# INTRODUCING ADVANCED SERVICES IN THE MARKET: AN EGO-NETWORK PERSPECTIVE ON THE VALUE CAPTURE PROCESS OF SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs)

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## THESIS SUMMARY

This study focuses on achieving a comprehensive understanding of the success of manufacturers exploiting the potential of advanced services in the market. Three main gaps are identified in the literature, referring to the early stages of advanced services provision, the value capture process and the extended embedded context. Accordingly, the proposed research questions address the dynamic, subjective and collaborative nature of value in advanced services:

- RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?
- RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?
- RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?

The exploratory purpose and social constructivism paradigm guide the method. The research follows a cross-sectional multiple-case study strategy. The ego-network perspective sets the boundaries of the phenomenon and guides the data collection process. Data is collected from 12 cases and 18 informants and analysed following an interpretive and iterative process. Insights from the analysis are presented in the form of within-case narrative stories and cross-case findings.

Findings identify strategic, knowledge and economic value outcomes emerging at the introduction stage of advanced services provision. To capture them, manufacturers develop production, problem-solving and platform activities in collaboration with partners. Partners' roles and ego-network characteristics determine their impact on the manufacturer's value capture process.

The study advances research in the multi-actor context through the ego-network perspective; it contributes to the literature on manufacturers' progression identifying the primary role of Big Data; it bridges the strategic management field and SNA to explain manufacturers' innovation; and it expands the understanding of manufacturers' competitiveness based on new ventures' network quality. This study also contributes with practical information to support manufacturers' decision-making as well as to evoke the institutional legitimation of advanced services.

Keywords: servitization, product-service system, manufacturer, collaboration, multi-actor context

**DEDICATION**

To my family: my dad, my mom and my brother.

Because you always tell me how proud you are of me.

Because you do not need to understand what I do to believe in me.

Because you remind me that I can accomplish anything I set my mind on.

Because you are my biggest support, even when I am thousand miles away.

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## LIST OF PUBLICATIONS

- **Journal publication**

Garcia Martin, P. C., Schroeder, A. & Ziaee Bigdeli, A. (2019). The value architecture of servitization: Expanding the research scope. *Journal of Business Research* (ABS 3), 104, 438-449.

- **Conference papers**

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Garcia Martin, P. C., Schroeder, A., Ziaee Bigdeli, A. & Baines, T. (2017). *Value in servitization: From dyad to network level*. Proceedings of the 24th Annual EurOMA Conference, Edinburgh, Scotland.

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## ABBREVIATIONS

| | |
|---|---|
| CE | Circular Economy |
| G-D | Goods-dominant |
| IoT | Internet-of-Things |
| MNC | Multinational corporation |
| PSS | Product-service system |
| RQ | Research question |
| S-D | Service-dominant |
| SME | Small and medium-sized enterprise |
| SNA | Social network analysis |

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# CHAPTER 1. INTRODUCTION

This study aims to understand how the nature of the relationship between the manufacturer introducing advanced services in the market and its partners impacts the manufacturer's value capture process. This chapter outlines the relevance of the research and provides an overview of the content of the thesis. First, the research territory is established through a description of the economic and environmental challenges motivating the spread of advanced services in the manufacturing industry. Second, the research topic is presented in detail through the introduction of the main concepts and framework based on the advanced services and business model literature. Third, the research gap is identified, stating the research questions. Fourth, the research method used to answer the research questions is introduced. Fifth, the research significance is highlighted through a brief summary of the research findings and contributions. To conclude, the thesis layout is illustrated summarising the research structure (Figure 1).

## 1.1 Research territory: advanced services in the manufacturing industry

The economic and environmental challenges dominating the manufacturing industry are pushing manufacturers to deploy new strategies in order to achieve long-term competitive advantages (Baines and Lightfoot, 2013). Among these attempts, the interest has predominantly switched towards the opportunities arising from the integration of product-service offerings (section 2.1.1), especially in the form of advanced services targeting customers' core business processes (Rymaszewska et al., 2017, Baines and Lightfoot, 2014). The potential of advanced services (section 2.1.3) can be observed through their distinctive characteristics and implications in the industry leading to new forms of value for the manufacturer (section 2.2).

From an economic point of view, the improvements in production processes challenges manufacturers' ability to maintain a competitive advantage solely based on price in a market already saturated with cheap mass production (Baines and Lightfoot, 2013). Manufacturers need to understand their customers operations to provide additional value beyond the product (Neely, 2008). Advanced services allow manufacturers to exploit customers' data through the use of sensors and analytic software (Rymaszewska et al., 2017), leading to new forms of value (section 2.2.6). But the deployment of new technologies is not exempt of risks for manufacturers.

The continuous evolution of technologies leads to a fierce and unpredictable competition (Müller et al., 2018). Evolving faster than customers' demands and aggressively imitated by competitors, disruptive technologies challenge manufacturers' ability to maintain new competitive advantages (Cozzolino et al., 2018, Bughin and van Zeebroeck, 2017). Advanced services allow manufacturers to build long-term relationships fostering the flexibility required to rapidly adapt to the dynamism that new technologies pose for the manufacturing industry (Eloranta and

Turunen, 2015). The long-term commitment required to provide advanced services (section 2.1.2) is also in line with the calls for environmental sustainability in the manufacturing industry as follows.

From an environmental point of view, energy and resource intensive processes can no longer be sustainable in a world of finite resources and climate change (Satyro et al., 2018). The production, supply and delivery processes of the manufacturing industry places manufacturers as one of the main pillars affected by sustainability issues (Garetti and Taisch, 2012). Advanced services allow manufacturers to consolidate a new consumption and production model based on services, rationalisation of material use and dynamic design and usage upgrades (Pialot et al., 2017, Tukker, 2004). The higher complexity and risks associated with advanced services (section 2.1.2) also represent a tool to address governmental and consumers' environmental pressures as follows.

Manufacturers are being challenged by the implementation of greener policies and the changes in demand patterns, with nearly three-quarters of all Millennials and Gen Z willing to pay a premium for sustainable products and services (Microsoft, 2018). Advanced services motivates the design of more reliable and easy to repair products as ownership remains with the manufacturer (Rapaccini, 2015). Thus, advanced services help to increase the life cycle of the product lowering the resource and energy consumption. This situation allows manufacturers to attract conscious consumers addressing both environmental and financial bottom lines (Rothenberg, 2007).

To conclude, advanced services constitute the product-service offering that allows manufacturers to better address the industry's economic and environmental challenges. Xerox's managed print services represent an illustrative example of the success of a manufacturer exploiting the potential of advanced services in the market. Xerox's model implies a transformation from traditional printer provision to a long-term total care document management contract, where analytics, auditing and tracking sit at the base of the product-service offering experience. Xerox's close collaboration with customers enables the organisation to achieve an agile innovation approach to explore new applications and markets leveraging on digital technologies (Xerox, 2018b). Xerox's total care contract also helps reduce the depletion of resources, where waste such as corrugated packaging is handled, recycled and reused by the organisation, enabling a Circular Economy (CE) (Xerox, 2018c). In addition, Xerox's model guarantees that all the equipment is returned to the organisation at the end-of-life, prioritising its maximum longevity and lowering resource consumption (Xerox, 2018b).

## 1.2 Research topic: the success of manufacturers in advanced services

The research topic focuses on achieving a comprehensive understanding of the success of manufacturers exploiting the potential of advanced services in the market (section 2.4). To do so, the literature on value in advanced services (section 2.2) and the value architecture construct from

business model literature (section 2.3) form the basis of a framework to understand the success of manufacturers in advanced services.

The value architecture is comprised by the value processes describing the way in which manufacturers create, deliver and capture value (section 2.3.1). In order to satisfy each value process, manufacturers need to deploy the right configuration of building blocks, comprised by specific sets of key activities, resources and partnerships (section 2.3.2). As a result, value outcomes emerge leading to the achievement of sustained competitive advantages for the manufacturer (section 2.2.6). But it is not only the manufacturer who has an important role in the creation, delivery and capture of value in advanced services. Advanced services imply the participation of a wide variety of partners whose resources and activities are integrated by the manufacturer (section 2.2.3).

The role of partners has been widely discussed in the literature, from manufacturer-customer interactions (e.g. Kohtamäki and Partanen (2016); Sjödin et al. (2016)) to the embedded context in which manufacturers design, develop and implement advanced services (e.g. Eloranta and Turunen (2016); Alghisi and Saccani (2015)). In the embedded context, each partner can impact their own as well as the success of others in advanced services. But direct reciprocity is not ensured (Payne et al., 2008), and the wide diversity of partners participating in the process represents a trade-off between the value that is created and delivered and the value that can be captured (Mizik and Jacobson, 2003).

Even though the increasing interest in understanding the implications of the embedded context in advanced services, literature has mainly focused on manufacturer-customer relationships. The wider embedded context, where interdependent actors operate, represents both an opportunity and a threat to the success of manufacturers in advanced services (section 2.4.3). The lack of research regarding the impact that diverse partners can have over the success of manufacturers exploiting the potential of advanced services in the market calls to further explore the phenomenon.

The literature review presented in section 2.5 discusses the need for further research in this topic. The following section introduces three research gaps and presents three research questions to achieve a comprehensive understanding of the success of manufacturers in advanced services.

## 1.3 Research gap: value capture in the extended embedded context

This study focuses on understanding how the nature of the relationship between the manufacturer introducing advanced services in the market and its partners impacts the manufacturer's value capture process. The focus of the study covers three specific gaps addressing the nature of value in advanced services. Three research questions are proposed to achieve a comprehensive

understanding of the success of manufacturers exploiting the potential of advanced services in the market.

The dynamic, subjective and collaborative nature of value in advanced services (section 2.2) impact manufacturers' success in advanced services (section 2.4). Three main gaps are identified, calling for further research to expand current knowledge regarding 1) the early stages of advanced services provision of manufacturers striving to become competitive advanced services providers in the market; 2) the value capture process and how manufacturers retain part of the value in advanced services; 3) the nature and impact of the extended embedded context beyond the manufacturer's customers and supply chain members.

First, the dynamic nature of value in advanced services implies that actors adapt over time in order to address their evolving needs and goals (section 2.2.5). Thus, manufacturers' success at earlier stages of advanced services provision (e.g. introduction of the offering in the market) differs from that at later ones (e.g. expansion of the offering) (section 2.4.1). Extant literature has addressed advanced services from the perspective of already experienced multinational corporations (MNCs) (e.g. Rapaccini (2015); Steiner et al. (2016)). But, earlier stages are characterised by higher levels of uncertainty (Reim et al., 2018, Erkoyuncu et al., 2013).This situation leaves a gap in knowledge, failing to understand the success of manufacturers which are yet to achieve traction in the market (section 2.5.1).

Second, the subjective nature of value in advanced services implies that value is heterogeneously experienced and influenced by each actor's specific characteristics and embedded context (section 2.2.1). Consequently, the creation and delivery of value for the customer does not necessary lead to the equal capture of value for the manufacturer (section 2.4.1). Extant literature has focused on understanding the configurations of key activities, resources and partnerships required to create and deliver value for the customer (e.g. Cenamor et al. (2017); Eloranta and Turunen (2016)). This situation leaves a gap in knowledge regarding the specific configuration leading the capture of value in advanced services (section 2.5.2).

Third, the collaborative nature of value in advanced services implies that each value process requires the interdependent interactions of a wide range of actors (section 2.2.3). Thus, manufacturers need to take into account the multi-actor context in which they operate (section 2.4.1). Extant literature has addressed the value processes within the boundaries of specific dyadic and triadic relationships (e.g. Finne and Holmström (2013); Sjödin et al. (2016); Song et al. (2016)). This situation leaves a gap in knowledge regarding the impact and wide variety of interdependent actors that have a role in the manufacturer's success in advanced services (section 2.5.3).

Three main research questions (RQs) are, therefore, proposed to address the identified gaps:

- RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?
- RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?
- RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?

The following sections introduce the research method and discuss the research significance of findings and contributions.

## 1.4 Research method: multiple case study

The social constructivism paradigm (section 3.1) and exploratory purpose (section 3.2) guide the design and development of the research method. The lack of previous literature addressing the proposed research questions implies the search for new insights rather than confirming existing knowledge. Accordingly, and in order to satisfy the proposed research questions, the research method follows a cross-sectional multiple case study strategy (section 3.3).

The ego-network perspective from social network analysis (SNA) is introduced to set the boundaries to the extended embedded context (section 3.4.1) and provide data collection tools (section 3.5.3). Data is collected from 12 cases and 18 informants from primary and secondary sources (section 3.6). Data is analysed following 3 interpretive and iterative steps addressing the preparation of data for the analysis, the reduction of data through the identification of connections, and the presentation of data with visuals and descriptions (section 3.7).

Each case is presented individually (Chapter 4) and insights from the analysis are provided in the form of within-case narrative stories (Chapter 5) and cross-case structure by sections (Chapter 6). Concluding each of the sections in the cross-case analysis, findings are stated answering each of the research questions.

## 1.5 Research significance: key findings and contributions

The present study extends the understanding and knowledge of the success of manufacturers exploiting the potential of advanced services in the extended embedded context, taking the stance of the manufacturer with regards to the value capture process when introducing advanced services in the market. The study highlights the forms of value emerging for the manufacturer, the actions taken to capture them and the impact of the manufacturer's partners in such process.

By answering the first research question (section 6.1.5), this study reveals strategic value outcomes in the form of uncertainty reduction and first mover positions, knowledge value outcomes in the form of increased market intelligence, and economic value outcomes in the form

of increased market share and reduced costs emerging through the introduction of advanced services in the market.

Moving to the second one (section 6.2.4), findings point that in order to capture such value outcomes, manufacturers take on production activities in the form of manufacturing, testing and certifying advanced services, problem-solving activities in the form of data management and targeting the offering to customers, and platform activities in the form of implementation within members operations.

For the last research question (section 6.3.10), findings signal partners' roles and manufacturer's ego-network characteristics as the determinants of partners' impact in the manufacturer's value capture process. Findings highlight academia, cross-industry organisations, MNCs, funding bodies, higher-level organisms, established traditional partners and end users as the key partnerships supporting the manufacturer's capture of value during the introduction of advanced services in the market.

This study contributes to the emerging advanced services theory in the multi-actor context through the ego-network perspective (section 8.2.1). The present study asserts the ego-network as the integrative perspective to build the knowledge and expand the understanding of advanced services in the multi-actor context. This contribution sets the precedent to elaborate on more comprehensive frameworks as well as to develop further theoretical contributions that take into account the complexity of the extended embedded context.

This study also contributes to the literature on manufacturers' progression towards the success in the exploitation of advanced services in the market (section 8.2.2). Particularly, this study identifies Big Data as the first layer of value in the manufacturer's progression from trial and error to growth at the introduction stage of advanced services provision. This contribution argues that data management skills are not only required in the exploitation of advanced services (i.e. innovation), but rather constitute a determinant of the organisational readiness to compete through advanced services.

This study is of theoretical importance because it bridges the field of strategic management and SNA to explain manufacturers' effective execution of innovation in advanced services (section 8.2.3). The present study contributes to theory by identifying the strategic potential of cross collaboration based on the specific position of partners in the manufacturer's ego-network. In line with latest research, this contribution to theory expands the knowledge on the relationship between the network's structure and the manufacturer's performance and progression in advanced services, demonstrating the positive effects of structural holes for the capture of value from innovative projects.

This study also connects research on new ventures with the advanced services literature, expanding the understanding of how network quality impacts competitiveness at the introduction stage of advanced services provision (section 8.2.4). The present study contributes to theory by identifying the manufacturer's embeddedness in clusters of higher-level organisms as a particular factor that can impact competitiveness based on network quality. This contribution provides the advanced services literature with an additional lens to analyse and understand manufacturers' success and failure in advanced services.

For practice, this study supports unexperienced managers to take more informed decisions when introducing advanced services in the market. In particular, this study hopes to evoke action from managers to evaluate and implement the necessary changes in its extended embedded context (section 8.3.1). This study suggests specific opportunities for collaboration as a way for managers to realise their potential and increase their competitiveness. Internally, it urges managers to place data management skills at the forefront of their capability development prior to the introduction of advanced services in the market. This study also calls for action to increase the current support and involvement of governmental institutions and other influencing organisms to help legitimate advanced services in the market (section 8.3.2).

## 1.6 Research structure

The research structure is illustrated in Figure 1 providing a navigation comprising the thesis layout:

Chapter 1: The current chapter has outlined the relevance of the research and provided an overview of the content of the thesis. The chapter has introduced the research territory describing the industry characteristics driving manufacturers' introduction of advanced services; the research topic through the main advanced services and business model literature concepts; the research gap addressing the dynamic, subjective and collaborative nature of value in advanced services; the research method highlighting the underlying guidance and main elements; and the research significance through a brief summary of research findings and contributions.

Chapter 2: Provides the research background and framework of the study looking at the success of manufacturers in advanced services. Main concepts are defined and discussed. The value architecture, from business model literature, is used to anchor the study in the literature and develop a framework. Building on such framework, a literature review is developed leading to the identification of the research gap and the establishment of the research questions.

Chapter 3: Describes the underlying research methodology and the research method of the study. The methodology comprises the philosophical paradigm and research purpose guiding the research method design and development. The research method comprises the boundaries and

actions required to answer the research questions, including the research strategy and case study design, the data collection and data analysis plan and processes. A pilot study, the data management and storage procedure and a statement on the quality and rigour of the research conclude the chapter.

Chapter 4: Introduces each of the case studies comprising the study. Each case description presents main company background and advanced services characteristics of each manufacturer. The chapter provides the basic information required for the understanding of the within-case analysis.

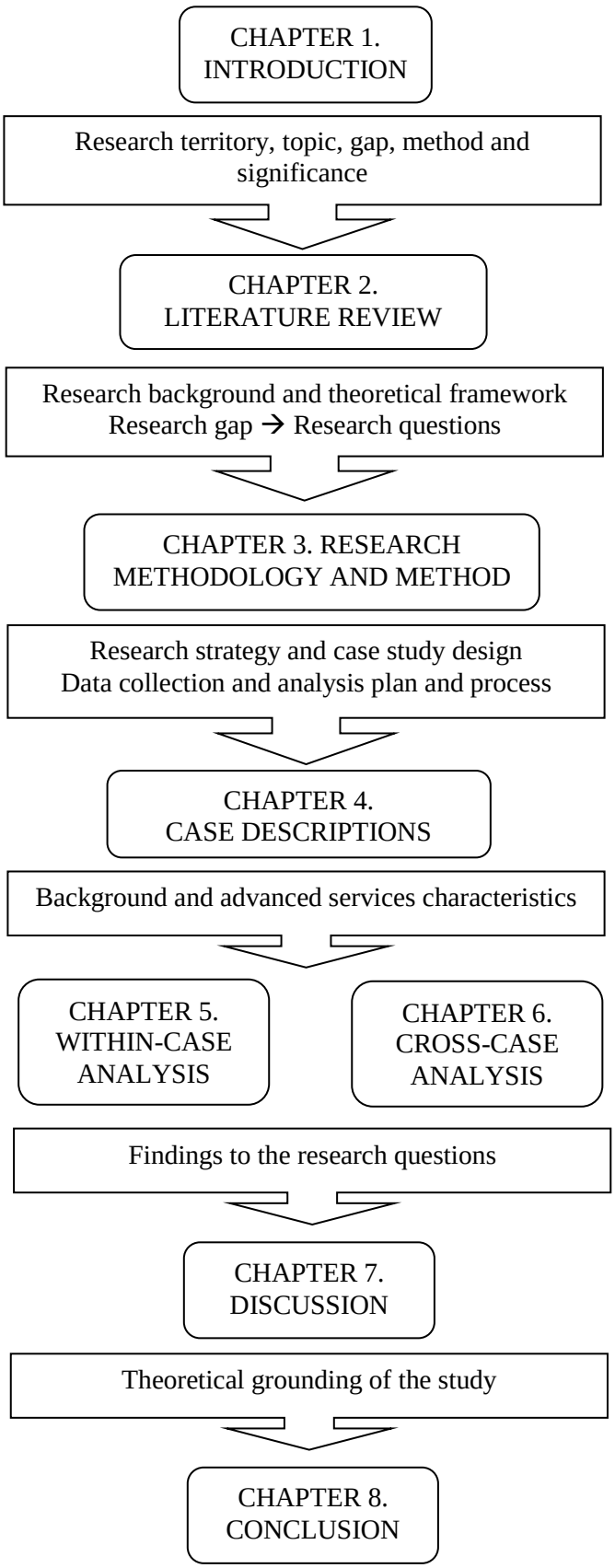
Chapter 5: Reports the insights from the within-case analysis in the form of two narrative stories addressing the manufacturer's value capture process and ego-network structure and composition. The chapter provides the context-specific knowledge required for the understanding of the higher-level cross-case analysis.

Chapter 6: Reports the insights from the cross-case analysis taking a holistic view of data, where results are compared and contrasted across cases. Most evidenced insights are retained and condensed into the answers to the research questions showcasing the findings of the study.

Chapter 7: Theoretically grounds the study in the literature through a discussion of the findings. The chapter reflects on how answering the research questions addressed the research gaps and discusses the findings with established literature and theoretical perspectives. The study expands current knowledge in advanced services, and more specifically with regards to service-dominant (S-D) logic, servitization, contingency and collaboration in advanced services.

Chapter 8: Concludes the thesis and highlights the impact of the present study for both theory and practice. The chapter provides an overview of the study and its key findings. It follows with a summary of the study's contributions to theory and a statement on its implications for practice. The chapter recognises the limitations of the study and identifies opportunities for future research. Concluding remarks finish the chapter.

