how we can use them in the best way"

5. CONCLUSIONS

5.1 Theoretical Contributions

This study holds numerous theoretical contributions towards servitization literature in general and digital servitization in particular. First, this study is uniquely positioned to contribute to the digital servitization literature by expanding the research context from single to global markets. Studies have discussed the specific digital capabilities (Vendrell-Herrero et al., 2021) and central activities (Hakanen et al., 2017) that enable manufacturers to provide services in global markets. The findings expand these views highlighting the critical role and relevance of subsidiaries, whose knowledge enables the accomplishment of manufacturers' global competitive advantages.

In addition, this study contributes with a comprehensive analysis of the specific types of knowledge relevant for global digital service provision. Indeed, whereas most studies exploring RKT and its benefits tend to adopt a quantitative approach (Najafi-Tavani et al., 2015, Nair et al., 2016), this study provides a richer qualitative understanding of the phenomenon in the context of digital servitization. In doing so, we identify a particular type of knowledge beyond commonly discussed *know-how*, the subsidiary's needs analysis knowledge. As shown by Ayala et al. (2017), knowledge sharing for service provision tends to be more intense and demanding to coordinate than product provision. This study complements such view, showing how RKT of subsidiary's internal needs with regards to global digital service provision can facilitate effective cross-border coordination through regular assessment of local gaps. Similarly, the identification of digital knowledge complements the views of Vendrell-Herrero et al. (2021), highlighting the need for real time monitoring data to successfully implement and improve digital servitization solutions across multiple markets. Thus, we argue that up to date and continuous digital knowledge and needs analysis knowledge should be part of the RKT from subsidiaries to headquarters in addition to their *known-how*.

Finally, we underline the benefits of leveraging RKT for manufacturers engaging in digital servitization. Accordingly, this study contributes to the emerging literature on understanding the interplay between headquarters and cross-border actors (i.e., Parida and Jovanovic (2021)) and open an avenue to achieve a deeper understanding of the global complexity of digital servitization. For example, manufacturers can rely on subsidiaries to test the commercialisation of new digital services. Leveraging on RKT to test service innovations may reduce headquarters' cost, complexity and risk of rolling a highly customised digital servitization solution across diverse markets simultaneously, while increasing subsidiaries opportunity to assume leading responsibilities in global digital service provision.

5.2 Managerial Implications

From a managerial perspective, this study's findings represent a novel and important contribution for practitioners. Digital servitization solutions must address local needs but also remain feasible and cost effective for global provision. Understanding the relevancy of subsidiary generated knowledge and the benefits of RKT enables managers to better assess and prioritize the role of subsidiaries in the successful implementation and expansion of global digital service provision. For instance, an adequate RKT could enable an increase in the degree of autonomy of subsidiaries while ensuring cross-border alignment with global strategic goals.

Markets are in continuous change and manufacturers need to be agile to respond and adapt accordingly. The study also contributes to management practice by shedding light into the attractiveness of specific global markets as testing grounds for digital servitization solutions. We suggest that practitioners assess RKT potential as an additional criteria to select those markets where there is a higher possibility of leveraging on relevant subsidiary generated knowledge.

5.3 Limitations and Future Research

This study is not exempt of limitations. Even though the selection of cases is representative of global digital service provision, findings are limited to the type of industry where the manufacturers operate as well as by the culture of the selected global markets (Gaur et al., 2019). Future research may be done in this area including manufacturers pursuing digital servitization from several industries/countries to complement this study's findings. Another limitation refers to the early stage of global digital service provision of the cases, which reflects the need to leverage RKT to establish the foundations for future expansion (Xin et al., 2019). A mirroring study exploring RKT between already established global service providers and their subsidiaries could be done to uncover new types of knowledge and implications for global scalability.

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