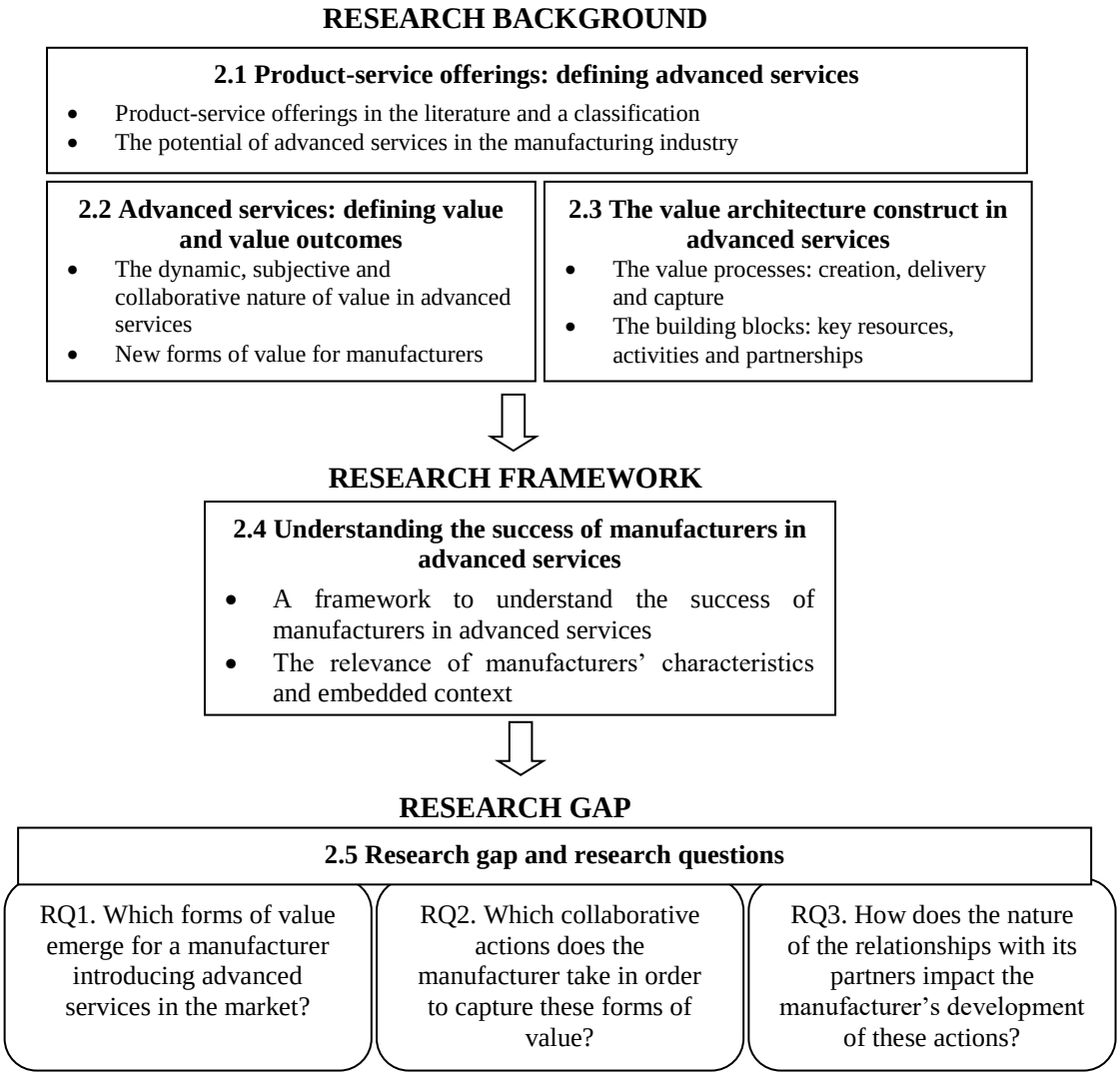
Figure 1. Research structure: thesis layout



# CHAPTER 2. LITERATURE REVIEW

This chapter provides the research background and framework of the study looking at the success of manufacturers exploiting the potential of advanced services in the market. First, a definition of advanced services is provided in the context of product-service offerings (Figure 2). The definition highlights the potential of advanced services, through its distinctive characteristics and implications in the industry, to lead to new forms of value for manufacturers. Second, the dynamic, subjective and collaborative nature of value in advanced services is discussed together with specific examples of value outcomes for manufacturers. Third, the value architecture construct is introduced based on the business model literature. As a result, a framework is developed to understand the success of manufacturers exploiting the potential of advanced services in the market. Through this framework, a literature review is developed leading to the identification of the research gap and the establishment of three research questions.

Figure 2. From research background to research framework to research gap



## 2.1 Product-service offerings: defining advanced services

This section defines advanced services in the context of product-service offerings in the manufacturing industry. First, it defines the concept of product-service offering and provides a classification of product-service offerings into base, intermediate and advanced services. Being the focus of this study, a deeper discussion on advanced services highlights its specific potential through its distinctive characteristics and implications in the industry leading to new forms of value for manufacturers.

### 2.1.1 Product-service offerings: definition, research communities and terminologies

A product-service offering can be defined as an integrated bundle of specific combinations of products and services. The relevance of product-service offerings has been widely discussed among academics. Even though discussions seem to be more prominent in recent years, it is worth mentioning that this phenomenon was first coined as *servitization* by Vandermerwe and Rada (1988) who were able to spot the potential of product-service offerings early on in the industry. Since then, product-service offerings have been analysed from several perspectives leading to contributions from a wide variety of research backgrounds.

Lightfoot et al. (2013) distinguish five research communities in the literature on product-service offerings, namely services marketing, service management, operations management, product-service system (PSS) and service science management and engineering. Similarly, an array of terminologies have been used to define and address product-service offerings in the literature, such as servitization (Baines et al., 2017), service infusion (Kowalkowski et al., 2012), S-D logic (Vargo and Lusch, 2008a), PSS (Beuren et al., 2013), industrial services (Erkoyuncu et al., 2013), integrated solution (Brax and Jonsson, 2009) or advanced services (Story et al., 2017).

Most of the literature on product-service offerings share the same principles but the motivation underlying the discussion may differ according to the research community. For instance, servitization and PSS are closely related but, whereas the discussion on servitization is motivated by the competitive advantage that product-service offerings can bring to manufacturers (Eloranta and Turunen, 2015), sustainability and environmental impacts tend to lead the discussion on PSS (Tukker and Tischner, 2006, Beuren et al., 2013).

### 2.1.2 Product-service offerings: a classification

Product-service offerings can be further classified according to the characteristics and implications of the specific bundles manufacturers choose to integrate. Table 1 provides a classification of product-service offerings according to two service characteristics, namely orientation and complexity, and three implications for manufacturers, namely commitment, risk

adoption and collaboration (Boyt and Harvey, 1997, Oliva and Kallenberg, 2003, Tukker, 2004, Baines and Lightfoot, 2013).

| | **Product-service offerings** | | |
|---|---|---|---|
| | **Base services** | **Intermediate services** | **Advanced services** |
| **Service orientation** | Product quality | Product maintenance | Customer's usage experience |
| **Service complexity** | Standardised | Output-based | Experience-based |
| **Manufacturer commitment** | Sporadic | Short-term | Long-term |
| **Manufacturer risk adoption** | Low | Medium | High |
| **Manufacturer collaboration** | Manufacturer | Manufacturer + Customer | Manufacturer + Customer + Network |

Table 1. Product-service offering classification

Service orientation refers to the subject towards which support is provided. In other words, the orientation determines the aim of the service. Whereas base and intermediate services aim to support a physical subject, advanced services aim to directly support the customer's operations through the provision of capabilities (Baines and Lightfoot, 2013). In other words, instead of enhancing the product qualities, the service aims to ensure specific results according to the customer's needs (Tukker, 2004).

Service complexity refers to the degree of customisation in the design and implementation of the service. In other words, the complexity determines the difficulty of the service in terms of its implementation. Base services tend to be standardised and less vital to customers' operations; intermediate services are designed based on the characteristics of the product and require a more technical implementation; advanced services are designed according to the characteristics of the customer and require a closer and flexible implementation (Boyt and Harvey, 1997, Baines and Lightfoot, 2013).

Manufacturer commitment refers to the required involvement of the manufacturer over time. Moving from base to advanced services, manufacturer's commitment gradually increases from sporadic moments in time (e.g. providing a spare part) to long-term commitment (e.g. continuous monitoring of customers' operations) (Oliva and Kallenberg, 2003). As the reliance on the product decreases and the core of the service is dependent on customers' usage experiences, there is a need to understand dynamic customers' needs to develop the product-service offering accordingly (Baines and Lightfoot, 2013).

Manufacturer risk adoption refers to the degree to which a manufacturer is required to adopt risks otherwise assumed by the customer. Whereas base and intermediate services do not tend to imply high levels of risk adoption, advanced services require manufacturers to take the responsibility

over product performance while retaining its ownership through long-term contracts or pay-per-use arrangements (Baines and Lightfoot, 2013, Oliva and Kallenberg, 2003).

Manufacturer collaboration refers to the extent to which a manufacturer is required to interact and integrate resources with external actors. The manufacturer's internal capacity is usually sufficient to provide base services whereas collaboration with the customer is required for intermediate services whose higher technicality require the manufacturer to move towards customers' operations (Oliva and Kallenberg, 2003, Tukker, 2004). Wider collaboration has to be considered in the case of advanced services where the higher service complexity and manufacturer risk adoption involve several organisations in the process (Oliva and Kallenberg, 2003).

### 2.1.3 Advanced services: definition and potential

Advanced services can be defined as a holistic integration where the service becomes an array of competences and processes that complement the physical product and extend the manufacturer's operations into those of the customer to satisfy its unique needs for a lengthy period of time (Baines and Lightfoot, 2013, Baines et al., 2013). The potential of advanced services for manufacturers can be observed through its distinctive characteristics and implications in comparison to base and intermediate services.

Whereas base and intermediate services focus on the physical product, customers' usage experiences become the focus of advanced services. As pointed out by Oliva and Kallenberg (2003), there is a change of support from product efficacy within general performance to product efficiency and effectiveness within customers' operations. The intangibility of experiences implies a higher degree of complexity in the design and implementation of advanced services. Raja et al. (2013), for instance, highlight how critical it is for manufacturers to obtain an intimate knowledge of their customers' usage experiences to successfully design and provide advanced services.

Advanced services require higher commitment by the manufacturer over the complete life cycle through long-term contracts in order to translate abstract customers' demands into concrete actions (Oliva and Kallenberg, 2003, Tukker, 2004). Similarly, advanced services require a higher risk adoption by the manufacturer. As the manufacturer and customer usually agree on a level of performance independent of the product involved, manufacturers assume a premium risk over advanced services due to the uncertainty and lack of control over customers' usage experiences (Oliva and Kallenberg, 2003, Tukker, 2004).

Whereas base and intermediate services can rely on the relationship between manufacturer and customer, the complexity and commitment of advanced services requires the joint efforts of the embedded network. New partnerships with distribution channels for service implementation or

with financial partners to offset the ownership of the product are usually developed by the manufacturer (Boyt and Harvey, 1997, Baines and Lightfoot, 2013).

In practice, base services require low risk adoption and collaboration and aim to support product quality at a moment in time in a standardised manner. A car manufacturer, for instance, can offer original spare parts to customers to be replaced in the event of failure to ensure the quality of the car remains the same. Intermediate services require some level of risk adoption and collaboration and aim to support product maintenance to ensure an output level during a short period of time. An industrial machine manufacturer, for instance, can offer a 1 year guarantee and advisory contract to customers to provide advice on how to improve production whenever the output drops below a certain level.

Advanced services require high risk adoption and collaboration and aim to support customers' usage experiences to ensure a result during a long period of time. Xerox's managed print services represent an illustrative example of advanced services. The printer manufacturer has been able to leverage the Internet-of-Things (IoT) connectivity unfolding an opportunity to deliver added value to customers through smart, customisable, scalable and secure document management platforms (Xerox, 2020). Xerox's model implies a transformation from traditional printer provision to a long-term total care document management contract, where analytics, auditing and tracking sit at the base of the product-service offering experience.

To conclude, the distinctive characteristics and implications of advanced services in the industry lead to new forms of value for the manufacturer, otherwise unattainable through base and intermediate product-service offerings. The following section analyses value in advanced services and classifies value for the manufacturer according to specific value outcomes emerging beyond base and intermediate offerings.

## 2.2 Advanced services: defining value and value outcomes

The potential of advanced services emerges from its distinctive characteristics and implications in the industry leading to new forms of value for manufacturers in comparison to other product-service and traditional offerings (section 2.1.3). This section explains value in advanced services highlighting its subjective perception, increasing collaborative orientation and dynamism over time. To do so, S-D logic is selected to set the bases for the understanding of value in advanced services.

S-D logic represents a particular lens to examine social and economic exchanges, where value is co-created and directly linked with customers' usage experiences (Vargo and Lusch, 2008a). This lens directly contrasts with goods dominant (G-D) logic, where customers are considered passive actors and value is linked to product quality (Green et al., 2017). Thus, S-D logic constitutes a

revealing lens to understand advanced services in contrast to the G-D logic characteristic of base and intermediate services and traditional offerings (Ng et al., 2012). Underpinned by S-D logic, the concepts of *value-in-use*, *value co-creation*, *value-in-context*, *indirect value* and the *evolution of value* are introduced and explained according to the inclusion of actors and time in the study of advanced services. New forms of value for manufacturers are also identified and classified as value outcomes providing concrete examples for manufacturers in advanced services.

### 2.2.1 Value-in-use: from transactional to subjective value

*Value-in-use* corresponds to the conceptualisation of value emerging for actors participating in advanced services. Pursuing advanced services represents a shift of orientation, from product to customer-centric offerings, and an increase in complexity, from tangible outputs to experiences (section 2.1.2). This shift has been portrayed in the literature as an evolution on value paradigms, from transactional *value-in-exchange* to subjective *value-in-use* (Macdonald et al., 2011, Ulaga and Reinartz, 2011, Bastl et al., 2012).

Whereas *value-in-exchange* is directly linked with the physical product exchanged, *value-in-use* is linked with the customer's experience with that product (Vargo and Lusch, 2008b, Lusch and Vargo, 2011). Value in advanced services aligns with Vargo and Lusch's (2008b: 28) definition of *value-in-use* being "always intangible, heterogeneously experienced, co-created, and potentially perishable":

- Always intangible: detached from the actual physical product and linked to customers' usage experiences.
- Heterogeneously experienced: high customisation and adaptation to provide the right bundle of product and services.
- Co-created: advanced services require joint efforts, where interaction and collaboration become crucial.
- Potentially perishable: continuous upgrades in order to quickly adapt to customers' dynamic needs.

In practice, Northumbria University partnership with Xerox represents an example of shift from *value-in-exchange* to *value-in-use*. Xerox® Managed Print Services allowed Northumbria to shift from more than 2000 printers to just 272 multifunctional printers meeting the operational needs of staff and students across campus (Xerox, 2018a). Printers are serviced by a Xerox team that ensures their reliability as well as supports the digitalisation goals of the University, providing advice on how to print something in a lower-cost manner or switch to a digital format. Thus, value for the University arises beyond the physical printer and into the experience of continuous support, interaction and customisation of Xerox.

The advanced services literature has progressively expanded the concept of *value-in-use* through the inclusion of actors and time in the analysis. The following sections highlight the collaborative and dynamic nature of value in advanced services through a set of value concepts.

### 2.2.2 Value co-creation: manufacturer-customer collaboration

*Value co-creation* expands the understanding of value to the interactions between manufacturers and customers. Under the umbrella term of *value co-creation*, academics have pointed out the relevance of collaboration in advanced services where customers are no longer recipients of value but rather an active part of the process (Lenka et al., 2017, Sjödin et al., 2016). Value co-creation, thus, requires manufacturers and customers to redefine their traditional roles and develop mutual learning in order to effectively understand and manage their interactions (Sjödin et al., 2016, Kohtamäki and Partanen, 2016).

In practice, KONE's customer-experience initiative represents a great example of relationship learning to successfully exploit value co-creation (Duncan et al., 2017). The Finish multinational has transformed from elevator manufacturer to provider of People Flow® experiences over the full life-cycle of buildings (KONE, 2020). In words of Pierre Liautaud, executive vice president of KONE, the direct interactions between frontline teams and customers allowed the multinational to understand customers better, leading to buy-in through the adaptation of processes and co-creation of new offerings (Duncan et al., 2017).

### 2.2.3 Value-in-context: manufacturer-network collaboration

Collaboration is not only required with customers, as manufacturers are embedded in a network of relationships. Literature has approached this expansion of boundaries to include multiple actors as *value-in-context*, where value becomes contingent on the integration of resources which are contextually and phenomenologically determined (Vargo et al., 2008). In other words, with the inclusion of multiple actors, the focus of attention switches from manufacturer-customer relationships towards the network – "aggregated system of participating organizations in a time and spacebound technosocial system" (Möller and Halinen, 1999: 416).

In this interdependent context, each actor's actions can have an effect on each other's as well as on the overall network's value. Karatzas et al. (2017), for instance, highlight how manufacturers can reduce the risks associated with usage instead of ownership contracts through information sharing across all the partners involved.

In practice, Alstom's partnerships represent a great example of digitally driven *value-in-context*. The French multinational has successfully transformed from train manufacturer to sustainable mobility maker (Alstom, 2020). In doing so, Alstom has partnered with the technology corporation IZBERG to launch its own Marketplace platform (Contursi, 2018) while also joining

the Digital Open Lab initiative to contribute to the digital transformation of the French National Rail Network (Alstom, 2018). Whether it is to increase knowledge about customers' operations or to integrate resources from expert organisations, advanced services imply a revolution in manufacturers' collaboration, with trust and communication replacing transactional and one-off exchanges among the parties (Raddats et al., 2017).

### 2.2.4 Indirect value: manufacturer-intermediary collaboration

*Indirect value* can also emerge for the manufacturer in triadic relationships where the source of value arises from an intermediary actor. A triad is composed by the relationship of two actors serving the same customer where *indirect value* can emerge between the manufacturer and a third party (Vendrell-Herrero et al., 2017, Karatzas et al., 2017). Bastl et al. (2012), for instance, observed the indirect value between an aerospace, defence and power equipment manufacturer and two of its suppliers, concluding that higher levels of supplier adaptation emerge to support the implementation of advanced services.

In practice, Caterpillar triadic collaboration represents a great example of how to exploit *indirect value*. The American machinery multinational has integrated digital technologies to provide integrated business solutions to customers (Caterpillar, 2020). Caterpillar has recently joined a triadic project together with a logistics expert organisation to support Rio Tinto in creating technologically advanced mine (Caterpillar, 2019). Indirect value arises from the collaboration, where both organisations will leverage on and learn from each other's resources and knowledge to deliver ground breaking equipment solutions to support Rio Tinto's mine.

### 2.2.5 Evolution of value: dynamism over time

The *evolution of value* can be conceptualised as the ability of actors to adapt over time. This conceptualisation of value does not focus on the inclusion of actors, but on the effect of time through actors' dynamic needs. Whereas the network is considered within a time, interest has recently moved towards understanding the evolution of network boundaries over time (Erkoyuncu et al., 2013). The *evolution of value* takes *value-in-context* to the next step, where network configurations evolve to fit the context dependency that rules the effectiveness and efficacy of interactions (Akaka et al., 2012). Macdonald et al. (2011), for instance, point out how manufacturers have to continuously upgrade their activities in order to satisfy customers' dynamic needs.

In practice, such *evolution of value* can be observed in Rolls-Royce's fast paced development of customer relationship management over time. The British multinational is a pioneer in cutting-edge technologies that deliver clean, safe and competitive solutions (Rolls-Royce, 2020). From the opening of the first Customer Service Centre for civil large engines in Singapore in 2015

(Rolls-Royce, 2015) to the development of a pioneering co-innovation agreement with Singapore Airlines in summer 2019 (Rolls-Royce, 2019), Rolls-Royce represents an example of how to continuously be at the forefront of innovation through increasing collaboration with its customers.

### 2.2.6 Value outcomes in advanced services

The particular dynamic, subjective and collaborative nature of value in advanced services leads to diverse outcomes that can be captured and support manufacturers' achievement of sustained competitive advantages. Table 2 highlights the diverse range of value outcomes available based on the dimensions discussed by Biggemann and Buttle (2005) and Songailiene et al. (2011).

| Dimension | Assessment | Value outcome examples |
|---|---|---|
| Economic | Assessment of financial costs and benefits | Supplier's efficiency<br>Economic targets<br>Market share<br>Profits |
| Strategic | Assessment of competitiveness | Access<br>Strategic position<br>Risk & uncertainty reduction |
| Knowledge | Assessment of innovativeness | Market intelligence<br>Innovation<br>Co-development |
| Personal | Assessment of legitimacy | Customer retention<br>Referrals |

Table 2. Value outcomes for manufacturers

Economic value outcomes represent the financial benefit that manufacturers can achieve through advanced services. The commitment and collaboration required in advanced services allow manufacturers to reduce costs in comparison to other offerings. Visnjic et al. (2017), for example, discuss how synergies between data driven innovations and advanced services' long-term contracts allow manufacturers to improve efficiency requirements without physical variations. In other words, the long-term commitment associated with advanced services allow manufacturers to monitor customers' operations over time leading to service upgrades without additional product investments.

Strategic value outcomes signal to the increase in competitiveness that manufacturers can derive from advanced services. Advanced services provide the opportunity to decouple business practices from resource and energy consumption as the focus switches to customers' experiences (Kjaer et al., 2019). Consequently, manufacturers can take advantage of green practices such as pay-per-use contracts or take-back schemes to achieve a strategic position in the market (Toffel, 2003). In other words, the focus on intangible experiences provides manufacturers with an opportunity to address current and upcoming environmental regulations building a barrier against competition.

Knowledge value outcomes address the opportunities for innovation emerging from advanced services. Innovation can emerge as a knowledge value outcome through manufacturers' close collaboration with customers. Lenka et al. (2016), for instance, show how the information exchange and customisation deployed in advanced services allow the early application of the next wave of technological advancements. In other words, the closeness established with customers in advanced services facilitates the introduction of emerging technologies to develop innovative customised offerings difficult to imitate by competitors.

Personal value outcomes point to the legitimacy of the relationship between the manufacturer and its customers. Advanced services allow manufacturers to lock-in customers through continuous product-service offerings' upgrades leading to recurrent long-term contracts (Reinartz and Ulaga, 2008). In other words, the relationship with customers goes beyond a transactional exchange and into a collaborative partnership increasing its value added for the customer over time.

To conclude, value in advanced services is characterised by an intrinsic dynamic, subjective and collaborative nature. This nature requires manufacturers to integrate resources with other actors in order to satisfy customers' needs through usage experiences over time. As a result new forms of value emerge for manufacturers beyond traditional transactional exchanges. Consequently, specific processes must be in place for value outcomes to emerge through advanced services. The following section introduces the value architecture construct to understand how manufacturers are able to exploit the potential of advanced services in the manufacturing industry.

## 2.3 The value architecture construct in advanced services

Value in advanced services emerges from the collaborative efforts of a diverse range of actors in an interdependent and dynamic context (section 2.2). The successful integration in such embedded context leads to new forms of value providing the manufacturer with competitive advantages otherwise unattainable in the industry (section 2.2.6). This section examines the underlying mechanism that manufacturers deploy to exploit the potential of advanced services in the market. To do so, the value architecture construct is introduced to theoretically anchor the current study with a grounded and validated explanation of value processes through business model literature.

### 2.3.1 The value processes: value creation, delivery and capture

The value architecture describes "the rationale of how an organisation creates, delivers, and captures value" (Osterwalder and Pigneur, 2010: 14). It is important to note that the value architecture portrays the value processes from the perspective of the provider, and therefore, reflects the view of the manufacturer in this study.

The value creation process refers to how organisations meet customers' expectations (Lepak et al., 2007). The goal is to design a solution that can better address customers' desired attributes (O'Cass and Ngo, 2011). To do so, organisations use a statement – known as value proposition (Anderson Jr et al., 2006) – highlighting the solution's attributes to persuade customers to choose them over its competitors'. In advanced services, the co-creation of value (section 2.2.3) requires manufacturers to understand customers' operations beyond their desired attributes and into their specific experiences with the product-service offering (Kohtamäki and Partanen, 2016).

The value delivery process explains how organisations understand their customers' operations in order to provide them with the necessary tools to experience the value proposition (Slater, 1997). The role of the manufacturer is to ensure that the value that has been created is experienced by the customer, satisfying its needs and requirements (Ambroise et al., 2018). In advanced services, the nature of the product-service offering, where value is linked to intangible characteristics rather than physical outputs, may challenge the division between the value creation and delivery processes. In the literature, some authors assess them simultaneously as boundaries between them become rather blurry (Macdonald et al., 2011, Raja et al., 2013).

The value capture process refers to the outcomes, including monetary (Lepak et al., 2007) and non-monetary outcomes (Reypens et al., 2016), that organisations can obtain when retaining value. In advanced services, a wide variety of outcomes emerge beyond the traditional economic value, such as personal, strategic and knowledge value outcomes (section 2.2.6). The long-term contracts characteristic of advanced services allow manufacturers to capture the personal value outcomes of customers' lock-in through continuous product-service offering upgrades (Reinartz and Ulaga, 2008).

Each value process – creation, delivery and capture – entails the transformation of resources into value through a structured flow of activities and partnerships (Vergidis et al., 2008). Thus, activities, resources and partnerships comprise the key building blocks required for the successful creation, delivery and capture of value (Osterwalder and Pigneur, 2010, Wallin et al., 2013, Joyce and Paquin, 2016). The following section describes in detail each of the components comprising the value architecture key building blocks through specific advanced services examples.

### 2.3.2 The building blocks: key activities, resources and partnerships

Table 3 provides a classification of the three building blocks underlying the creation, delivery and capture of value according to business model literature (Osterwalder and Pigneur, 2010). Each building block comprises a set of key activities, key resources and key partnerships.

| Building block | | Description |
|---|---|---|
| Key activities | Production | Actions involving the design, production or delivery an output |
| | Problem-solving | Actions involving the creation of new solutions to specific customer problems |
| | Platform | Actions involving the management of platform systems |
| Key resources | Physical | Tangible inputs such as raw materials, facilities or machines |
| | Intellectual | Intangible inputs such as patents, knowledge, brands or databases |
| | Financial | Monetary assets such as cash or credit lines |
| | Human | Personal assets such as highly skilled workforce |
| Key partnerships | Efficiency | Collaboration motivated by optimisation and economies of scale |
| | Risk reduction | Collaboration motivated by reduction of risk and uncertainty |
| | Integration | Collaboration motivated by acquisition of particular resources and activities |

Table 3. Building blocks for manufacturers' creation, delivery and capture of value

According to business model literature, three main *key activities* can be identified, namely production, problem-solving and platform (Osterwalder and Pigneur, 2010). Production activities relate to those actions intended to design, produce or deliver an output. Problem-solving activities relate to those actions intended to provide new solutions to specific customer problems. Lastly, platform activities relate to those actions intended to manage platform systems. A platform system is composed by an enabling tool, usually cloud-based, allowing the integration of a set of actors and the flow of a set of resources within specific secured boundaries. For instance, the multinational Facebook Inc. counts with a social media platform based on a cloud-based tool (facebook.com) allowing people (users) to connect and share information (flow of resources) across the globe (boundaries) (Facebook, 2020).

Key resources, on the other hand, distinguish between physical, intellectual, financial and human (Osterwalder and Pigneur, 2010). Physical resources relate to tangible inputs ranging from simple raw materials to complex machinery used in a variety of activities. On the other side of the spectrum, intellectual resources relate to intangible inputs that can act in conjunction with physical resources, such as brands or standalone, such as databases. Financial resources relate to economic inputs such as cash or credit lines supporting the development of activities. Lastly, human resources relate to the inputs brought by specific individuals such as highly skilled employees.

Finally, key partnerships generally refer to the business relationships having a role in the value creation, delivery and capture processes (Allee, 2008). Depending on the motivation to form such

partnerships, it is possible to distinguish between efficiency, risk reduction and integration (Osterwalder and Pigneur, 2010). The role of efficiency partnerships is to support the reduction of costs, through resource and activity optimisation or economies of scale. Risk reduction partnerships are aimed at supporting the organisation in uncertain environments. Lastly, integration partnerships are meant to join forces to acquire and share particular resources or activities.

In practice, the design and development of the advanced services offering belongs to the category of production activities, which require physical resources such as sensors installed to monitor and collect data (ABB, 2020b). Financial resources are also key for production activities, with calls for funding increasingly spreading to support manufacturers' service initiatives (EPSRC, 2016). Similarly, efficiency partnerships such as outsourcing part of the more standardised production activities may result in a reduction of costs for the manufacturer.

In order to develop an advanced services offering, the manufacturer needs to identify the solution that best address specific customers' needs. To do so, problem-solving activities such as getting to know customers' operations through on-site visits can help the manufacturer to design the offering. Thus, knowledge about customers' operations represents a key intellectual resource for manufacturers' ability to satisfy customers' specific needs through advanced services. A partnership with academia, can also reduce manufacturers' uncertainty regarding the adequacy of the offering through the integration of specialised knowledge.

Platform systems have become increasingly popular among manufacturers for cloud-powered services such as predictive maintenance (ABB, 2020a, IBM, 2019). Such technology can also help traditional manufacturers to cope with the product-centric mindset of current human resources as advanced services start to become the main source of competitive advantage. Similarly, platform activities can support manufacturers' vertical integration within supply chains to better address customers' needs through advanced services.

To conclude, the previous examples represent some of the possible configurations of building blocks. Specific situations will require manufacturers to deploy different configurations of key resources, activities and partnerships in order to successfully create, deliver and capture value in advanced services. The following section examines in detail the success of manufacturers in advanced services in order to better understand the factors having a role in the configurations.

## 2.4 Understanding the success of manufacturers in advanced services

The potential of advanced services emerges from its distinctive characteristics and implications in comparison to other product-service and traditional offerings (section 2.1.3), providing the manufacturer with new forms of value leading to otherwise unattainable competitive advantages

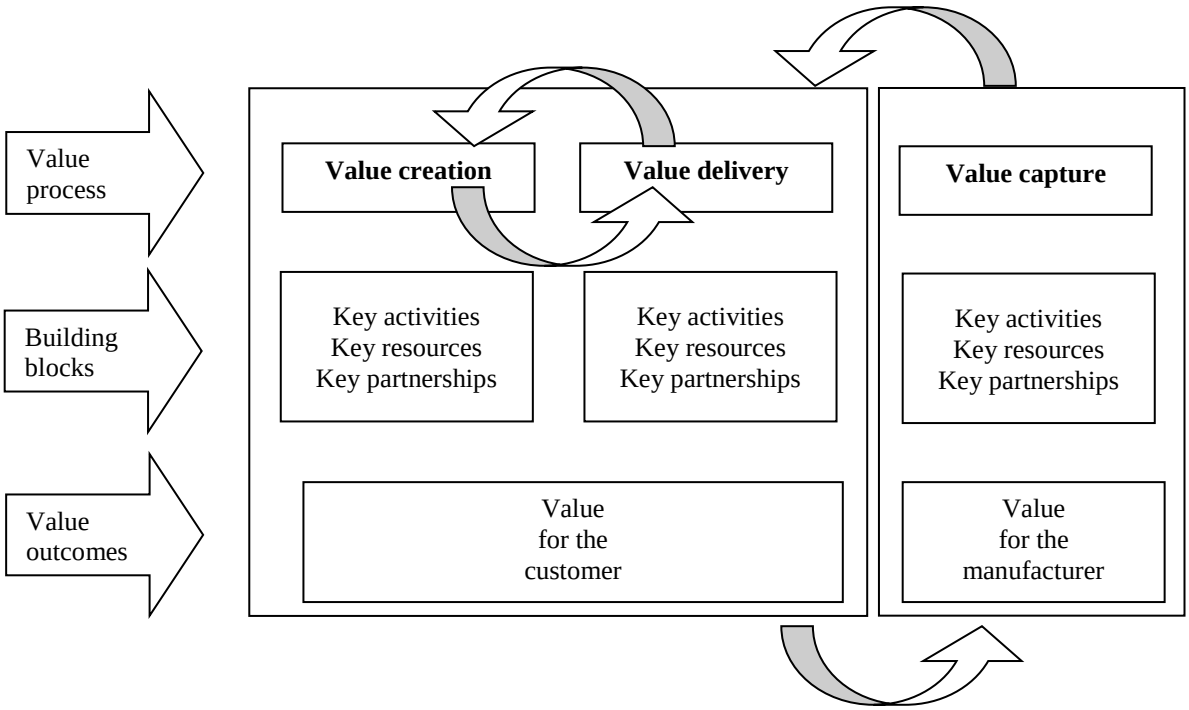
(section 2.2.6). Value in advanced services is intrinsically dynamic, subjective and collaborative in nature, requiring manufacturers to adopt higher risks while deploying collaborative relationships to achieve new competitive advantages (section 2.2). To do so, manufacturers need to deploy the right configuration of key activities, resources and partnerships to be able to create, deliver and capture value (section 2.3). Thus, the manufacturer's particular characteristics as well as its interdependent relationships with a wide range of actors have a direct impact over is ability to successfully exploit the potential of advanced services.

This section elaborates a framework to explain the success of manufacturers exploiting the potential of advanced services in the market. To obtain a comprehensive view, it highlights the impact of manufacturer's size and the embedded context in the process. As a result, the focus of the study is placed on small and medium-sized enterprises (SMEs) and a need for further research is identified.

### 2.4.1 The success of manufacturers in advanced services

Figure 3 provides the conceptual boundaries to understand the success of manufacturers in advanced services. The value processes describe the way in which manufacturers create, deliver and capture value in advanced services (section 2.3.1). The value creation and delivery process are directly interdependent, where building blocks interact and feedback each other in an iterative process leading to value for the customer. Similarly, the value creation and delivery processes inform the value capture process and vice versa.

Figure 3. The success of manufacturers in advanced services



In order to satisfy each value process, manufacturers need to deploy the right configuration of building blocks (section 2.3.2). Manufacturers develop a set of activities and use a set of resources in order to satisfy specific needs and goals through advanced services. Given the collaborative nature of value in advanced services (section 2.2.3), manufacturers need to also take into account the multi-actor context in which the processes are embedded (Lusch et al., 2010). The integration of key partnerships through collaborative relationships completes the building blocks' configuration. Given the dynamic nature of value in advanced services (section 2.2.5), manufacturers need to continuously adapt to evolving conditions and modify the configurations of key resources, activities and partnerships accordingly (Macdonald et al., 2011).

As a result, a set of value outcomes emerge from the creation and delivery of value for the customer leading to the achievement of sustained competitive advantages through the capture of value for the manufacturer (section 2.2.6). Given the subjective nature of value in advanced services (section 2.2.1), the value that is created and delivered for the customer does not equal the value captured for the manufacturer (Payne et al., 2008).

The following section further elaborates on the success of manufacturers in advanced services taking a closer look at the impact of manufacturer's size and embedded context in advanced services.

### 2.4.2 The role of size in the success of manufacturers in advanced services

Current literature has highlighted the opportunities that advanced services can bring to manufacturers (Rapaccini, 2015, Rabetino et al., 2017), but it has mainly taken a general approach without considering their diversity. The willingness of an organisation to take on specific strategic decisions is influenced by its characteristics (Whittington, 1988). Thus, in order to understand the success of manufacturers in advanced services, there is a need to look beyond the specific bundles of products and services and into the manufacturer itself.

The integration of services by manufacturers is influenced by the size of the organisation, with larger manufacturers usually taking the lead in the implementation (Neely, 2008). Examples can be observed in the literature, where studies have mainly explored the opportunities that advanced services bring to MNCs. GE power turbines represent a highly analysed case due to the company's success in optimising their energy supply through the implementation of remote monitoring technology (e.g. Allmendinger and Lombreglia (2005)). Rolls-Royce's *power-by-the-hour* total care package has also been widely discussed in the literature due the company's success in taking over any responsibility for maintenance and risks from customers (e.g. Neely (2008)).

Size requires special attention when looking into the degree of risk adoption and collaboration required for advanced services (section 2.1.2). Whereas SMEs' customer portfolio is usually characterised by lower-value and non-repeatable customers, larger manufacturers are able to relay on their extensive installed base to secure service contracts from high-value customers (Raja and Frandsen, 2017). Also, SMEs are heavily dependent on their networks to acquire and integrate the resources needed for service provision due to their lower capacity (Mennens et al., 2018). Conversely, the flexibility and absence of strict structures of SMEs has a positive effect over the development of radical service innovations (Prajogo and McDermott, 2014), which can facilitate the introduction of advanced services.

SMEs represent over 99% of manufacturers in the European Union, accounting for 59% of total employment and 45% of value added (Johansson, 2008). Thus, understanding SMEs' advanced services provision is of great importance due to their role in the innovation and growth of the manufacturing industry. Even though most of the attention has been given to well-known MNCs, manufacturing SMEs are engaging in service innovation at different degrees (Kowalkowski et al., 2013, Gebauer et al., 2012) which might imply that a sizable part of advanced services may already be provided by smaller manufacturers outside the public eye.

Addressing only MNCs becomes a burden to the transfer of knowledge to the context of smaller manufacturers (Gebauer et al., 2010, Rapaccini, 2015), whose diverse characteristics are not being considered. The present study addresses this lack of knowledge by focusing exclusively on SMEs in order to achieve a comprehensive understanding of the success of manufacturers in advanced services.

### 2.4.3 The role of the embedded context in the success of manufacturers in advanced services

Current literature has highlighted the contextual embeddedness of value in advanced services (Chandler and Vargo, 2011). In other words, not only the manufacturer has a role in the value processes, but a wide variety of actors whose interdependent interactions determine value in advanced services. The collaborative nature of value in advanced services has been widely discussed in the literature, from manufacturer-customer interactions (e.g. Kohtamäki and Partanen (2016); Sjödin et al. (2016)) to the embedded context in which manufacturers design, develop and implement advanced services (e.g. Eloranta and Turunen (2016); Alghisi and Saccani (2015)).

Key partnerships are also of particular importance for understanding the value capture process and its configuration. Managing collaborative relationships impact on service performance (Karatzas et al., 2017), which in turn can lead to specific value outcomes. In this interdependent context, each actor's actions have an impact over their own as well as others' value in the

embedded context (Raja and Frandsen, 2017). Manufacturers need to maximise value retention within its boundaries taking into account the multi-actor context in which they are embedded (Lepak et al., 2007, Cox, 2004, James et al., 2013).

Direct reciprocity is, however, not ensured and the value that co-creation provides to the customer does not equal the value that advanced services provide to the manufacturer (Payne et al., 2008). The wide diversity of actors participating in the process sets a trade-off between the creation and delivery of value and the value captured (Mizik and Jacobson, 2003). Thus, the embedded context represents both an opportunity and a threat to the success of manufacturers in advanced services.

Even though the increasing interest on understanding the implications of multiple actors in advanced services, current literature has mainly focused on the value emerging from manufacturer-customer relationships. The lack of current understanding regarding the impact that diverse actors can have over the success of manufacturers in advanced services calls to further explore the phenomenon within the embedded context.

In order to achieve an overall picture of what is known, the following section provides a literature review of the success of manufacturers exploiting the potential of advanced services in the market across value processes and embedded contexts.

## 2.5 Research gap and research questions

In order to achieve a comprehensive understanding of the current state of knowledge, the literature review addresses the success of manufacturers exploiting the potential of advanced services in the market. The aim is to analyse the literature and identify specific gaps with regards to the specific value process (section 2.4.1) and embedded context (section 2.4.3). To do so, relevant papers are selected, classified and analysed accordingly as follows.

First, in order to ensure the quality of papers in the review, the review follows a recognised and widely used criteria in business and management literature (i.e. Matthews and Marzec (2012); Thomé et al. (2016); Bigdeli et al. (2018)). Consequently, the inclusion of papers is narrowed down to journals ranked as worldwide distinction (4* rated journals), top in their field (4 rated journals) and highly regarded (3 rated journals) by the Academic Journal Guide 2018 (Association of Business Schools, 2018).

Second, the framework developed to understand the success of manufacturers in advanced services (section 2.4.1), is used to classify the literature according to each of the value processes – creation, delivery and capture – from business model literature (section 2.3). The classification reflects the value process that represents the main focus of the research, even though references to building blocks belonging to other value processes may also appear in the paper.

Third, the interdependent context in which the value processes take place (section 2.4.3) is addressed through the further classification of the literature according to the number of actors participating in each process. To do so, Chandler and Vargo's (2011) four levels of analysis – dyad, triad, network and system – are used to classify and analyse the boundaries of the embedded context.

Table 4 shows the key papers selected and classified to review the success of manufacturers exploiting the potential of advanced services in the market. The review identifies three main gaps of significance in the literature due to its relevance to achieve a comprehensive understanding of the success of manufacturers. The following sections describe the research gaps identified and propose three main research questions to address them.

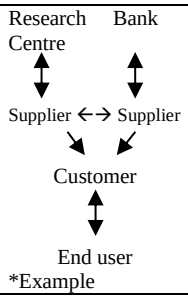
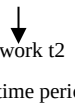
| | **Context** | **Value concept** | **Value creation** | **Value delivery** | **Value capture** |
|---|---|---|---|---|---|
| **DYAD** |  | Value-in-use | Vargo & Lusch, 2004; Payne et al., 2008; Vargo & Lusch, 2008a; Vargo & Lusch, 2008b; Smith et al., 2014; Opresnik & Taisch, 2015; Kohtamäki & Partanen, 2016; Sjödin et al., 2016; Cenamor et al., 2017; Coreynen et al., 2017; Lenka et al., 2017; Rabetino et al., 2017; Raddats et al., 2017; Rymaszewska et al., 2017 | Macdonald et al., 2011; Raja et al., 2013; Baines and Lightfoot, 2014; Macdonald et al., 2016; Song et al., 2016; Reim et al., 2018 | Ulaga & Reinartz, 2011; Kohtamäki et al., 2013; Rapaccini, 2015; Steiner et al., 2016; Forkmann et al., 2017; Visnjic et al., 2017; Ambroise et al., 2018 |
| **TRIAD** |  | Indirect value | | | Bastl et al., 2012; Finne & Holmström, 2013; Karatzas et al., 2017; Vendrell-Herrero et al., 2017 |
| **NETWORK** |  | Value-in-context | Lusch et al., 2010; Eloranta & Turunen, 2016; Story et al., 2017 | Alghisi & Saccani, 2015; Visnjic et al., 2018 | **This PhD research** |
| **SYSTEM** |  | Evolution of value | | Erkoyuncu et al., 2013 | |

Table 4. The success of manufacturers exploiting the potential of advanced services in the market

### 2.5.1 The dynamic nature of value: the introduction of advanced services in the market

The dynamic nature of value in advanced services implies that actors adapt over time in order to address their evolving needs and goals along the stages of advanced services provision (section

2.2.5). Even though the influence of time for the success of manufacturers in advanced services (section 2.4), current research fails to address the dynamic nature of value in advanced services.

Macdonald et al. (2011) identified different time periods over which value experienced by customers evolves according to their goals requiring manufacturers to continuously adapt their processes. Erkoyuncu et al. (2013) focused on the bidding stage of service contracts and identified specific aspects that need to be defined in order to reduce the uncertainty and ambiguities in the delivery of value at an early stage. The interest on understanding the impact of time in advanced services materialised into some attempts to identify and determine different stages in manufacturers' transition from product-centric to product-service offerings (Martinez et al., 2017, Lütjen et al., 2017).

Most research still considers advanced services as a static binary state where manufacturers are either providing product-service offerings or not. This is accentuated by the focus of the advanced services literature on portraying already experienced MNCs, where higher revenues become the topic of discussion (e.g. Rapaccini (2015); Steiner et al. (2016)). There is evidence that the potential of advanced services leads to new forms of value beyond the transactional nature of less complex manufacturing offerings (section 2.2.6). However, there is a period of transition until advanced services can become the manufacturer's principal source of competitive advantages. The lack of consideration given to the early stages of advanced services provision leads to a misleading picture of the success of manufacturers in advanced services.

Current findings do not reflect the complexity faced by manufacturers at prior stages, when the provision of advanced services is recognised to be under higher levels of uncertainty (Reim et al., 2018, Erkoyuncu et al., 2013). As shown by Reim et al. (2018), experience leads to trust building mechanisms reducing the need for control and monitoring of customers' behaviour. Thus, the agency mechanisms based on loyalty, for instance, are less likely to be available at earlier stages. Similarly, Erkoyuncu et al. (2013) identify a set of uncertainties that challenges the manufacturer's definition of requirements impacting on cost and performance at the early stages of industrial service contracts. Thus, economic value outcomes such as higher revenues, for instance, are less likely to emerge in the short-term for manufacturers introducing advanced services.

To conclude, current research has overlooked the dynamic nature of value in advanced services. Prior studies have indicated the presence of different stages in the transformation of product-centric manufacturers (Martinez et al., 2017, Lütjen et al., 2017), but research has mainly focused on the financial success of already experienced MNCs. From the few studies taking into account prior stages, it is possible to observe specific challenges, such as uncertainty (Erkoyuncu et al., 2013) or lack of historical data (Reim et al., 2018), that manufacturers need to overcome before

being able to progress to later stages. This situation leaves a gap in knowledge, failing to understand the success of manufacturers which are yet to achieve traction in the market. Consequently, there is a need to expand current knowledge regarding the early stages of advanced services provision of manufacturers striving to become competitive advanced services providers in the market.

The present study addresses this gap in the advanced services literature by focusing on identifying the value outcomes emerging for manufacturers at the introduction stage of advanced services provision:

*RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?*

### 2.5.2 The subjective nature of value: the value capture process

The subjective nature of value in advanced services implies that value is heterogeneously experienced and influenced by each actor's specific characteristics and embedded context (section 2.2.1). Even though the value that is created and delivered for the customer does not equal the value captured for the manufacturer (section 2.4), current research fails to address the subjective nature of value in advanced services.

As shown in Table 4, most of the research has been done on the processes of value creation and delivery, with the customer at the forefront of the analysis. This distribution of the literature can be explained by the fact that authors initially focused on understanding which key activities and resources are required by manufacturers to create and deliver *value-in-use* in advanced services in comparison to *value-in-exchange* (Payne et al., 2008, Vargo and Lusch, 2008b, Macdonald et al., 2011). Such studies have filled the gap between the existent knowledge on transactional manufacturer-customer exchanges and the need to understand the collaborative interactions required to create and deliver value in advanced services.

Research on value creation and delivery has provided manufacturers with examples of actions taken to reduce complexity and identify opportunities for resource integration. For instance, research on the development of platform activities to facilitate value creation in advanced services has emerged as a topic of interest (Cenamor et al., 2017, Eloranta and Turunen, 2016). Similarly, researchers have also highlighted the relevance of integrating customers as operant resources in the implementation of advanced services (Song et al., 2016, Macdonald et al., 2011). But, given the lack of reciprocity between value for the customer and value for the manufacturer (Payne et al., 2008), the actions developed for the creation and delivery of value to the customer do not necessary lead to the capture of value for the manufacturer.

The value capture process remains as an underdeveloped research topic with just a few papers taking a stance on value for the manufacturer. Prior studies have satisfied the need for a general view on the process in comparison to traditional manufacturing. For instance, research highlights the relevance of service capabilities and how manufacturers need to leverage on resources different from those deployed in traditional offerings (Ulaga and Reinartz, 2011, Steiner et al., 2016, Forkmann et al., 2017). In service triads, researchers suggest complementing legally-bounded relationships with shared relational and cooperative norms to prevent opportunistic behaviours (Finne and Holmström, 2013, Bastl et al., 2012, Karatzas et al., 2017). But, such studies lack an integrated view of the required building blocks' configuration – key resources, activities and partnerships – for manufacturers' success in advanced services (section 2.4.1).

To conclude, current research has overlooked the subjective nature of value in advanced services. Prior research has demonstrated the lack of reciprocity between value for the customer and value for the manufacturer (Payne et al., 2008), but extant literature has mainly focused on the creation and delivery of value to the customer. Additionally, the few papers analysing the capture of value take a narrow view into the process, considering building blocks independently of each other. This situation leaves a gap in knowledge regarding the specific configuration leading the capture of value in advanced services. Consequently, there is a need to expand current knowledge regarding the value capture process in order to understand how manufacturers retain part of the value in advanced services.

The present study addresses this gap in the advanced services literature by focusing on identifying the key activities developed and key resources deployed by manufacturers in collaboration with key partnerships to capture the value emerging at the introduction stage of advanced services provision:

*RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?*

### 2.5.3 The collaborative nature of value: the manufacturer's partners

The collaborative nature of value in advanced services implies that each value process requires the interdependent interactions of a wide range of actors (section 2.2.3). Even though the demonstrated relevance of multiple actors to achieve a comprehensive understanding of the success of manufacturers in advanced services (section 2.4), current research fails to address the collaborative nature of value in advanced services.

The advanced services literature has mainly focused on the dyadic level of analysis, where manufacturer-customer collaboration remains as the focus of the research across the value creation (e.g. Sjödin et al. (2016)), delivery (e.g. Song et al. (2016)) and capture processes (e.g. Forkmann et al. (2017)). Collaboration has also been analysed in the context of triadic

relationships, focusing on the impact that intermediaries have in manufacturers' value capture process within upstream service supply chains (Finne and Holmström, 2013, Vendrell-Herrero et al., 2017). Such studies have provided manufacturers with a priority checklist in terms of resource deployment and relationship management to create, deliver and capture value within the boundaries of specific dyadic and triadic relationships.

The extended embedded context, on the other hand, remains as an underdeveloped research topic with just a few papers looking at the impact of multiple actors in advanced services. Story et al. (2017), for instance, discuss how manufacturers and intermediaries can help to overcome limitations in their capabilities by integrating each other's resources. Similarly, Eloranta and Turunen (2016) highlight the relevance of key partnerships in reducing operational complexity for the manufacturer's creation of value. Lastly, Alghisi and Saccani (2015), show how the effective implementation of product-service offerings requires the alignment and information exchange between all actors in the service supply chain. Given the impact of collaboration over value in advanced services (section 2.2), current research has led to only partially developed knowledge.

The lack of consideration given to the implications that the extended embedded context can have for the success of manufacturers in advanced services has increasingly been noticed by academics. Raddats et al. (2017) urge researchers to adopt a multi-actor perspective beyond the focal organisation in future studies, highlighting its relevance to extend the knowledge about key resources in advanced services. In this light, Song et al. (2016) and Cenamor et al. (2017) point to the need of expanding their analysis to include the role and involvement of network actors, such as third party service specialists or intermediaries. Likewise, Story et al. (2017) suggest further investigation to understand how actors collaborate and integrate their resources in the wider network.

Such gap is even more accentuated in the case of the value capture process where the embedded context implies the possibility of value slippage – value created at one level of analysis may be captured at another (Lepak et al., 2007). Vendrell-Herrero et al. (2017), for instance, call for studies that look into understanding how network governance affects the capture of value for manufacturers. Similarly, Forkmann et al. (2017) point to the need of achieving a deeper knowledge of manufacturer–network interdependencies and the ways in which they influence success and failure in advanced services.

To conclude, current research has overlooked the collaborative nature of value in advanced services where each actor's actions can have an effect on each other as well as on the overall embedded context (Raja and Frandsen, 2017). Most research has been developed focusing on dyadic and triadic collaboration, hindering the ability to evaluate the interdependencies taking

place in the wider multi-actor context. This situation leaves a gap in knowledge regarding the impact and wide variety of interdependent actors that have a role in the manufacturer's success in advanced services. Consequently, there is a need to expand current knowledge in order to understand the nature and impact of the extended embedded context beyond the manufacturer's customers and supply chain members.

The present study addresses this gap in the advanced services literature focusing on identifying and understanding partners' roles in the manufacturer's capture of the value emerging at the introduction stage of advanced services provision:

*RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?*

## 2.6 Summary

This chapter has provided the research background and framework of the study based on the success of manufacturers exploiting the potential of advanced services in the market. The chapter evolved from an introduction of the main concepts upon which the research is constructed to the establishment of a framework and development of a literature review. The identification of research gaps and the proposed research questions concluded the chapter.

The potential of advanced services for manufacturers can be observed through its distinctive characteristics and implications leading to new forms of value for manufacturers. Advanced services are characterised by directly supporting the customers' operations through customised designs and flexible provision of capabilities. To satisfy such customer orientation and degree of complexity, manufacturers are committed to address customers' dynamic needs along their usage experiences while retaining the ownership and responsibility over the product through long-term contracts. The long-term viability of advanced services is supported through the development of close collaborative partnerships offsetting the higher commitment and risk adoption of manufacturers. Manufacturers' actions in advanced services lead to new forms of value beyond a transactional exchange.

*Value-in-use*, characterised by being intangible, heterogeneously experienced, co-created and potentially perishable, reflects the subjective perception of value in advanced services. The increasing collaborative orientation and dynamism over time were further discussed through several conceptualisations. First, *value co-creation* highlights the relevance of interactions between the manufacturer and its customers. Second, *value-in-context* comprises the inclusion of multiple actors, where the focus of attention switches towards the multi-actor context in which the manufacturer is embedded. In-between, *indirect value* appears to analyse the value emerging through interactions with third-party intermediaries. Lastly, the *evolution of value* emerges as the

ability of actors and resources to adapt over time when taking into account the effects of time in advanced services.

The nature of value in advanced services reflects the new competitive advantages arising through the provision of advanced services. New forms of value, including economic, strategic, knowledge and personal outcomes, emerge for manufacturers beyond the transactional value characteristic of traditional offerings. In order to understand how manufacturers achieve them, the value architecture construct from business model literature was introduced to explain the success of manufacturers in advanced services.

The value architecture construct anchors the present study through a grounded and recognised model. It provides the conceptual boundaries to frame the success of manufacturers exploiting the potential of advanced services in the market. Comprised of the value processes, it describes the way in which manufacturers create, deliver and capture value in advanced services. In order to do so, manufacturers need to deploy the right building blocks' configuration of key activities and resources. Given the collaborative nature of value in advanced services, manufacturers also develop collaborative relationships completing the building blocks' configuration with specific key partnerships.

Given dynamic and subjective nature of value in advanced services, the configuration of building blocks needs to adapt over time while value for the customer does not necessarily translate into value for the manufacturer. In order to further understand the success of manufacturers in advanced services, the impact of their size and embeddedness were analysed more in detail. Consequently, the present study was set to focus on SMEs and identified a lack of knowledge regarding the impact of the multi-actor context, which called to further explore the phenomenon under different embedded contexts in a literature review.

The literature review revealed that prior research has mainly focused on analysing advanced services from the perspective of experienced MNCs. In addition, an unbalanced interest has been proven towards the processes of value creation and delivery, whereas little knowledge has been developed in the value capture process. Similarly, prior studies have indicated the importance of manufacturer-customer relationships, but few studies have yet explored the implications of the extended multi-actor context in which the manufacturer is embedded.

Consequently, three main gaps were identified, calling for further research to expand current knowledge regarding 1) the early stages of advanced services provision of manufacturers striving to become competitive advanced services providers in the market; 2) the value capture process and how manufacturers retain part of the value in advanced services; 3) the nature and impact of the extended embedded context beyond the manufacturer's customers and supply chain members.

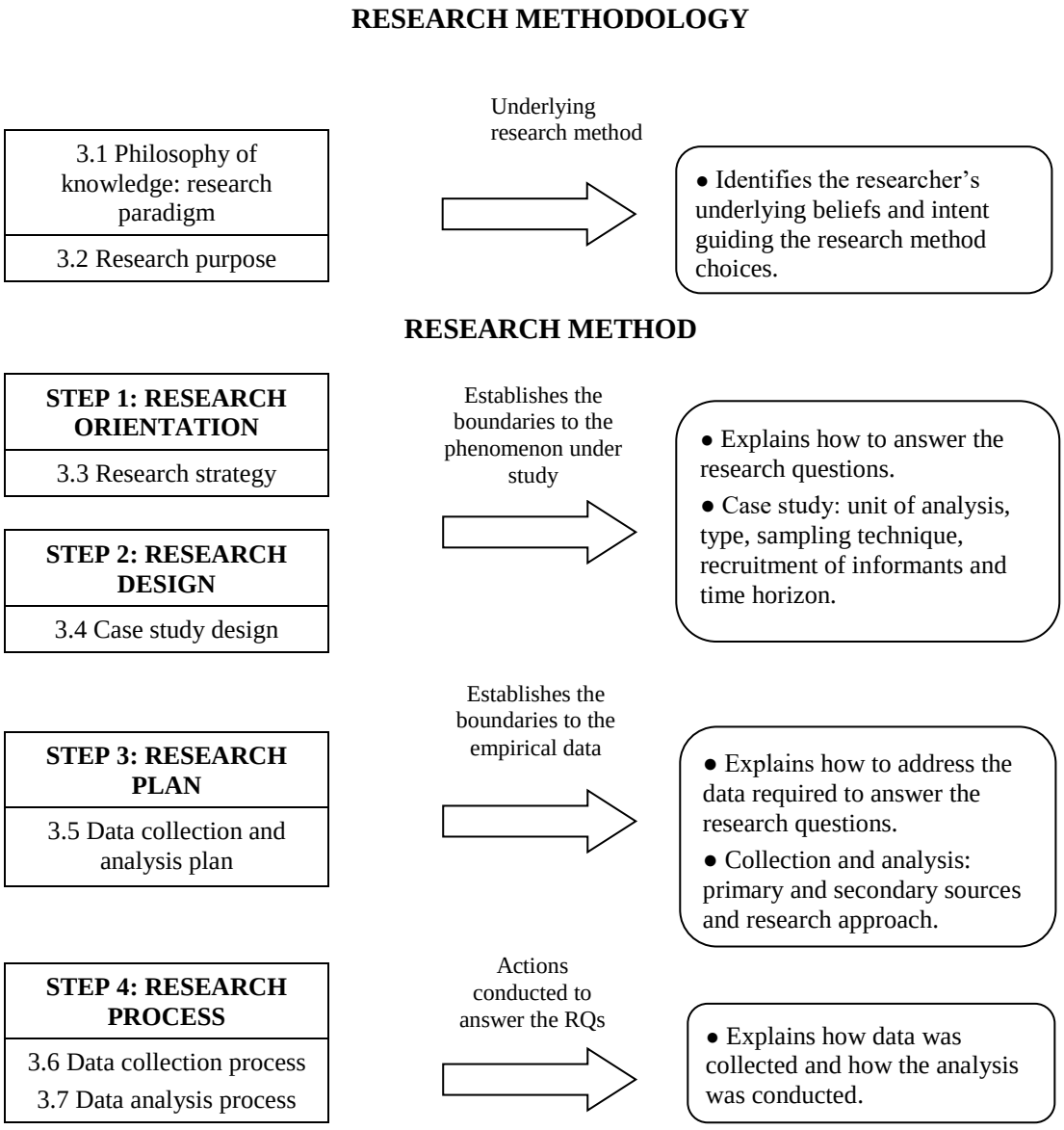
This study focuses on understanding how the nature of the relationship between the manufacturer introducing advanced services in the market and its partners impacts the manufacturer's value capture process. In order to do so, three research questions were proposed as follows:

- RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?
- RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?
- RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?

# CHAPTER 3. RESEARCH METHODOLOGY AND METHOD

The research methodology guides the design and development of the research method. The research method explains the boundaries and actions required to answer the research questions. Figure 4 provides an illustration of the research methodology's guidance and method's boundaries and actions.

Figure 4. Research methodology and method: guidance, boundaries and actions



The chapter starts with the identification of the researcher's underlying philosophical paradigm and research purpose and their implications for the research method. The research method is introduced with the explanation of the research strategy selected. In order to set the boundaries to the phenomenon under study, the case study design is explained in detail. The data collection and analysis plan further provide boundaries to the required empirical data, while the data collection and analysis process describe the actions developed to obtain and interpret it. The chapter concludes with the pilot study developed to test the research method and a statement ensuring the confidentiality of data and the quality of the research.

## 3.1 Philosophy of knowledge: research paradigm

The relevance of paradigms for the discovery of knowledge was pointed out by Thomas S. Kuhn, who defined them as the recurrent conceptual, observational, and instrumental applications of theories that guide the development of a particular discipline (Kuhn, 1970). Consequently, the paradigm is crucial to understand the underlying assumptions that dictate the way the study is designed and conducted (Krauss, 2005).

Specifically, five main paradigms can be differentiated according to their ontological, epistemological and methodological assumptions. Ontology relates to the nature of reality and answers to the question of *what can be known?*; epistemology relates to the relationship between researcher and reality and answers to the question of *what is the nature of the relationship between the researcher and what can be known?*; methodology relates to the plan of action to know reality and answers to the question of *how can the researcher go about finding out what can be known?* (Guba and Lincoln, 1994).

The following sections provide a description of each of the paradigms and highlight the implications of the researcher's social constructivist paradigm with regards to this study's research method choices.

### 3.1.1 Positivism, postpositivism, critical theory and social constructivism

Table 5 provides a description of research paradigms – positivism, postpositivism, critical theory and social constructivism – based on the work developed by Guba and Lincoln (1994) and Hatch (2002). Each paradigm is described according to its underlying assumptions as well as the main product that can emerge from the research.

| | **Ontology** | **Epistemology** | **Aim** | **Methodology (in general)** | **Product** |
|---|---|---|---|---|---|
| **Positivism** | Naïve realism: real and fully known | Dualist, objective: researcher independent from knowledge | True nature of reality | Quantitative: experiments, surveys, verification of hypothesis | Facts, laws, predictions |

| | | | | | |
|---|---|---|---|---|---|
| **Postpositivism** | Critical realism: real, stratified but only approximated | Dualist, objective: researcher as data collection instrument | Close approximations of stratified reality | Qualitative, quantitative and mixed: systematic procedures, frequency counts, low level statistics | Generalisations, descriptions, grounded theory |
| **Critical theory** | Historical realism: virtually shaped by structures | Interpretive, subjective: framed by researcher's values | Exposing structural issues | Qualitative: transformative, dialogic and dialectical | Critiques challenging structures |
| **Social constructivism** | Relativism: multiple and human constructed | Interpretive, subjective: co-constructed by researcher and participant | Individual constructions of reality | Qualitative: naturalistic, hermeneutic and dialectical | Case studies, interpretations, narratives |

Table 5. Research paradigms based on Guba and Lincoln (1994) and Hatch (2002)

Positivism is inherently realist, seeing the world as an observable and fully known reality. Dualist and objective epistemology meaning reality is external and independent to the researcher, who has a neutral position in the research. The aim of the researcher is to capture the true nature of reality. The methodology is based on quantitative methods with experiments and verification of hypothesis, leading to facts, laws and predictions.

Postpositivism assumes a critical realism ontology, considering a stratified reality but only known in an imperfect approximated manner. Postpositivists understand reality in three domains being the real domain where mechanisms and structures impact events; the actual domain where events are observed; and the empirical domain where events are experienced (Bhaskar, 1978). Dualist epistemology meaning the researcher tries to be as objective as possible acting as a data collection instrument. The aim of the researcher is to capture close approximations of the stratified reality. The methodology is based on rigorous and systematic procedures in qualitative research and frequency counts and low-level statics in quantitative research, leading to generalisations, descriptions and grounded theory.

Critical theory assumes reality as historically determined and evolving according to economic, social, political, cultural and gender structures over time. Epistemologically, reality cannot be separated from the researcher's values and knowledge is mediated through the political stance of the researcher. The aim of the researcher is to expose the issues related to specific structures. The methodology is known as transformative, where the researcher dialogues with those being oppressed by structures to uncover their consciousness dialectically reaching understandings that lead to critiques of the structures in order to drive social change.

Social constructivism assumes a relativistic ontology, believing that several realities can coexist according to experientially based, local and specific human constructions. Epistemologically, reality cannot be separated from the researcher's interpretations where knowledge emerges from the co-construction of the subjective reality with participants (Krauss, 2005). The aim of the researcher is to capture individual constructions of reality. The methodology is based on naturalistic qualitative methods and hermeneutic principles to dialectically uncover participant's perspectives, leading to case studies, interpretations and narratives.

### 3.1.2 Social constructivism paradigm: implications for the research method

This study is built upon the social constructivism paradigm. The dynamic, subjective and collaborative nature of value in advanced services is phenomenologically determined (Vargo et al., 2008). In other words, value is understood as a reality that is human constructed and thus, diverse for each actor participating in advanced services. Consequently, the proposed research questions focus on the understanding of value for the manufacturer according to its specific lived experiences in the extended embedded context.

Rejecting the positivist's assumption of a dualist epistemology, social constructivism allows the researcher to co-construct knowledge with the participant in order to understand human experience as it is lived (Laverty, 2003). The data collection process involves researcher and informant interactions in the form of interviews (section 3.5.1) to collect specific qualitative data (section 3.5.3). To obtain the required data, the recruitment of informants follows the premise that the person having the experience is in the best position to known its meaning (Rennie, 2000) through the recruitment of experts (section 3.4.4).

Rejecting the postpositivism's stratified ontology, social constructivism allows to focus only on events as they are experienced (empirical domain) rather than the underlying mechanisms (real domain) or observable characteristics (actual domain). Social constructivism believes on multiple realities that are human constructed according to each individual. This study focuses on the manufacturer's construction of the value capture process in the extended embedded context. In order to address the specific manufacturer's stance of reality, the ego-network perspective from SNA sets the boundaries to the unit of analysis (section 3.4.1) and guides the data collection plan (section 3.5.3).

Rejecting the critical theory's transformative methodology based on identifying the historical structures underlying reality, social constructivism unfolds the understanding of the natural settings of individuals' realities. The outcome is not to lead social change from inequalities but to lead action from individuals' experiences. The data analysis process is informed by the systematic constant comparative method and the thematic analysis of qualitative data (section 3.7) to ensure a rigorous interpretation of data in the advanced services context. Inherently subjective, the

scientific notions of validity and reliability are not applicable and an alternative measurement is required to judge the goodness of the research (section 3.10).

## 3.2 Research purpose

The research purpose of the study refers to the researcher's underlying intent in conducting the study and guides the steps taken to answer the research questions. The following section provides a description of the different research purposes and discusses their suitability for the present study. To conclude, the implications of an exploratory purpose are outlined to provide a better understanding of the research method choices.

### 3.2.1 Exploratory, descriptive and explanatory purposes

According to the research purpose, the study's contributions must increase the understanding and opportunities for action in either an exploratory, descriptive or explanatory manner (Marshall and Rossman, 2011). In other words, the research purpose tells what the study is likely to accomplish. Consequently, the research purpose has an impact over the research method as it determines the type of contributions that would emerge in the field of study.

An exploratory study is meant to provide new insights when there is a lack of earlier data on the topic. Thus, an exploratory study is used when the phenomenon under investigation has no clear outcomes yet (Baxter and Jack, 2008). A descriptive study is used to provide a detailed description of phenomena, events or people (Marshall and Rossman, 2011). A descriptive study uses the information available to explain in detail how a specific phenomenon takes place. Lastly, an explanatory study tries to identify the links shaping a phenomenon in a cause-effect manner (Baxter and Jack, 2008). An explanatory study is based on a result that is dependent of a specific variable, where both the outcome and the trigger are previously known but the relationship has not been established yet.

### 3.2.2 Exploratory purpose: implications for the research method

According to the nature of the gaps identified in the literature and the research questions (section 2.5), the present study has an exploratory purpose. In other words, the study aims for new insights rather than confirming existing knowledge. Several implications guide the research choices made to satisfy this exploratory study.

The lack of previous literature addressing the proposed research questions challenges the research method choices due to the lack of precedence (Stebbins, 2001). Consequently, the lack of previous literature addressing the value capture process in the extended embedded context calls for a research method that is robust enough to fulfil the research gap. A multiple-case study is selected to ensure strong findings through the analysis and comparison of several cases (section 3.4.2).

The phenomenon under study must be clearly defined in order to be able to determine its boundaries of application (Barratt et al., 2011). The ego-network perspective is selected to delimit the unit of analysis (section 3.4.1) and the interview questions through data collection tools used in SNA (section 3.5.3). The ego-network perspective provides clear boundaries to the extended embedded context and the type of data to be collected. Even though the need for boundaries, the exploratory purpose also requires an open view towards the research.

Flexibility and open-mindedness must lead the enquiry to effectively explore a given phenomenon (Stebbins, 2001). The research method maintains a flexible and open view on data and the phenomenon under study. The method is designed to allow for flexibility through a wide sampling case criteria (section 3.4.3) and semi-structured interviews (section 3.5.2). The lack of tight criteria around the case selection and interview questions allows their adjustment to better fit the emerging insights from the empirical data without losing rigour in the process.

Lastly, the research method must reflect the search for new insights rather than the confirmation of existing ones (Baxter and Jack, 2008). The lack of previous outcomes requires a higher degree of interpretation to achieve a body of knowledge that addresses the novelty of the research. The data analysis plan reflects an abductive approach, where the research framework is continuously confronted with the empirical world and reoriented accordingly (Dubois and Gadde, 2002), in order to build theory through specific empirical evidence (section 3.5.5).

## 3.3 Research strategy: qualitative case study

This study aims to understand how the nature of the relationship between the manufacturer introducing advanced services in the market and its partners impacts the manufacturer's value capture process. In order to do so, three main research questions are proposed:

- RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?
- RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?
- RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?

The research strategy refers to the general orientation to the conduct of the research (Bryman, 2016). The following sections discuss the research strategy based on the choices made with regards to its nature – qualitative and quantitative – and type – narrative, phenomenology, grounded theory, ethnography, and case study. Based on this study's paradigm, purpose and research questions, the research follows a qualitative case study strategy.

### 3.3.1 Qualitative research

Qualitative research can be defined as a situated activity through which researchers study a phenomenon in its natural settings to make the world visible through interpretive practices (Denzin and Lincoln, 2003). Three main reasons motivate the selection of a qualitative rather than quantitative research (Table 6).

| Qualitative research | Quantitative research | Rationale |
|---|---|---|
| Natural settings | Controlled settings | Understanding the manufacturer's value capture process as experienced in the extended embedded context |
| Participant perspectives | Objective reality | Understanding the manufacturer's individual constructions beyond the facts |
| Emergent design | Predetermined design | Required data has no meaning until it is processed and interpreted by the researcher |

Table 6. Rationale for qualitative research

First, Creswell (2013) recommends qualitative research when the researcher needs to understand the context of participants. The proposed research questions address the value capture process beyond the manufacturer and into the extended embedded context in which it takes place. Qualitative data is required to not only understanding the value capture process, but also the context in which that understanding is formed as a matter of situated knowledge (Laverty, 2003).

Second, qualitative research focuses on meanings rather than measures, emphasising the socially constructed nature of reality (Denzin and Lincoln, 2003). Consistent with this study's ontology and epistemology, qualitative research allows for the discovery of individual subjective constructions regarding the impact of partners in the manufacturer's value capture process beyond the measurement constraints of quantitative research.

Third, Edmondson and McManus (2007) recognise a methodological fit between qualitative research and lack of previous knowledge on the phenomenon. Consistent with the exploratory purpose of this study, qualitative research provides flexibly allowing to adapt the design and development of the enquiry along the researcher's interpretation of data, unlike predetermined quantitative experiments.

### 3.3.2 Case study strategy

The type of research strategy determines the choices made to answer the research questions. Narrative study, phenomenology, grounded theory, ethnography and case study comprise the five main strategies used in qualitative research (Creswell, 2013). Data collection and data analysis tools may overlap across strategies, whereas the focus and desired outcome of the research set the boundaries between them. Accordingly, a case study appears as the most appropriate strategy to answer the research questions (Table 7).

| | Focus | Desired outcome | Rationale |
|---|---|---|---|
| **Narrative** | Understanding of the extended account of stories told by one or two participants | Chronological narrative about the stories of an individual's life | The study does not focus on stories but on specific events as perceived by the manufacturer at the current moment |
| **Phenomeno-logy** | Understanding of a phenomenon through the commonalities in a number of individuals' experiences of that phenomenon | Describing the *essence* of the experience based on the commonalities of individuals | The study does not look to provide a description of commonalities but an in-depth understanding that can drive further action |
| **Grounded theory** | Developing a theory grounded on the data from the field | A theory illustrated through hypothesis, figures or frameworks | The study emerges from a pre-existing theoretical framework |
| **Ethnography** | Understanding of behaviours through the observation of groups in relation to specific cultural contexts/settings | Description how the culture-sharing group works | The study does not take into account the impact of culture in manufacturers' experiences |
| **Case study** | In-depth examination of a phenomenon in its current real-life context | Lessons learnt from the case or cases | The study focuses on manufacturers' real life embedded context |

Table 7. Rationale for case study strategy

A case study strategy is used to examine a phenomenon in its real-life context in a detailed and intensive manner (Yin, 2014). The intrinsic dynamic (RQ1), subjective (RQ2) and collaborative (RQ3) character of the research questions requires a research strategy that takes into account the relevance of the real-life context. According to Yin (2014), three conditions must be assessed when deciding to pursue a case study strategy.

Starting with the research questions, Yin (2014) suggests that a case study would better answer "how" and "why" type of questions. This form of research questions relate to the understanding of how specific events take place, rather than how many times or which types of events are taking place. In other words, a case study allows for in depth understanding of phenomena, including the rationale behind why that event is producing those outcomes. This study looks at how the nature of the relationship between the manufacturer introducing advanced services in the market and its partners impacts the manufacturer's value capture process, through a mix of "which" and "how" question types. Whereas phenomenology is a descriptive enterprise, prioritising disclosure over explanation (Giorgi, 1994), a case study allows for deep understandings that can drive further action.

The second condition refers to the extent of control over behavioural events. Yin (2014) argues that a case study is advised when the behaviour under study cannot be manipulated. This study aims to obtain raw data of manufacturers' perceptions and experiences in a natural uncontrolled

manner. As pointed out by Eisenhardt and Graebner (2007), central to case studies is the ability to study the unaltered real-world context in which the phenomena takes place. Whereas ethnography's context is culturally-driven (Bryman, 2016), case studies allow to analyse phenomena framing the context according to the proposed research questions.

The third condition mentioned by Yin (2014) refers to the timeframe of events. Case studies are preferred when studying contemporary rather than historic events. The proposed research questions aim to obtain information related to a phenomenon occurring in the present and dependent on the current embedded context. The objective is not to focus on what has happened in the past, but on how the manufacturer's partners impact the value capture process at their current stage introducing advanced services in the market. Whereas narratives are based on chronological extended accounts of individual stories (Creswell, 2013), a case study allows to focus on events taking place in the present moment.

Finally, another important characteristic of a case study strategy refers to the role of theory in the research. A case study is meant to be a theoretically informed process led by the nature of the research questions, where data is used to reframe and contrast conceptual assumptions (Yin, 2014). This study emerges from a gap in the literature on value in advanced services and is conceptualised through business model literature. Whereas grounded theory emerges solely from the data, a case study is built upon the bases of a pre-existing theoretical framework that can be re-shaped along the research process.

The following section provides a description of the case study in terms of the decisions made regarding its design.

## 3.4 Case study design

The design of a case study comprises the decisions determining how to address the phenomenon under study. It sets the boundaries regarding the unit of analysis, the type of case study, the sampling technique, the recruitment of informants and the time horizon.

### 3.4.1 Unit of analysis: the ego-network perspective

One of the starting points when designing a case study refers to the unit of analysis. This study introduces SNA, specifically the ego-network perspective, to set the appropriate boundaries to the unit of analysis.

According to Yin (2014), the unit of analysis must be a concrete real-life phenomenon that allows to determine the scope of data needed to answer the research questions. Advanced services literature has previously adopted a manufacturer's stance regarding value capture within the boundaries of a dyadic unit of analysis (e.g. Kohtamäki et al. (2013); Forkmann et al. (2017)).

But, due to the exploratory purpose of this research, there is a lack of precedence regarding the establishment of a unit of analysis in the extended embedded context. Consequently, the SNA is selected to address the determination of a unit of analysis.

SNA understands social structures in the form of networks, defined as a set of relationships or more formally, as a set of nodes and a description of ties between the nodes (Kadushin, 2004). Nodes can be individuals, teams, organisations or any entity which is able to hold a relationship with other entity; whereas ties can be friendships between individuals, exchanges between teams or alliances between organisations (Borgatti and Ofem, 2010). As shown by Han et al. (2018), SNA has been increasingly used in the design of operations and management disciplines' research with a focus on relationships. For the purpose of this study, the unit of analysis is clearly defined through the three elements commonly used in SNA – sampling unit, unit of observation and modelling unit.

The sampling unit refers to the partial network object of study (Wasserman and Faust, 1994), setting the boundaries that limit the inclusion of actors for the analysis. For this study, boundaries take the form of an ego-network, including the ego (manufacturer) and its first-order connections or alters (partners) (Marsden, 1990). Ego-networks have been widely used within several social disciplines, such as sociology (e.g. Bernardi et al. (2007)), psychology (e.g. Van Tilburg et al. (1991)) or anthropology (e.g. Lizardo (2014)), as a means to understand phenomena through the relationships (alters) among actors given an entry point (ego) of connection. The social constructivism paradigm implies the understanding of knowledge as it is experienced from the phenomenological stance of the manufacturer. The ego-network allows to focus on the manufacturer's subjective perspective as the interest is mainly placed on the ties between alters and the ego rather than among all nodes (Crossley et al., 2015).

The unit of observation refers to the actor from whom information is elicited (Wasserman and Faust, 1994). For this study, where the focus is placed on manufacturers' (egos) perceptions regarding partners' (alters) roles on their value capture processes, only the views of the manufacturers are deemed relevant sources of information. Given the time and costs constraints of obtaining data directly from each of the alters (Wellman, 2007), the ego is commonly the main source of information in ego-network research (e.g. Berán et al. (2018); Arnaboldi et al. (2016)). But, it is important to consider the trade-offs between obtaining one-sided information from a wider variety of egos and including a first-hand view of alters.

For this study, only eliciting information from the manufacturer is in line with the research questions and supported by SNA research. Heath et al. (2009) inclusion of alter interviews, in their ego-network study on whether educational choices are influenced by the embedded network or taken solely by an individual, allowed for the discovery of less evident forms of alters'

influences. In this case, interviewing alters becomes a strength as alters' relevance in the network is not directly determined by a conscious choice of the ego. On the contrary, interviewing alters does not add value to the study when the focus is to understand only those relationships being relevant for the ego. Barbieri (2003) shows how in-depth interviews with self-employed egos allow to identify the specific network members being a source of relevant resources for egos' working experiences without requiring alters' information. Consequently, interviewing partners will not increase the reliability of contributions given the focus of this study on manufacturers' subjective perceptions.

The modelling unit refers to the level at which network data is analysed including single actor, dyad, triad, subgroup and network (Marsden, 1990, Wasserman and Faust, 1994). For instance, data from an ego-network sampling unit can be analysed regarding the frequency of interaction among a pair of actors (dyad) or regarding its total number of ties (network). Three modelling units reflect the level required to answer the research questions of this study. The value outcomes emerging through the introduction of advanced services in the market (RQ1) as well as the actions taken by the manufacturer (RQ2) are directly related with the manufacturer, where the data required is subjective to a single actor level. Following, the impact of the nature of the relationships with its partners (RQ3) is analysed in manufacturer-partner dyads as well as in the network level.

Literature has shown how looking at network data at different levels can help researchers obtain deeper and more comprehensive understanding of the extended embedded context. For instance, Wellman and Frank (2001) explain how multi-level analysis captures interactive effects otherwise ignored, and allows researchers to develop a more substantive analysis. Adopting a multi-level modelling unit is not only beneficial to identify theoretical influences at different levels, but it also reduces the chances of losing some of the richness in the data that can happen through a single level of analysis (Contractor et al., 2006). Thus, combining the analysis of egos, ego-alter dyads and network data allows to obtain an integrated view and understanding of the value capture process.

In conclusion, the unit of analysis is composed of three main elements based on SNA. First, the sampling unit delimits the boundaries of the extended embedded context, selecting the ego-network as the limitation to the inclusion of actors in the study. Second, the unit of observation delimits the boundaries of the data collection, selecting the ego as the only actor in the ego-network from whom information is elicited. Third, the modelling unit delimits the boundaries of the data analysis, selecting a single actor level to answer RQ1 and RQ2 and a dyad and network level to answer RQ3. The combination of such three elements ensures the clear definition of boundaries in order to explore the phenomenon under study.

### 3.4.2 Type of case study

Depending on the number of cases, it is possible to differentiate between single and multiple-case studies (Yin, 2014). For this study, a multiple-case study addresses the exploratory purpose.

A single-case study comprises one unit of analysis and it is commonly used to build theory by confirming or challenging existing propositions; to document and analyse in depth an extreme circumstance; or to aim for a revelation through previously unavailable data (Yin, 2014). A multiple-case study involves separate cases, which lead to individual outcomes that can be compared and contrasted, increasing the robustness of the findings (Yin, 2014). The multiple-case study is commonly used to achieve replication, which can be literal if the cases provide similar results or analytical if the cases provide contrasting outcomes (Yin, 2014). It is important to note that the multiple-case study must be motivated by an underlying theoretical interest that calls for similar or contrasting results.

The exploratory purpose of this research, where evidence and theory development is limited, calls for a multiple-case study. According to Eisenhardt and Graebner (2007), the development of theory through multiple-case study requires a research problem that has no feasible answer in the current literature. A multiple-case study allows for an increased breadth and depth to the data collection process drawing evidence from several contexts (Kindström, 2010). For this study, the multiple-case study is selected to explore the logical replication that may arise across diverse ego-network structures and compositions. Theoretical replication provides an increased precision, validity and stability of findings leading to more robust conclusions (Miles and Huberman, 1994). The goal is to allow for the understanding of the value capture process beyond the misjudged representativeness of a single manufacturer's introduction of advanced services and embedded context and through the identification of patterns from several cases.

Current empirical research on value in advanced services also supports the choice of multiple-case study. As tested by Coreynen et al. (2017) on their exploratory study about digitisation in advanced services, a multiple-case study appears to facilitate the analysis and understanding of different advanced services pathways. Similarly, Rymaszewska et al. (2017) also provide an example of how a multiple case study approach represents the right strategy to build theory by proposing a conceptual framework focused on the relevance of IoT in advanced services. Finally, Raddats et al. (2017) analyse service relationships through an exploratory qualitative multiple-case study extending existing theory to include interactively developed capabilities.

In conclusion, the exploratory purpose of this study calls for a multiple-case study to successfully cover the details needed to empirically investigate the role of partners for the manufacturer's value capture process in advanced services. Thus, choosing a multiple-case study allows to identify

robust conclusions on a phenomenon currently undermined in the advanced services literature through the comparative analysis of different insights.

### 3.4.3 Sampling technique

The sampling technique delimits the boundaries for inclusion or exclusion of cases according to specific criteria. For this study, cases are sampled through a purposive theoretical sampling technique.

In a broad sense, probability sampling techniques, based on sampling distributions, are commonly used in quantitative research whereas purposive sampling techniques, based on sampling certain units, are characteristic of qualitative research (Teddlie and Yu, 2007). For instance, among probability sampling techniques, random sampling is recommended for hypothesis-testing research to obtain a rigorous statistical evidence on distributions within a population (Eisenhardt, 1989). In the case of a research whose purpose is that of developing theory not testing it, such sampling technique is neither necessary nor desirable. Glaser and Strauss (2008) argue that sampling for generating theory must be consciously designed taking into account the similarities and differences within the selected population. Among purposive sampling techniques, Eisenhardt and Graebner (2007) recommend theoretical sampling for case study research in order to obtain an understanding of the relationships and logic behind specific constructs.

A theoretical sampling, guided by the theory in progress (Suddaby, 2006), is flexible enough to adapt to the needs of an exploratory study. Bryman (2016) describes how theoretical purposive sampling follows an iterative approach between sampling and theoretical reflection, refining categories rather than boosting a sample size. Exploratory research in the advanced services literature also support these claims. Rabetino et al. (2017), for instance, also adopted a purposive theoretical sampling based on three basic inclusion criteria in order to explore the strategic logic of advanced services. Similarly, Story et al. (2017) were able to discover a set of critical capabilities for advanced services through the analysis of cases sampled through a purposive theoretical technique limited by a single inclusion criterion.

In order to satisfy the exploratory purpose of this research, where the lack of empirical evidence requires an open view on the topic, a purposive theoretical sampling technique is selected. Consequently, the inclusion criteria is designed to consider similarities in order to identify general uniformities whereas also allows for differences in order to develop discoveries. The manufacturer (ego) must be a SME (European Commission, 2020), characterised by:

(1) staff headcount lower than 250;
(2) annual turnover of equal or less than €50 million or
(3) total balance sheet equal or less than €43 million

Where:

a) The SME's business activity must belong to the manufacturing industry including the processing and fabrication of both components and final products.
b) The SME needs to be at the introduction stage of advanced services provision: introducing the product-service offering in the market.

In conclusion, the selection of cases follows a purposive theoretical sampling technique based on an open criteria according to the exploratory purpose of the study. The sampling also needs to address the recruitment of specific informants as the units of observation selected are not individuals but organisations. The following section describes the recruitment of informants within each manufacturer.

### 3.4.4 Recruitment of informants

The manufacturer (ego) is the selected unit of observation from whom information is elicited in the ego-network (section 3.4.1). Being organisations rather than individuals, specific informants must be recruited. For this study, informants are recruited based on their status as experts on advanced services.

The recruitment of experts as informants is an extended technique in theory generating research (e.g. Cowles et al. (2002); Chakkol et al. (2018)). Qualitative research is recognised to purposefully select informants rather than using a random selection technique (Creswell, 2013). Examples supporting these claims can be found in the advanced services literature. Story et al. (2017), for instance, researched the capabilities required to deliver advanced services based on 24 interviews with senior executives within 19 organisations, because such knowledge could only be found in high-profile industrialists. Similarly, Rymaszewska et al. (2017) analysed the role of IoT in advanced services processes in 3 organisations where, in order to ensure the quality of data, only the manager responsible for the successful implementation of IoT was interviewed.

Marsden (1990) argues that when information within a network is collected from individuals as representatives of organisations, the rule of thumb is to make sure that such individuals have the knowledge that it is being sought. According to Littig (2009), an informant can be given the status of expert by the researcher as a result of their *know why* – tacit knowledge of the structures, procedures and events in a given organisation – and *know how* – experience knowledge from practice in a given field – regarding a specific research topic. For this study, the selection of experts is based on their:

- Know why: tacit knowledge about the organisation's advanced services including motivation, goals, challenges and opportunities.

- Know how: experience within the organisation's advanced services journey including activities, resources and partnerships.

In conclusion, the recruitment of informants is made according to their status as experts in advanced services. The rationale for this recruitment technique is guided by the philosophical paradigm and supported by previous research in advanced services. Experts comprise the only source of information able to provide valuable insights to answer the proposed research questions.

### 3.4.5 Time horizon

The time horizon refers to the point in time in which case study data is collected. This study follows a cross-sectional time horizon.

The time horizon can follow a cross-sectional or a longitudinal design (Bryman, 2016). Cross-sectional case studies are characterised by the collection of information at one point in time; whereas a longitudinal time horizon is based on the collection of data at different periods. The aim of this study is to analyse manufacturers' value capture processes at the introduction of advanced services in the market, which does not require collecting data at separate times. The time constrains of the project also favour the data collection at a single time to avoid over extending the process.

In conclusion, the data collection process occurs at one point in time. The following section provides a detailed description of the data collection and analysis plan, completing the boundaries to the research method.

## 3.5 Data collection and analysis plan

The data collection and analysis plan comprises the decisions determining how to obtain and interpret the data required to answer the research questions. It sets the boundaries regarding the primary and secondary sources of data as well as the approach guiding the analysis of data.

### 3.5.1 Primary data source: interviews

Interviews represent one of the most popular and widely used data sources in qualitative research enquiry (Bryman, 2016). According to Patton (2002), the purpose of interviewing is to find out about individual perspectives entering into someone else's mind and collecting their stories. Similarly, Seidman (2006) describes how accessing individuals' consciousness through interviews allows researchers to form meanings based on the complexity of experiences. Consequently, interviews are selected as the primary source of data following the need to form meanings from the expert knowledge of manufacturers' subjective value capture processes. The social constructivism paradigm guiding this research points to the need for interviews as the data source to satisfy each of the research questions.

In order to answer *RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?*, data about value outcomes must be sought in relation to the manufacturers' perception and intangible experiences introducing advanced services in the market. Empirical research on value in advanced services supports the choice of interviews. For instance, Payne et al. (2008) analysis of the value co-creation process sources the required data from interviews. Similarly, Alghisi and Saccani (2015) developed interviews with several manufacturers in order to understand the challenges to value delivery in the wider context. Interviews satisfy the need to achieve an understanding of the intangible, heterogeneously experienced, co-created, and potentially perishable nature of value in advanced services (Vargo and Lusch, 2008b).

In order to answer *RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?*, data about the actions and how those are developed requires specific expert knowledge directly dependent on the context and subjective experience of the individual (section 3.4.4). Fieldwork sources such as participant observation or quantitative sources such as standardised questionnaires may satisfy the need of collecting explicit data. But, expert knowledge requires a deeper process in order to reach individuals' tacit know-why and know-how (Bogner and Menz, 2005). As pointed out by Littig (2009), expert knowledge represents an analytical construct that is not ready available to be collected but it is rather realised in the course of interaction between interviewer and interviewee. Interviews satisfy the need to interactively unfold the tacit expert knowledge of manufacturers.

In order to answer *RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?*, there is a need to go beyond the ego-network structure and into its composition through the manufacturer's perception of relationships. Latest literature on SNA supports the collection of qualitative data through interviews in order to understand networks in a comprehensive manner. Edwards (2010), for example, considers that the insider view of a network requires subjective accounts that cannot be captured by numeric data. The works of Provan and Milward (1995) and Hollstein (2011) portray how interviews allowed the collection of interviewees' specific views and impressions otherwise missed within the network. Heath et al. (2009) also developed interviews in order to reveal both relationship- and network-based accounts supporting the use of qualitative sources of information.

In conclusion, the collection of primary qualitative data is sourced through interviews. The social constructivism paradigm and previous research in advanced services and SNA support the choice of interviews for data collection. Interviews comprise the data collection source that allows to achieve the required subjective and experiential data to answer the research questions. To do so, a semi-structured interview is selected as explained in the following section.

### 3.5.2 Interview structure: semi-structured

Depending on the level of predetermination of the wording and sequencing of questions, interviews can be generally classified as structured, semi-structured or unstructured (Patton, 2002). For this study, the data collection is made through semi-structured interviews.

Structured interviews provide the higher level of strictness where questions are specified in detail and the interviewer cannot pursue topics that were not anticipated in the guide (Patton, 2002). Semi-structured interviews are characterised by a guide of questions that set the bases to investigate a subject while allowing the interviewer flexibility to probe, explore and ask about other topics that may emerge during the course of the interview (Patton, 2002). Lastly, unstructured interviews are described as conversations where questions directly arise from the context (Patton, 2002).

The exploratory purpose of the research calls for a flexible structure to avoid constraining with closed questions that would limit the discovery of useful insights. Advanced services literature support this claim with several qualitative exploratory studies using semi-structured interviews (i.e. Sjödin et al. (2016); Raddats et al. (2017); Rabetino et al. (2017); Rymaszewska et al. (2017)). Consequently, the use of a structured interview was deemed inappropriate. The use of unstructured interviews was also rejected due to the mismatch between the required degree of interpersonal, social skills and confidence in the ambit of interviews (Eriksson and Kovalainen, 2008) and the experience of the interviewer. Semi-structured interviews satisfy this study's need for a guide while allowing flexibility through additional follow-up and in-depth questions in the course of the interview.

In conclusion, semi-structured interviews lead the data collection process. The exploratory purpose, lack of experience of the interviewer and previous research in advanced services support the choice of a semi-structured interview. Semi-structured interviews address the need for flexibility providing an interview guide designed to allow for additional questions according to the emerging needs of the research. The interview guide comprises two differentiated sets of questions as explained in the following section.

### 3.5.3 Interview guide: ego-network and value capture questions

The interview guide comprises the planned questions in the semi-structured interview (Appendix 1). In a broad sense, questions can be classified into six categories according to whether the information asked is about experiences, opinions, feelings, knowledge, sensory or background data (Patton, 2002). The body of the interview guide is composed by two main sets of questions to satisfy a double aim: 1) to identify the key partnerships and connections forming the manufacturer's ego-network; 2) to understand the manufacturer's subjective perspective and experience regarding the value capture process in the ego-network.

The first set of interview questions follows the General Social Survey (GSS) administered to the American population in order to obtain national data (Burt, 1984). The GSS allows to address the exploratory purpose of this research through a robust data collection tool in SNA. The GSS is based on the *name generator* and *name interpreter* data collection tools to unfold an ego-network structure and composition (Marsden, 1990). The *name generator* asks the manufacturer (ego) to nominate those partners (alters) with whom they enjoy a particular type of relationship (Crossley et al., 2015). The *name interpreter* goes beyond the identification of partners (alters) and into the nature of the relationship in the ego-network (ego) (Marsden, 1990).

In SNA, not only the role of a partner determines its impact but its position (structure) and strength of the relationship (composition) (Wasserman and Faust, 1994). The structure unfolds the nature of relationships in the ego-network according to its presence, absence or position; whereas the composition unfolds the nature of such relationships, in terms of their traits, features or resources. In order to achieve a comprehensive understanding of the nature of the relationship with partners (RQ3), the GSS data collection tool addresses the manufacturer's ego-network structure and composition characteristics (Table 8).

| | Characteristic | Description |
|---|---|---|
| **Structure** | **Structural hole** | Lack of tie among a pair of nodes (Burt, 2000) |
| | **Brokerage position** | Node's opportunity to participate in, and control of, valuable resource diffusion for connecting two nodes otherwise unconnected (Burt, 1984) |
| | **Cluster** | Areas of the network where nodes are more connected to each other than to the rest of the network (Tichy et al., 1979) |
| | **Bridge position** | Node that is a member of multiple clusters (Granovetter, 1983) |
| **Composition** | **Intensity** | Frequency of interactions between nodes (Tichy et al., 1979). The higher the frequency, the higher the strength of the tie (Granovetter, 1973). |
| | **Multiplexity** | Node with multiple roles within one tie (Tichy et al., 1979). The higher the number of roles, the higher the strength of the tie (Granovetter, 1973). |

Table 8. Ego-network: structure and composition characteristics

Structural holes appear when there is a lack of connection between two actors (Burt, 2000). This situation represents an opportunity for an actor to hold a brokerage position, controlling the diffusion of valuable resources in-between (Burt, 1984).The opposite situation occurs in a cluster, area characterised by higher number of connections between actors in comparison to the rest of the ego-network (Tichy et al., 1979). Actors that belong to several clusters, known as bridges, have the ability to bridge the specific available resources, activities and partnerships between clusters (Granovetter, 1983). Moving on to the composition, intensity refers to the frequency of interaction among a pair of actors, strengthening their connection the more frequent they are

(Granovetter, 1973, Tichy et al., 1979). Multiplexity takes place when an actor takes on multiple roles strengthening its connection with another actor (Granovetter, 1973, Tichy et al., 1979).

The second set of questions involves experience, opinion and knowledge questions about advanced services. Based on the theoretical framework (section 2.2), the enquiry looks at the value outcomes and value architecture building blocks – key activities, resources and partnerships – comprising the manufacturer's value capture process. In order to achieve an understanding of the phenomenological stance of the manufacturer, this set gives priority to experience and opinion questions as experienced in the extended embedded context.

In conclusion, the interview guide is planned to collect the data required to answer the research questions. The body of the interview is comprised of two main set of questions, based on the GSS and the theoretical framework of the study. The primary data collected through the semi-structured interviews is complemented with a secondary data source in the form of documentation as explained in the following section.

### 3.5.4 Secondary data source: documentation

Documentation involves a wide and heterogeneous variety of sources which have not been produced under specific request but are already constituted for the researcher to collect and use (Yin, 2014). For this study, the secondary data source is collected through official private documentation.

Documentation can reveal data in an unobtrusive and nonreactive nature, where the researcher is able to analyse the settings of the phenomenon and participants involved in the study without altering or influencing them (Marshall and Rossman, 2011). Scott (1990) differentiates between personal and official documentation, with the latest further divided into private and state, according to their authorship. Personal documentation has been produced by individuals and can include diaries, letters, autobiographies or visual objects (Scott, 1990). Private official documentation has been produced by entities and can include annual reports, advertisements, newsletters or organisational charts (Scott, 1990). State official documentation has been produced by governmental bodies and can include parliamentary debates, regulatory policies or laws (Scott, 1990).

The collection of documentation is widely extended across research fields. Personal documentation, for instance, is thoroughly used in the field of sociology due to their interest for researchers investigating individuals' traits, where written diaries may reveal unobserved behaviours during field work (Haldar and Wærdahl, 2009). Similarly, the use of official state policies appears as a relevant source of data in the field of politics, where regulatory bodies can constrain or facilitate action (Laver et al., 2003). Lastly, private official documentation is widely used in the field of business research, where company memos or annual reports provide

researchers with additional insights (Brown and Sarma, 2007). The relevancy and interest of each type vary according to the specific research questions.

For this study, a secondary data source in the form of private official documentation (section 3.6.2) is used as a form of triangulation of sources in order to remove possible irrelevancies in the operationalisation of findings generated by both data sources (Patton, 1990). Personal and official state documentation are not considered relevant as the research questions focus on manufacturers' subjective perspective at the organisational ego-network level. Consequently, the focus is placed on official private documentation from manufacturers. The triangulation is achieved using the secondary data to test the consistency of the primary data collected through interviews and to provide complementary information otherwise unavailable.

In conclusion, secondary data is sourced through documentation following triangulation, to develop converging lines of inquiry (Yin, 2014). According to the research questions, official private documentation is selected to obtain the required secondary data. The following section describes the research approach selected to guide the analysis completing the boundaries established to the data collection and analysis plan.

### 3.5.5 Data analysis plan: research approach

The research approach determines the underlying role that theory takes in the development of the data analysis process (Dubois and Gadde, 2002) influencing the design of the research method. Three main categories comprise the different research approaches used by researchers – deduction, induction and abduction. The paradigm and purpose of this research call for an abductive approach to the data analysis process.

Deduction takes place when theory appears to be the main point of reference, and the research evolves around specific theoretical hypothesis that are tested through empirical research (Dubois and Gadde, 2002). Induction takes data as the starting point to then elaborate on theoretical generalisations (Dubois and Gadde, 2002). Considering the exclusive nature of both approaches, some authors have argued the existence of abduction as a third option. According to Dubois and Gadde (2002), abduction is characterised by a research framework that is continuously confronted with the empirical world and reoriented accordingly.

In an abductive approach, the theoretical framework becomes both an input and an output of the research (Taylor, 2018). In other words, the framework provides an initial direction for the analysis but at the same time it is re-shaped according to the match and mismatch of the patterns found in the empirical data (Dubois and Gadde, 2002). As shown by Story et al. (2017), loose concepts extracted from literature are expanded through the empirical findings providing a better understanding of an underexplored issue in advanced services.

In this study, an abductive approach satisfies the constructivist and exploratory purpose of the research allowing for co-constructed interpretation through an ongoing adjustment of data collection through the insights emerging from data analysis (Eisenhardt, 1989). Thus, an abductive approach is selected to guide the data analysis process allowing to re-shape theoretical constructs through the interpretation of insights emerging from the empirical data (section 3.7).

The following sections describe the execution of the actions developed in the data collection and analysis processes.

## 3.6 Data collection process

The data collection process comprises the actions executed to obtain the required data to answer the research questions. It states the number of cases and informants recruited and explains how data was collected.

### 3.6.1 Number of cases and informants

This section discusses and provides a rationale for the case sample and informants recruited. This study counts with 12 cases and 18 informants from whom information is elicited to answer the research questions.

Each case was selected according to the inclusion criteria established in the sampling technique (section 3.4.3). Cases were selected according to the emergent theory from the data analysis process, in order to ensure that further cases would be likely to replicate the theoretical reflections from initial within-case findings. Qualitative research does not require large samples like quantitative research, as it seeks to understand subjective perceptions in a given environment rather than average or parametric distributions (Dana and Dana, 2005). Patton (2002: 245), for instance, argues that "the validity, meaningfulness, and insights generated from qualitative inquiry have more to do with the information-richness of the cases selected and the observational/analytical capabilities of the researcher than with sample size".

The selected cases resulted from the identification and recruitment of 8 cases comprising SMEs within and outside the UK as well as the recruitment of 4 cases from the established partnership with local SMEs of the researcher's Research Centre. All selected cases were included in the study and coded with alphabetic characters (note that the use of the character "I" was omitted to avoid confusion with the personal pronoun). The sequence of cases reflects the business background of the SMEs, where already established manufacturers introducing advanced services (Cases A-F) are followed by those introducing advanced services since inception (Cases G-M).

The decision to stop the inclusion of cases in this study was based on the trade-off between the richness of data achieved and the loss of depth experienced with additional cases. In other words,

the sample size of 12 cases allowed for a deep understanding of within-case meanings to elaborate rich value capture process and ego-network stories. At the same time, the 12 cases allowed to identify rich cross-case evidence for each category emerging in the analysis to elaborate on higher-level theoretical reflections from similar and contrasting insights.

Informants were recruited following their status as experts regarding specific know why and know how (section 3.4.4). The number of informants vary from one to two within each case, adding to a total of 18 (Table 9). The adequate number of informants in qualitative research has been discussed by various authors (e.g. Adler and Adler (2012) suggest a mean of 30; Mason (2010) points to 20 and 30; Guest et al. (2006) signal to 12) but this issue still remains uncertain where no clear adherence exists. As pointed out by Mason (2010), the number of informants becomes irrelevant as the quality of data is the measurement of its value. According to Bryman (2016), the crucial point is to have a clear justification on the adequacy of the number of informants to answer the specific research questions.

| Case | Informant/s role | Years in the business | Know why | Know how |
|---|---|---|---|---|
| A | Founder and Managing Director | 20 | Lead and development of advanced services | Implementation and decision making |
| B | Founder and Managing Director | 29 | Lead and development of advanced services | Implementation and decision making |
| C | Founder and Managing Director | 13 | Lead and development of advanced services project | Coordination and decision making |
| | Implementation Manager | 6 | Integration of advanced services project | Implementation and management |
| D | Head of Business Development | 11 | Development of advanced services partnerships | Relationship management and customisation of offering |
| E | Managing Director | 10 | Initiator of advanced services project | Coordination and decision making |
| | Advanced Services Manager | 1 | Lead and development of advanced services project | Coordination and commercialisation |
| F | Business Development and Export Manager | 15 | Lead and development of advanced services | Management and decision making |
| G | Founder and Chief Engineer | 18 | Initiator and development of the business idea | Business architecture and technical decision making |
| | Systems and Sustainability Engineer | 4 | Development of the business idea | Innovation and alignment across the business |
| H | Co-founder and Head of Design | 8 | Lead and expansion of advanced services | Product design and business growth |
| J | Partnership Manager | 1 | Management of advanced services partnerships | Education and awareness |
| K | Co-founder | 1 | Initiator and development of the business idea | Implementation and decision making |

| | | | | |
|---|---|---|---|---|
| | Co-founder | 1 | Initiator and development of the business idea | Implementation and decision making |
| L | Co-founder and CTO | 3 | Initiator and development of the business idea | Implementation and technical decision making |
| | Co-founder and CCO | 3 | Initiator and development of the business idea | Implementation and communication decision making |
| M | Co-founder and CEO | 2 | Initiator and development of the business idea | Implementation and product design decision making |
| | Co-founder and CTO | 2 | Development of the business idea | Implementation and technical decision making |

Table 9. Informant/s' role, know why and know how

For the purpose of this research, the required expert knowledge was mainly found in higher management positions. Being at the introduction stage of advanced services provision, not all employees in the organisation were involved in the advanced services side of the business. Consequently, the already small size of the cases was further reduced to the limited amount of informants who had the status of expert in advanced services (section 3.4.4). Appendix 2 provides additional examples from the literature to support the rationale behind a limited number of quality informants.

The innovativeness of advanced services implied a high degree of confidentiality. This situation limited the number of employees who had the required tacit knowledge about the specific advanced services goals and specific actions to answer RQ1 and RQ2. Consequently, most of the experts happen to be the founder or CEO and a high-level manager or business head leading the advanced services project. The recent creation of some of the organisations (e.g. Case J) and the recent introduction of advanced services in already established ones (e.g. Case E) explain the diversity in years in the business of some of the experts.

As dictated by the social constructivism paradigm, the understanding of the value capture process in the ego-network is based on partners as perceived and experienced by the manufacturer (ego) – known as cognitive networks (Marsden, 1990) – rather than on actually existing ones. This scenario limited the amount of employees who had the required information about the already established as well as potential partners to answer RQ3. Consequently, the partners that were under development, and yet to be made public at the moment of the interview, were only known by the founder or CEO leading advanced services.

In conclusion, 12 cases and 18 informants comprise the sample size and recruitment of informants of this study. The following section describes the actions developed during the data collection process in detail.

### 3.6.2 Primary and secondary data collection

Interviews (section 3.5.1) and documentation (section 3.5.4) are the sources from which data was collected to answer the research questions. The data collection process within each case started with the collection of public secondary data about the manufacturer in order to ensure its suitability for the research. A screening of the online sources available was also developed to obtain a preliminary overall idea of the manufacturer's business activity and advanced services. Once the informants within the organisation were recruited, the interview was developed and non-publicly available secondary data was collected. Additional public secondary data was further collected according to research needs.

The interviews lasted an average of 50 minutes, and they were developed either in person or via Skype at the convenience of the informant. Given the exploratory purpose of the research, the initial interview guide was tested through a pilot study (section 3.8). As a result, it was re-shaped from a two-step into a final one-step guide (section 3.5.3).

Interviews started with an introduction of the objective and motivation of the research to set the boundaries and remind the informant of the context of the discussion. Then, a set of more general questions was asked to facilitate the emergence of insights and allow the informant to familiarise with the topic of discussion. Background questions about the job role and years in the organisation as well as knowledge questions regarding the specific business activity and target market served to initiate the conversation. Once the informant felt comfortable talking about the topic, the body of the interview began with the GSS and advanced services sets of questions.

During the first set of questions, the GSS started with a *name generator* to elicit the names of organisations with whom the informant had business interactions in the previous six months. Simultaneously, a *name interpreter* was used to known about the frequency, relevance and content of such interactions, among others (Burt, 1984). As a bridge between both sets, opinion and knowledge questions on advanced services and value proposition served to move from the ego-network to the advanced services topic. During the second set of questions, informants were given freedom to point out and explain goals according to their particular perspective and expectations within the embedded ego-network. Questions were guided by the research framework, where specific building blocks terminology was used as a common wording familiar to the informants due to their expertise and managerial role.

The interviews concluded asking the informant if there was anything else they wanted to comment or highlight that was not covered during the interview. When applicable, non-publicly available documentation was also collected from the informant to further clarify and exemplify issues discussed during the interviews ensuring consistency of results. In order to ensure the rigour of

the information, each documentary reality was assessed according to the quality criteria developed by Scott (1990: 6) regarding:

1. Authenticity: Is the evidence genuine and of unquestionable origin?
2. Credibility: Is the evidence free from error and distortion?
3. Representativeness: Is the evidence typical of its kind, and, if not, is the extent of its untypicality known?
4. Meaning. Is the evidence clear and comprehensive?

Table 10 shows a summary of the documentation collected in each of the cases. Depending on the availability of quality secondary data, documentation vary across cases being publicly available digital documentation (e.g. official website) the only common source among them.

| **Private official documentation** | |
|---|---|
| **Case** | **Non-publicly available** |
| **A** | - SME updates on advanced services journey during Research Centre roundtables<br>- Case study on SME advanced services journey developed by Research Centre |
| **B** | - Strategic partners agreement and diagram internal document<br>- SME audio-visual file on advanced services roadmap and value proposition<br>- SME updates on advanced services journey during Research Centre roundtables<br>- Case study on SME advanced services journey developed by Research Centre |
| **D** | - SME audio-visual file on advanced services roadmap and value proposition<br>- SME updates on advanced services journey during Research Centre roundtables<br>- Case study on SME advanced services journey developed by Research Centre |
| **F** | - SME updates on advanced services journey during Research Centre roundtables<br>- Case study on SME advanced services journey developed by Research Centre |
| **G** | - Deliverable for funded project regarding advanced services – internal document |
| **H** | - Business case presentation at Masters' degree course |
| **L** | - Business case presentation during Research Centre workshop |
| **Case** | **Publicly available** |
| **A** | - SME official website |
| **B** | - SME official website<br>- Innovation showcase – SME audio-visual presentation<br>- Global Entrepreneurship Summit – SME audio-visual presentation<br>- Investment pitch |
| **C** | - SME official website<br>- Official advanced services project blog<br>- Corporate audio-visual content<br>- Press interviews with Founder<br>- Press release on Manufacturing Centre partnership |
| **D** | - SME official website<br>- Press releases on SME<br>- SME featuring in partner's website |

| | |
|---|---|
| **E** | - SME official website<br>- Press interviews with Managing Director<br>- Business award on professional management<br>- Innovation centre – Advanced services project audio-visual presentation<br>- Business association – SME audio-visual presentation |
| **F** | - SME official website |
| **G** | - SME official website<br>- Corporate audio-visual content<br>- Interviews with Founder<br>- Press releases on SME<br>- Sustainable vehicles audio-visual episode on SME<br>- Research papers featuring the SME<br>- Government funding and equity crowdfunding news |
| **H** | - SME official website<br>- Green, environmental and design awards<br>- Press releases on the SME<br>- Research paper featuring the SME |
| **J** | - SME official website<br>- Corporate audio-visual content<br>- Green competition participation<br>- Design competition award<br>- CE fast-pitch competition<br>- Press releases on the SME |
| **K** | - SME official website<br>- Corporate audio-visual content<br>- Co-founder official blog<br>- Circular fashion competition award |
| **L** | - SME official website<br>- Corporate audio-visual content<br>- Crowdfunding campaign<br>- Audio-visual SME presentation at technology trade fair |
| **M** | - SME official website<br>- CE Showcase<br>- Crowdfunding campaign<br>- CE fast-pitch competition<br>- Press releases on the SME |

Table 10. Secondary data collection by case

In conclusion, primary data was collected through interviews with informants where flexibility was prioritised in order to ensure the emergence of insights. According to the specific needs for further data and to ensure consistency of results, secondary data was judged and collected through publicly and non-publicly available documentation. The following section provides a description of the data analysis process developed to answer the research questions.

## 3.7 Data analysis process

The data analysis process comprises the actions executed to interpret the data collected to answer the research questions. The data analysis can be defined as the "process of examining and interpreting data in order to elicit meaning, gain understanding, and develop empirical knowledge" (Corbin and Strauss, 2008: 1). Qualitative research is characterised by a higher degree of interpretation where strict quantitative processes are substituted by the flexibility of multiple available techniques (i.e. pattern searching in case studies (Creswell, 2013); phenomenological reduction in phenomenology (Giorgi, 1994); axial coding in grounded theory (Strauss and Corbin, 1990)). Independently of the process selected, there is a need to ensure that the analysis is developed with the same rigour as quantitative studies (Strauss and Corbin, 1990).

The analysis of the present study is developed through an interpretive and iterative process in order to construct the knowledge required to answer the research questions. Informed by the 4 stages comprising the systematic constant comparative method (Glaser and Strauss, 2008) and the 6 stages comprising the thematic analysis of qualitative data (Bryman, 2016), this study's analysis process is divided in 3 main steps (Table 11). Each step addresses the preparation of data for the analysis, the reduction of data and identification of connections, and the presentation of data with visuals and descriptions.

| Steps | Stages | Actions and tools |
|---|---|---|
| Preparing and organising the data for analysis | Stage 1. Note taking during data collection | Action: Reflective notes<br>Tool: Analytic Memos (all stages) |
| | Stage 2. Transcription and secondary data compilation | Action: Marking texts<br>Tool: Express Scribe Transcription Software |
| Reducing the data and identifying connections | Stage 3. Begin the coding process | Action: Within-case reading<br>Action: Open coding<br>Tool: QSR NVivo 12 (all coding)<br>Tool: Ego-network diagram |
| | Stage 4. Identify themes | Action: Axial coding<br>Action: Within-case, cross-case and theoretical framework comparisons<br>Tool: Within- and cross-case summary tables |
| | Stage 5. Identify connections between themes | Action: Selective coding<br>Action: Within-case, cross-case and theoretical framework comparisons<br>Tool: Conceptually clustered matrix<br>Tool: Content analytic summary table |
| Presenting the data | Stage 6. Presentation of findings | Action: Answering RQs<br>Tool: Content analytic summary table<br>Tool: Ego-network diagram<br>Tool: Conceptually clustered matrix |

Table 11. Data analysis process: steps, stages, actions and tools

Consistent with the abductive approach of this study (section 3.5.5), the analysis was developed through an iterative and interrelated process where data was contrasted and compared within and across cases as well as with the theoretical framework of the study (section 2.4.1). The data collection was informed by the insights obtained from the analysis and stages run simultaneously until the process was terminated. In order to provide a robust and rigorous multiple-case logic (Eisenhardt, 1991), the following sections explain each of the steps in detail, describing the actions developed and the tools used to satisfy them.

### 3.7.1 Preparing and organising the data for analysis

The first step of the process comprises the preparation of the data for its adequate analysis. The researcher's goal is to get familiar with the data and to start the thinking process already during the collection of data. Two main stages are distinguished:

- Stage 1. Note taking during data collection

The first stage took place in parallel with the data collection process. Note taking during data collection was performed to keep track of the researcher's reflections during interviews with regards to specific details or pieces of information. These reflections comprised the opening of analytic memos for each of the cases. Analytic memos comprise the reflective thoughts of researchers regarding the analysis of data which act as a way to release the researcher from conflicting thoughts and contain the initial insights (Glaser and Strauss, 2008).

Analytic memos can include any type of information that the researcher considers relevant at any point in time during the analysis. In this study, the development of analytic memos continued throughout all the stages, in which the researcher annotated a variety of information, from vague thoughts on relationships to specific examples of codes and themes.

- Stage 2. Transcription and secondary data compilation

For each case, interviews were transcribed and all secondary data was compiled in order to move to the reduction of data into themes. Part of the transcription of interviews was done by the researcher through the software tool *Express Scribe Transcription Software* in combination with a transcription pedal, and part was developed by a professional transcription company with prestige within the field of academic research (section 3.9).

During this stage, the researcher got more familiar with the data, marking texts along the process. Both tag marks and value marks were used to facilitate finding specific text for later retrieval and to point where specific figures (e.g. number of employees) and names (e.g. MNC partner) were provided, respectively (Denzin and Lincoln, 2003). The following step comprises the coding process developed during the reduction and identification of connections in data.

### 3.7.2 Reducing the data and identifying connections

The second step of the analysis process comprises the reduction of data into themes and the identification of connections across them. The researcher's goal is to illustrate broad units of information through a common idea made of several aggregated codes (Creswell, 2013). Three main stages are distinguished:

- Stage 3. Begin the coding process

This stage denoted the start of the coding process, in which the researcher thoroughly read and re-read the data of the specific case while coding pieces of information. The coding process throughout the analysis was developed using the *QSR NVivo 12* software. The interpretation of data requires an important creative component where the researcher needs to make decisions about what properties to focus on and which meaning is given to data (Suddaby, 2006). For the purpose of this research, the coding process was approached in a flexible manner to avoid restraining insights from the data.

Open coding was used within each case, where codes emerged solely from the interpretation of raw data. Open coding can be described as labelling phenomena, where an observation, a sentence, a paragraph is given a name that represents the phenomenon (Strauss and Corbin, 1990). Open coding was used in interviews, where sentences were coded under a concept or group of concepts that contained the meaning of that particular data.

The flexibility of open coding provided the researcher with an initial sense of the data within each of the cases. Ego-network diagrams were also developed at this stage to achieve an understanding of the main actors and relationships within each case (Chapter 5). In essence, meaning making was based solely in the interpretation of information within the context of the specific case. Moving on to the following stage, iterations across cases and theory provided the higher degree of abstraction required to aggregate codes and identify themes.

- Stage 4. Identify themes

This stage grouped the codes generated in the previous stage into higher-level categories of codes sharing the same properties and categories into broader themes. As stated by Glaser and Strauss (2008: 109), the analysis develops "as different categories and their properties tend to become integrated through constant comparisons that force the analyst to make some related theoretical sense of each comparison". The open coding process within-cases evolved into an axial coding process of comparisons across cases and references to the theoretical framework of the study (section 2.4.1).

Axial coding reshapes open coding by putting data back together in new ways through the further refinement of codes into categories and subcategories (Strauss and Corbin, 1990). At this stage,

the literature can challenge the researcher's ability to see beyond established concepts, but if used for comparative purposes, it can support the identification of properties of concepts leading to a better understanding of data (Corbin and Strauss, 2008). As pointed out by Baxter and Jack (2008), one of the challenges of the analysis is to treat data independently rather than considering the overall case.

For this study, the theoretical framework was used to identify the broader aggregate dimensions in the analysis ensuring the coherence in the interpretation of text in relation to its parts. Concepts from the theoretical framework were used in an abductive manner to further elicit the merge of knowledge and refinement of categories. Continuous iterations and reduction of data allowed for a more focused analysis of new cases.

An important aspect during this stage was to maintain a balance between the specific data available in each case and the higher-level interpretation required beyond specific cases. Continuous revision of analytic memos, development of within- and cross-case tables helped achieving a holistic story line to the emergent insights. For instance, Table 12 portrays a within-case table for Case C open coding, where quotes from the interview ground the interpretation in its specific context.

| | **Open coding** | **Quote** |
|---|---|---|
| **Case C** | Pilot 20 bikes | *"it will be a stepped sort of phased introduction […] the first 20 or so bikes"* |
| | Early adopters | *"I've got a list that's maybe 3,000 strong, with people that are specifically interested."* |
| | Innovative advanced services | *"And we differ from quite a few businesses in the cycle industry […] the bike we've developed is quite different in specification to our current range which we sell to people "* |
| | Feedback | *"get good feedback quite quickly about how they're coping with them and how they are to live with."* |
| | Continuous improvements | *"understand what might go wrong or what might need to be adjusted so we can address that for future design iterations, so it takes us closer to our goal of having a hassle free bike"* |
| | Customers' usage | *"begin to understand how the bike is affected by usage and inform our future servicing here because a big part of it is the refurbishment of the bike when it comes back before it goes to the next customer."* |

Table 12. Example of within-case open coding for Case C

Refinement from within-case codes to broader cross-case categories through constant comparisons continued until the reduction of codes merge into the final number of categories and themes reflecting the scope of the study (refer to Appendix 3 for full list of final themes and categories). Moving on to the following stage, the constant comparison allowed the identification of patterns across cases connecting themes and categories.

- Stage 5. Identify connections between themes

Connections emerged and evolved along the analysis motivated by the constant comparison of data between cases. The axial coding of the previous stage evolved into a selective coding process focused in building a coherent story around the main themes in the data.

Selective coding focuses on specific categories and identifies their interrelationships as a way of articulating the knowledge acquired during the analysis (Creswell, 2013). Connections emerged both at the specific case and at the phenomenon level. Conceptually clustered matrix – simple representation of pieces of information that belong together (Miles and Huberman, 1994) – and content analytic summary tables – representation that classifies characteristics of different cases (Miles and Huberman, 1994) – comprise the main visual tools used in the understanding of connections.

Some connections were first identified within cases and further extrapolated to the wider context of the phenomenon through the cross-case comparisons. For instance, the partner supporting the manufacturer's value capture process (RQ3) was directly linked with the manufacturer's specific internal and external need for collaboration (RQ2) within each of the cases. Table 13 shows the conceptually clustered matrix designed to understand how Case H's specific key partnerships in the value capture process where related to the need for collaboration to develop problem-solving activities.

| **Case H** | | | |
|---|---|---|---|
| **Key activity: Problem-solving** | | | |
| **External need** | **Quote** | **Key partnership** | **Quote** |
| Industry mindset | *"the biggest problem so everything is moving really slow."*<br>*"they are so fixed to the idea that yeah, this is how it was and it works quite okay and I don't see the benefits for our company, so they decide to postpone or then just don't see that it's important for them. And of course, yeah, yeah, it might be a cultural thing that like the sustainable thinking has not reached every company."* | Optimisation and economies of scale<br>Resource optimisation by leveraging on the partnership with a big construction company. Having the big construction company as a partnership can help Case H to efficiently access such cluster of sub-contractors. | *"So we have a long period relationship with some bigger construction company. […] they are not the ones who actually create the disposable packages, those are their sub-contractors which provide the windows and doors and any other construction element on the construction site. So through these construction companies we can get our hands to their, like suppliers and they can force their suppliers to use reusable solutions so this is what we aim at right now."* |
| Newness to the industry | *"So we've just been doing like cold calls to the companies that we assume might benefit most from this. And this has been quite difficult because we don't have that good insight what is happening. We have* | Reduction of risk and uncertainty<br>Using Parent Case H to find and target companies | *"[…] so we want to combine that to the old original [Case H] somehow because it's a good name of course and we want to be, of course, part of that and […] it makes us, it does work having that name famous so we* |

| | | | |
|---|---|---|---|
| | *been calling to many kind of companies"*<br>*"it's very frustrating to talk to people who are not a bit interested about sustainability"* | | *get like a double effect on that, doing it, yeah."* |

Table 13. Example of conceptually clustered matrix for Case H

Other connections were identified once enough cross-case data was available. For instance, the relevance of partners' ego-network position (RQ3) in manufacturer's development of certain actions (RQ2) was only identified through the occurrence of the same event across several contexts. Table 14 shows an excerpt of the content analytic summary table designed to compare the characteristic of a bridge position in manufacturers' partners across cases.

| Key partnership | Case | Bridge position quotes |
|---|---|---|
| Industry MNC | Case A | *"that you do one particular food line and then there are extra production lines in the same company or there's a whole load of different sites. […] value will be larger. For example you can supply whole conveys of UV lights as part of a process"* |
| | Case D | *"maybe 65% of our customers are automotive now and that's generally down to [automotive MNC] because a lot of them are in [automotive MNC]'s supply chain and that got us stuff."* |
| | Case H | *"So we have a long period relationship with some bigger construction company. […] So through these construction companies we can get our hands to their, like suppliers and they can force their suppliers to use reusable solutions so this is what we aim at right now."* |
| Funding body | Case B | *"So basically what we are doing now in the UK, we have this new project which brings together a consortium of 13 entities in India and the UK. Funded by [UK public funding body] and [India public funding body]. It gives us the opportunity to build a pilot mill […] Because we are fundamentally building a communal trust. And the [UK public funding body] project has been incredibly useful for this bonding, trusting."* |
| | Case C | *"So we've got an ongoing project, so through [UK public funding body] we are connected with the [University manufacturing group] and we carried out, we collaboratively carried out a materials project."* |
| Cross-industry partnership | Case C | *"it's also kind of a gateway to a network of businesses in the area, so different engineering companies with expertise in all sorts of areas. So in the future when we start to tackle like certain components, it might be we need to have a casting or a forging of a part, there's a resource that we can go to, to find someone, you know, locally that could do it for us."* |
| | Case E | *"Yes, it can also lead to the entrance of different customers. I mean, […] it can help to provide access to certain organisations."* |
| Academia | Case F | *"I do a lot of networking and I was part of [University]'s growth program and through that you meet a lot of people and I believe that that is how I got the invitation to go to a workshop explaining what applied services is all about."* |
| | Case L | *"we've got the other potential project with [University]. […] yeah, so that's an [European funding body], for the time being, funded project in healthcare. […] And it just turned out that we were like, well, that sounds like a nice thing to do. Let's do that, because it's worthwhile, probably do some development off the back of it, be able to share our findings and, you know, be further involved in the community."* |

Table 14. Example of content analytic summary table for "bridge position" category

The cross-case comparisons provided the researcher with a better understanding and reliance on interpretations as data collected from new cases confirmed the already established connections. Only those connections observed across most cases were retained in order to ensure the uniformity of the emergent knowledge (Eisenhardt and Graebner, 2007). The following and last step of the analysis explains the presentation of knowledge that emerged from the process.

### 3.7.3 Presenting the data

The last step of the analysis comprises the presentation of the knowledge acquired during the process. The researcher's goal is not to elicit truth statements about reality, but to achieve an understanding of relationship patterns and how such relationships construct reality (Suddaby, 2006). Two main stages are distinguished:

- Stage 6. Presentation of data

The presentation of data posed the challenge of deciding how to best address the need to answer the research questions without compromising the compelling in-depth knowledge acquired during the analysis. According to Creswell (2013), the presentation of qualitative insights can assume various forms, from narrative statements to visual pictures and a series of propositions. For this study, a description of cases, narrative within-case stories and a cross-case structure by sections were selected to present the insights from the analysis.

The description of cases (Chapter 4) grounded the data in its overall context, where the main company background and advanced services characteristics of each manufacturer were presented. The description of cases comprises the basic information required for the understanding of the detailed within-case presentation.

Deeper insights were provided through value capture and ego-network within-case narrative stories (Chapter 5). The value capture narrative story was described based on the themes and sub-themes identified in the analysis (Appendix 3). The story was illustrated in a conceptually clustered matrix at the beginning of each case's narrative. The storyline flows through the themes explaining the value capture process. The v*alue outcomes* and *key activities* deployed to capture them are introduced first. A description of the sub-theme *need for collaboration*, classified as *internal* if the manufacturer requires support regarding availability of *key resources* – physical, intellectual, financial and human – and as *external* if the manufacturer requires support due to a circumstance beyond its organisational boundaries, highlights the collaborative nature of the value capture process. This sub-theme acted as the link in the story to introduce the last theme, *key partnerships*.

The ego-network narrative story was described based on the *ego-network* theme identified in the analysis. The ego-network diagram was used to illustrate the main actors and relationships as

nominated by each of the cases. The storyline flows from *structure* to *composition* sub-themes highlighting their presence in manufacturers' ego-networks as follows.

*Intensity* addresses the frequency and nature of interactions between the manufacturer and specific partners. Intensity is classified across cases as *relational* – interactions take place regularly and/or involve a collaborative exchange – or as *transactional* – interactions occur occasionally and/or do not involve a collaborative exchange –. *Multiplexity* of roles highlight those partners which have multiple roles in the manufacturer's ego-network, where the more roles they have the strongest the partner becomes for the manufacturer.

*Structural holes* address the lack of connection between the manufacturer and another actor or between partners within the ego-network. *Brokerage* positions highlight those actors that have an advantageous position by controlling the flow of non-redundant resources between both ends of a structural hole. *Clusters* address the presence of a high number of connections between actors in comparison to other areas of the ego-network, involving the manufacturer or a partner or group of partners. *Bridge* positions highlight those actors that form part of several clusters, inside or outside the ego-network.

The insights provided through within-case stories comprise the context-specific knowledge required for the understanding of the higher-level cross-case presentation.

Informed by Eisenhardt and Graebner (2007), the cross-case presentation of data was made in three sections corresponding to the research questions (Chapter 6). Each research question was presented through the comparison of main categories and sub-categories identified in the analysis (Appendix 5). The connections identified in the analysis were highlighted and summarised in a content analytic table at the start of each section.

The first section reports the forms of value emerging for manufacturers introducing advanced services in the market classified according to the *strategic*, *knowledge*, *economic* and *personal* categories. The second section reports the collaborative actions taken by manufacturers classified according to the *production*, *problem-solving* and *platform* categories and *internal* and *external* need for support categories. The third section reports the impact of partners in the manufacturer's value capture process according to their *integration*, *risk reduction* and *efficiency* role categories and ego-network *structure* and *composition* categories.

At the end of each of the sections, and in line with Eisenhardt and Graebner (2007), only those insights replicated across most of the cases were retained to answer the research questions. Consequently, most evidenced insights were summarised into a few statements and illustrated in a conceptually clustered matrix showcasing the lessons learned from the study (Lincoln and Guba, 1985).

To conclude, the analysis of primary and secondary data was developed simultaneously to the data collection process allowing for the re-shape of the latest one. The data analysis process was developed across 3 interpretive and iterative steps comprising the preparation of data for the analysis, the reduction of data and identification of connections, and the presentation of data with visuals and descriptions. The final step led to the statements answering the research questions.

## 3.8 Pilot study

A pilot study comprises a feasibility study where part of a full study, a trial of methodology, or a section of anticipated research is tested to guide the future research plan (Kim, 2010). A pilot study is not meant to produce results, but to allow researchers to identify pitfalls and make the appropriate adjustments before running the actual research strategy. The exploratory purpose of this study increases the uncertainty regarding the appropriateness of the research method. For this study, a pilot was developed to test and review the research method.

Depending on the type of research, pilot studies can be developed and analysed separate to the main study, known as external pilots, or they can also contribute to the final analysis, known as internal pilots (Arain et al., 2010). The pilot was designed to be internal unless major challenges were identified, and given the positive outcomes and the valuable data collected, the pilot was included as part of the main study, comprising Case A. The implementation of a pilot study can provide researchers with several advantages, such as, identifying barriers to participant recruitment, finding whether data collection instruments may be inappropriate, warning about difficulties to follow research protocols or reflecting on the researcher's ability to conduct data collection (Arain et al., 2010, Kim, 2010, van Teijlingen and Hundley, 2001). The following section explains how the pilot improved the accuracy and confidence in the research method.

### 3.8.1 Pilot study: implications

The goal of the pilot was two-fold, 1) to ensure the appropriateness of the interview guide 2) to confirm the boundaries of the unit of analysis. As a result, the pilot helped to redefine the interview guide and positively reinforced the focus and selected boundaries to the phenomenon under study.

The interview guide was initially designed into two steps, where questions regarding the ego-network and those regarding advanced services were meant to be asked at two different moments in time to avoid an excessively long single interview. The structure and content of questions proved to obtain the required information but the pilot suggested that developing the interview at one moment in time would be more efficient and effective, and thus, the interview timeline was re-designed as one-step guide:

- Increased efficiency: during the course of the ego-network set of questions, the informant already provided information regarding the relevance of partners for advanced services. Such information already answered some of the questions planned for the second interview. Consequently, it was decided that in order to leverage on such information in a timely (i.e. follow-up questions) and consequent (i.e. avoid repetition) manner, all questions should be asked in one interview.
- Increased effectiveness: following a one-step guide also favoured the ability to obtain more accurate and additional information on current and potential partners. As pointed out by Marsden (1990), people are unable to accurately report on specific transactions, but they can recall and report on their usual social relations. During the pilot, advanced services questions allowed for additional *name interpreter* data about partners that were not elicited during the ego-network questions but recalled during the second set of questions.

The pilot confirmed the appropriateness of the selected unit of analysis through the introduction of SNA in the context of advanced services. The sampling unit, unit of observation and modelling unit boundaries were proven to successfully delimit the data collection and analysis without compromising the exploratory purpose of the research. The results of the pilot study were published as a conference paper further increasing the confidence on the research method choices:

- Increased confidence: The results of the pilot study were published and presented at the 25th Annual EuROMA 2018 Conference in Budapest, Hungary (Garcia Martin et al., 2018).

In conclusion, the pilot was useful to increase the efficiency, effectiveness and confidence on the research method, which in turn helped to improve the credibility of the findings. The following section addressed the research ethics describing the management and storage of data.

## 3.9 Data management and storage

Given the variety of informants and types of information gathered, data required specific handling in order to ensure the confidentiality and safety of the content. This section discusses the procedure followed for the management and storage of data.

The high personal and interpersonal character of qualitative inquiry, especially interviews where individuals can disclose things they never intended to tell, requires a strong ethical framework that deals with its intrusive nature (Patton, 2002). Ethical approval for this research was obtained from the ABS Research Ethics Committee of Aston University dated 10th November 2017, on the basis described in the *Application Form*, *Protocol* and supporting documentation, including *Participant Information Letter*, *Consent Form* and *Sample Interview Questions*. Conditional of

ethical approval is the protection of informants' welfare throughout their participation, which was ensured through the procedures regarding awareness, consent, confidentiality and anonymity as follows.

Participation requires informed consent which can only be obtained after individuals have been thoroughly and truthfully made aware of the research. Thus, researchers need to explicitly inform individuals, in full details and in terms familiar to them, what the research is about, who is developing it, why it is being developed, how it is to be used and how it is being funded (Bryman, 2016). In the case of primary data, each informant was first approached with a short statement delineating the basic objective of the research as well as the form in which data is collected, offering further information upon request. Upon informant's agreement, the *Participant Information Letter* (Appendix 4) and *Consent Form* (Appendix 5) were sent together with a follow-up message to set up a date and time for the interview.

On the day of the interview, the informant was reminded about participant right to remain anonymous and to withdraw at any point in time, about the research focus and the interview purpose and was allowed to ask any remaining doubts about the process. After the interview, the informant was asked to agree on being contacted again for further data collection. In the case of secondary data, following Hewson et al. (2003), available digital data in the public Internet domain was used without informed consent ensuring that anonymity of informants is protected. On the other hand, verbal consent was obtained for the use of internal private documents provided by informants during or after the interview under the same conditions as primary data.

Confidentiality must be ensured in order to protect individuals from harm (Baez, 2002). Individuals were informed about the strictly confidential nature of their participation in the study in the *Participant Information Letter*. The aim of the duty of confidentiality is to avoid that any sensitive information is disclosed or used for any other purposes, unless authorised, than those agreed in verbal or written form for the research (Corti et al., 2000). In the case of network research, this duty extends to the information collected about third parties and researchers are also obligated to protect them against harm (Marsden, 2011). The study and data collection process was approved by the University Research Ethics Committee of Aston University, ensuring that data is electronically stored under password-protected files and retained for a period of ten years after the completion of the study in accordance with the University's policy on Academic Integrity. During the data analysis process, part of the interviews were transcribed by a professional transcription company with prestige within the field of academic research. A separate confidential agreement was signed with the company to ensure the compliance with the University's ethical approval.

Anonymity must be ensured in order to protect individuals' privacy (Baez, 2002). The aim of anonymisation is to disguise the identity of individuals, which may require the anonymisation of towns, company names, brands and any other data that could potentially reveal their identity (Corti et al., 2000). Each case was coded with alphabetic characters (i.e. Case A, Case B) and named according to their generic business activity (i.e. Disinfection light solutions). Informants were coded according to their role in the organisation (i.e. Founder) and each actor within the ego-network was coded according to the general role they had in relation to the manufacturer (i.e. Component supplier). Additionally, the *Informed Consent* provided the right to use anonymised quotes in publications.

In conclusion, all data collected and processed for the purpose of this research was managed and stored under ethical compliance granted by the ABS Research Ethics Committee of Aston University. The following section describes the set of actions that were taken in order to further ensure the rigour and quality of the study.

## 3.10 Rigour and quality of the research

Rigour and quality are the characteristics used to judge the goodness of scientific research, assessing both the plan and process as well as the outcome (Lincoln and Guba, 1988). Rigour refers to the integrity deployed conducting a study based on researchers' actions during its design and development (Noble and Smith, 2015). Quality refers to the relevancy and usefulness of the study based on researchers' actions to enhance the credibility of findings (Morse et al., 2002). The appropriateness of a specific judgement criteria is directly dependent on the study' underlying philosophical paradigm and research method. The higher the degree of interpretation of evidence in shaping the meaning of data, the higher the difficulty to assess the rigour and quality of the research. Consequently, there is a lack of consensus regarding the most adequate criteria to judge qualitative research in comparison to the established quantitative criteria.

Validity and reliability are commonly used criteria to judge the rigour and quality of quantitative research (Wasserman and Faust, 1994). Some authors have claimed its incompatibility with qualitative research (Lincoln and Guba, 1988, Yardley, 2000), whereas others have argued the need to adapt the criteria (Morse et al., 2002). For this study, the social constructivism paradigm assumes that findings are a product of the interaction between data and the researcher, where no unique reality exists but multiple and complex ones (Creswell and Miller, 2000). The incompatibility with the exactness of quantitative criteria requires an alternative judgement of the rigour and quality of this study.

Table 15 provides a summary of the rigour and quality criteria based on Morse et al. (2002), Fereday and Muir-Cochrane (2006) and Lincoln and Guba (1988) adaptations to qualitative research and the actions taken to ensure this study's compliance.

| | Criterion | Definition | Actions |
|---|---|---|---|
| **Rigour** | Logical consistency | Sound reasoning and appropriate method | Published theoretical framework<br>Transparent analysis process stages |
| | Sample appropriateness | Efficient and effective saturation of categories | Purposive theoretical sampling<br>Expert informant |
| | Subjective interpretation | Preserving participants' voice | Several sources of evidence<br>Quotations |
| | Adequacy | Consistency between data and findings | Informant validation<br>Independent validation<br>Case study database |
| **Quality** | Direct application | Practitioners as critics of research findings | Published conference and journal papers |
| | Actionability | Empowering action on the bases of findings | Managerial and theoretical contributions |
| | Transferability | Empowering inferences to similar contexts | Thick, rich description |

Table 15. Rigour and quality: criteria and actions

### 3.10.1 Rigour of the research plan and process

The rigour of the research plan and process is judged against its logical consistency, sample appropriateness, subjective interpretation and adequacy.

Logical consistency refers to the need of logically justifying the choice of methods and reasoning made to arrive to the findings (Fereday and Muir-Cochrane, 2006). In other words, it tries to establish if the research plan and process is well rounded and sustained to be compelling enough. This study's literature review has been published demonstrating the robustness of the theoretical framework upon which the multiple-case study is based (refer to Garcia Martin et al. (2019)). The step-by-step process described in the analysis of data (section 3.7) shows the transparency of how themes and categories have been identified from informants' data providing a compelling process.

Sample appropriateness occurs when the sample size allows efficient and effective saturation of categories. In other words, a sample is appropriate when it allows to collect sufficient data to ensure that all aspects of the phenomenon under study have been taken into account (Morse et al., 2002). This study's purposive theoretical sampling technique provided the required flexibility to adjust the data collection according to the emerging insights from the data analysis. Consequently, categories from the theory in progress were saturated with the inclusion of consistent and disconfirming cases ensuring the understanding of reality from all possible lenses (Creswell and Miller, 2000). The recruitment of expert informants ensured that data was only collected from those individuals who could best answer the interview questions further increasing the integrity of the process.

Subjective interpretation refers to the need of demonstrating that categories and relationships reflect the subjective informants' points of view (Fereday and Muir-Cochrane, 2006). In other words, it tries to establish that what is portrayed in the study accurately corresponds with reality. As pointed out by Darke et al. (1998), the use of several sources of data strengthens case study findings through the convergence of multiple evidence regarding specific properties. This study's collection of data comprises both primary and secondary sources which were used to compare meanings and to clarify constructs. Quotations from interviews further demonstrate how the interpretation of data reflects informants' own words.

Lastly, adequacy refers to the consistency between findings and common-sense experience (Fereday and Muir-Cochrane, 2006). In other words, it tries to ensure that findings are consistent with the study's context, providing enough rigour to be applied by practitioners. This criterion has been addressed through informant validation, where case descriptions and within-case analysis were sent to the participants in the study to ensure that their business context has been understood correctly (Bryman, 2016). Also, the research has been evaluated and corroborated by the independent and professional view of three academics. A trail of evidence in the form of a case study database, comprising all the raw information, documents and notes collected for each case, has also been developed to explicitly demonstrate the foundations and trustworthiness of findings (Darke et al., 1998).

### 3.10.2 Quality of the research product

The quality of the research outcome is judged against its direct application, actionability and transferability.

Direct application refers to the credibility achieved when practitioners use the knowledge generated from the research (Fereday and Muir-Cochrane, 2006). Two main conference papers have been published and presented regarding the knowledge generated with this study (Garcia Martin et al., 2017, Garcia Martin et al., 2018) as well as a journal publication in the ABS 3 listed Journal of Business Research (Garcia Martin et al., 2019). Further publications and dissemination of both findings and contributions is under development to ensure the maximum diffusion and access of knowledge to practitioners and the public in general.

Actionability refers to the ability of findings to evoke those who are directly or indirectly affected by the study to take action within their own environment (Lincoln and Guba, 1988). In order to address the actionability of findings, the study's contributions to theory and implications for practice (sections 8.2 and 8.3) state not only what has been found but the steps that can be taken by researchers and practitioners.

Lastly, transferability refers to the ability of the research to foster inferences to other contexts (Lincoln and Guba, 1988). In order to address the transferability, the study provides thick and rich

descriptions of the research and theoretical background as well as of each of the cases. The research questions and answers use a terminology that reflects the views of participants as well as the business context in which the research is embedded.

In conclusion, the rigour and quality of this study is judged based on the adaptation of qualitative research criteria. The study's compliance with logical consistency, sample appropriateness, subjective interpretation and adequacy ensures the rigour of the research plan and process. The study's compliance with direct application, actionability and transferability ensures the quality of the research product.

## 3.11 Summary

This chapter has explained and justified the research method selected to satisfy the research questions. The chapter evolved from an introduction to the research methodology guiding the design and development of the research method to a detailed description of the boundaries and actions taken to answer the research questions.

The research methodology describes the set of underlying assumptions that guide the design and development of the research method. Social constructivism is identified as the philosophical paradigm shaping the researcher's view of the world. The exploratory purpose of the study guides the establishment of boundaries to the phenomenon under study and the data required to discover new insights rather than confirming existing knowledge.

The research method explains the steps setting the boundaries and actions required to answer the research questions. This study follows a cross-sectional multiple case study formed by 12 cases and 18 informants. The data collection follows triangulation of sources through primary data and secondary data, in the form of interviews and documentation, respectively. The analysis is guided by an abductive approach and follows 3 interpretive and iterative steps comprising the preparation of data for the analysis, the reduction of data and identification of connections, and the presentation of data with visuals and descriptions. A pilot study served to confirm the robustness of the research method.

Confidentiality and safety of data management and storage as well as protection of informants' welfare throughout their participation is ensured through the Ethical approval granted by the ABS Research Ethics Committee of Aston University. Lastly, specific criteria is used to judge the goodness of scientific research demonstrating the rigour and quality of the qualitative research. The rigour of the research plan and process is ensured through compliance with logical consistency, sample appropriateness, subjective interpretation and adequacy. The quality of the research product is ensured through compliance with direct application, actionability and transferability.

# CHAPTER 4. CASE DESCRIPTIONS

This chapter introduces each of the case studies comprised by a manufacturing SME and its ego-network. According with the sampling criteria (section 3.4.3), SMEs belong to the manufacturing industry and are at the introduction stage of advanced services provision (Table 16). Each case description presents the company background information and a contextualisation of advanced services.

## 4.1 Case A: Disinfection light solutions

Case A is comprised by a light equipment solutions manufacturing SME and its ego-network. The SME can be classified as a micro enterprise composed of 9 employees and is based in the United Kingdom. The SME has three main distinctive solutions operating in the following industries: curing solution in the automotive industry; fluorescent inspection solution in the aerospace and automotive industries; and disinfection offering in the health industry. It operates mainly in the UK, counting with 20% exports, being half of them within Europe but also within the US and Australia.

Regarding advanced services, the motivation underlying the transformation is to make the business more valuable through long-term contracts instead of relying in continuous transactional product sales. Besides, the SME is building the advanced services offering around an already existing service culture and competitive advantage based on the organisation's health and safety technology and knowledge. To do so, rather than converting existing customers, the SME is at the stage of piloting advanced services in the food industry where the aim is to provide the capability of disinfecting food lines through a remote monitoring usage-based offering.

## 4.2 Case B: Rice milling solutions

Case B is comprised by a milling equipment solutions SME and its ego-network. The SME can be classified as a micro enterprise composed of 4 employees and is based in the United Kingdom. It operates in the rice industry where millers are its main customers. China, India and Brazil represent its biggest markets, whereas the UK stands out within Europe.

Regarding advanced services, the motivation underlying the transformation arises as an extension of the SME's service culture of helping and supporting the customer. The SME is at the stage of piloting the advanced services offering in the rice industry, trying to overcome their aversion to new technologies assuming the capital risks and technology responsibility through long-term contracts. The SME's value proposition is based on efficiency and advanced services are built around remote motoring and predictive maintenance offering.

| Case description | | | | | |
|---|---|---|---|---|---|
| **Case** | **Size** | **Location** | **Manufacturing industry** | **Advanced services offering** | **Introduction stage of advanced services provision** |
| A | 9 | UK | Light equipment | Remote monitoring usage-based disinfection solutions | Piloting the advanced services offering |
| B | 4 | UK | Rice milling machines | Remote motoring and predictive maintenance usage-based solutions | Piloting the advanced services offering |
| C | 40 | UK | Cycling | Hassle free biking experience | Piloting the advanced services offering |
| D | 125 | UK | Transit Packaging | Fully bespoke and customised packaging solutions | Transforming current customers into initial advanced services partnerships |
| E | 25 | ES | Industrial Sensors | Predictive maintenance, efficiency and quality management platform | Transforming current customers into initial advanced services partnerships |
| F | 18 | UK | Commercial blinds | Integrated disposable curtains' installation and replacement solutions | Piloting the advanced services offering |
| G | 25 | UK | Automotive | Reliable and convenient personal mobility experience | Piloting the advanced services offering & Developing a circular value network |
| H | 2 | FI | Commercial packaging | Closed-loop re-usable packaging solutions | Building an initial customer base |
| J | 13 | CZ | Food packaging | Re-usable food storage and management modular platform | Piloting the advanced services offering |
| K | 4 | UK | Promotion and marketing materials | Re-usable promotion and marketing materials distributed platform | Piloting the advanced services offering |
| L | 2 | UK | Wearables | Integrated digital system experience | Building an initial customer base |
| M | 3 | US | Ecommerce packaging | Closed loop re-usable e-commerce packaging solution with a built-in platform-based technology | Start growing the business |

Table 16. Case descriptions: Company and advanced services characteristics

## 4.3 Case C: Premium cycling equipment

Case C is comprised by a premium cycling equipment SME and its ego-network. The SME can be classified as a small enterprise composed of 40 employees and is based in the United Kingdom. The SME specialises in premium bicycles for children, with five different lines each covering a wide range of ages and purposes. It also offers four bicycle lines for adults and older people as well as a range of cycling accessories. The SME operates in Europe and the US, with the UK being its biggest market.

Regarding advanced services, the motivation underlying the transformation comes as a strategic decision from top management to ensure the long-term viability of the business. The SME wants to provide bikes as a service addressing the rising costs and price volatility while reducing the environmental impact. The SME is at the stage of piloting the advanced services offering, which is built around a new bike, designed to provide a hassle free biking experience to customers and to be used multiple times along a life span of 50 years. To do so, the SME is currently divided, where five employees are directly working in the advanced services project whereas the rest of the business keeps working in the traditional lines and supporting the project when needed.

## 4.4 Case D: Transit packaging solutions

Case D is comprised by a transit packaging solutions SME and its ego-network. The SME can be classified as a medium enterprise composed of 125 employees and is based in the United Kingdom. The SME covers a wide variety of industries, with 65% of sales coming from the automotive industry. Due to the nature of the product, the SME does not export as customers need to be located within close distance in the UK.

Regarding advanced services, the motivation underlying the transformation emerged during the crisis in 2008 when the SME decided to introduce basic services to provide added value to customers. As an extension of the company's service culture, the SME aims to tie customers in through advanced services and is at the stage of transforming current transactional ones in a commoditised market where competition is based on price. To do so, the SME relies on its bigger size and flexibility to provide fully bespoke and customised advanced services offerings based on identifying customers' specific problems.

## 4.5 Case E: Industrial sensors platform

Case E is comprised by an industrial solutions SME and its ego-network. The SME can be classified as a small enterprise composed of 25 employees and is based in Spain. The SME specialises in the fields of power transmission, converting, industry 4.0 and industrial electronics, with industrial solutions being applied across a diverse range of industries with an emphasis in

machine tooling, packaging and naval. The SME operates within Spain and Portugal, and in a lesser degree in Morocco.

Regarding advanced services, the motivation underlying the transformation emerges as an opportunity to strengthen the position in the market exploiting the connectivity industry trends through the development of its own integrated platform. The SME is at the stage of transforming current transactional customers into advanced services partnerships. The advanced services offering comprises a platform for the collection, analysis and visualisation of specific customers' processes data made of adaptable hardware and software components. The value proposition is customised to the needs of each customer being predictive maintenance, efficiency and quality at the forefront of the provision. To do so, the SME retains ownership of the platform and provides support in data treatment and decision making as well as periodic platform upgrades according to the requirements of the customer.

## 4.6 Case F: Commercial blinds solutions

Case F is comprised by a shading solutions SME and its ego-network. The SME can be classified as a small enterprise composed of 18 employees and is based in the United Kingdom. The SME's shading solutions can be divided between commercial blinds sold in the education and construction industries and disposable curtains sold in the healthcare industry. Besides, the SME also develops individual ad-hoc projects across diverse sectors such as the automotive industry. The SME operates in the UK, with the biggest disposable customer being located in Southern Ireland and a small part being exported into Gibraltar and the Middle East.

Regarding advanced services, the motivation underlying the transformation emerges as an opportunity to increase its market share in the healthcare industry. The SME is at the stage of developing a pilot to test the advanced services offering, based on an integrated disposable curtains' installation and replacement package solution. The value proposition aims to provide the healthcare industry with a high quality curtain management system. To do so, the SME retains the ownership of the product and takes care of the periodic sourcing, installation, replacement and disposal of curtains.

## 4.7 Case G: Automotive mobility solutions

Case G is comprised by an automotive SME and its ego-network. The SME can be classified as a small enterprise composed of 20 employees and is based in the United Kingdom. The SME aims to systematically eliminate the environmental impact of personal transport and has been developing the product, the system and the ideology of the business for over 18 years. The SME is segmented across retail customers, public sector (e.g. council), private sector (e.g. company

fleet vehicles) and car sharing schemes. Due to the nature of the product and required infrastructure, the SME does not export as customers need to be located within close distance.

Regarding advanced services, the motivation of the SME is driven by sustainability and based on the need to future proof the business gradually decoupling revenues from material consumption as a way to ensure superior financial performance. The SME is at the stage of developing a beta test of 20 cars that feeds into the development of a circular value network – upstream implementation of advanced services in the supply chain for volume production. The advanced services offering is built around a car, designed for longevity to bridge the gap between the first and subsequent users. The SME aims to ensure customers' peace of mind with a cascade value proposition based on reliability and convenience. To do so, the SME takes care of the maintenance, the insurance and the fuel while the car becomes a revenue generating asset in the balance sheet.

## 4.8 Case H: Re-usable commercial packaging solutions

Case H is comprised by a packaging solutions SME and its ego-network. The SME can be classified as a micro enterprise composed of 2 employees and is based in Finland. The SME was born in Christmas 2017, as a spin-off of e-commerce packaging Parent Case H originated in 2011, as an alternative to single use packaging. Both companies are separate but collaborate together leveraging on the experience and knowledge already acquired in the packaging industry. The SME specialises in on-demand re-usable packaging solutions for industrial companies (e.g. furniture and steel component manufacturers), with a current focus on the construction industry. The SME operates in Finland and across Europe.

Regarding advanced services, the motivation originally emerged as a mix of sustainable and economic reasons while working for the Finnish Post Office. Parent Case H envisioned the design of reusable packaging as a way to reduce the environmental impact while leveraging on the economic opportunity of the growing e-commerce industry where no other alternative solution was available. After 7 years, the SME aims to expand the e-commerce success and is at the stage of building its customer base towards industries that require more specialised packaging solutions. The advanced services offering is fully customised and the value proposition is built on 5 main pillars being, cost efficiency – reducing packaging costs over usage cycles, process efficiency – massively reducing packaging time, end user satisfaction – higher protective quality of packaging materials, marketing – communication of sustainable brand values, and sustainability – reducing environmental impact.

## 4.9 Case J: Food packaging platform

Case J is comprised by a sustainable retail food solutions SME and its ego-network. The SME can be classified as a small enterprise composed of 13 employees and is based in the Czech Republic. The SME operates with food producers and retailers, currently in the Czech Republic but aiming to expand abroad.

Regarding advanced services, the motivation of the SME is driven by sustainability and born to remove existent barriers against waste reduction. The SME is at the stage of piloting the advanced services offering, comprised of a modular platform of reusable capsules with built-in technology designed to prevent the production of packaging waste along food supply chain. The SME value proposition is aimed to food shoppers, retailers and producers through the provision of a convenient and enjoyable shopping experience, reduced costs and improved logistics efficiency, and social responsibility and brand image. To do so, the SME retains the ownership of the platform and takes care of the capsules maintenance and replacement as well as of the technology upgrades.

## 4.10 Case K: Promotion and marketing platform

Case K is comprised by a sustainable promotional materials SME and its ego-network. The SME can be classified as a micro enterprise composed of 4 employees and is based in the UK. The SME operates across several market segments targeting marketing campaigns, trade shows, marketing events, trade fairs and festivals among others. The SME currently operates in the UK but the aim is to create a distributed system to leverage on local actors and resources across multiple locations.

Regarding advanced services, the motivation of the SME is driven by sustainability and born during the Global Innovation Lab event supporting Sustainable Development Goals in 2017. The advanced services offering is built around a textile printing technology designed to decrease the amount of single-use promotional materials. The SME value proposition is based on 3 main pillars being, flexibility – leasing of promotional materials, marketing – customer interaction and engagement, and sustainability – reducing environmental impact. To do so, the SME is developing a leasing promotion and marketing distributed platform to be implemented across already established local networks in the industry. The SME is at the stage of testing the scalability of the technology through several pilots.

## 4.11 Case L: Wearable technology

Case L is comprised by a wearable technology SME and its ego-network. The SME can be classified as a micro enterprise composed of 2 employees and is based in the United Kingdom. The SME aims to revolutionise human experience through the merge of virtual and real worlds

increasing personal connection while reducing digital dependency. Tech-savvy early adopters smartphone users comprise the SME's targeted market segment. The SME counts with a pool of 600 worldwide early adopters who have already registered their interest in the wearable device.

Regarding advanced services, the motivation of the SME is driven by the exploitation of the long-term commercial opportunities that can be derived from the wearable users' data. The SME is at the stage of building an initial customer base with early adopters. The advanced services offering is built around a hardware and software system, designed to be used in connection with a smartphone, and able to interact and integrate with users' life experiences as well as digital platforms. The SME value proposition is based on providing new integrated experiences – merge of digital and real worlds, transparency – ethical and user driven data privacy and access, and continuous improvements – hardware and software upgrades on subscription. To do so, the SME takes care of the data management, software upgrades and hardware replacement over the product's life cycle.

## 4.12 Case M: E-commerce packaging platform

Case M is comprised by an e-commerce packaging SME and its ego-network. The SME can be classified as a micro enterprise composed of 8 employees and is based in the United States. The SME was born in 2017 as a way to ship items without the waste associated with traditional packaging. The SME currently operates in the US, with a focus on soft e-commerce goods, particularly in the apparel industry. Customers can be divided between those which share core sustainable values, those which want to accomplish sustainable strategic goals in the upcoming years and those which want to cut down on costs.

Regarding advanced services, the product idea originally emerged 10 years ago driven by the lack of sustainable alternative packaging to single-use cardboard and polymer bags. The recent growth of e-commerce and the advancements of technology motivated the SME to upgrade that original reusable shipper with the latest technology to reinvent the packaging industry. The SME has developed a pilot with 13 medium-sized apparel brands and it is currently at the stage of applying the learnings from last year pilot to start growing the business. The advanced services offering comprises a closed loop re-usable e-commerce packaging solution with a built-in platform-based technology. The value proposition is built on three main pillars being, customer experience – touch points, engagement and platform data, cost efficiency – re-usability of up to 200 times, and sustainability – reducing environmental impact.

# CHAPTER 5. WITHIN-CASE ANALYSIS

This chapter reports the insights of the analysis providing an in-depth understanding of each of the cases comprising this study. Within-cases, insights are presented in the form of two narrative stories describing the manufacturer's value capture process and the manufacturer's ego-network's structure and composition (section 3.7.3). The chapter provides the context-specific knowledge required for the understanding of the higher-level cross-case analysis.

## 5.1 Case A: Disinfection light solutions

### 5.1.1 The value capture process

Case A is currently piloting the advanced services offering entering a new market in the food industry. At this stage, strategic and knowledge value outcomes emerge from advanced services. In order to capture such value outcomes, Case A is undergoing production and problem-solving activities. Collaboration is required to integrate intellectual resources and to efficiently deploy the available human resources as well as to offset the newness in the food industry.

Table 17 shows a summary of Case A value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) and external needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Strategic: uncertainty reduction<br>Knowledge: market intelligence – benchmark | Production: manufacturing and testing prototype | **Internal** | Human resources: workforce | Efficiency: outsourcing electrical assembly |
| | Problem-solving: data management | | Intellectual resources: specialised knowledge | Integration: cross-industry organisation |
| | Problem-solving: targeting customers | **External** | Newness in the industry | Risk reduction: supermarket MNC |

Table 17. Case A value capture process

Regarding value outcomes, proving the success of the pilot provides Case A with success stories to demonstrate the viability of the advanced services offering in the market. That **physical evidence** increases Case A's confidence and strategically **reduces the uncertainty** associated with the novelty of advanced services in the food industry:

*"[…] certainly improve the process, reduce the uncertainty and the risks of any problems. […] once we get the success stories to replicate them through […] And*

*we can change the process when, instead of using chemicals they can use UV, and being confident that it is going to work. It is very early yet in the food industry for UV."* Case A - Disinfection light solutions

The pilot at the same time, increases Case A's market intelligence through unique **performance data** to know the **benchmark** for the advanced services offering in the food industry:

*"And of course, having the advanced services is really important here because you have to validate the process somehow. So you have to measure the amount of UV to prove it is working. Because it is so important, if light drops off it can reduce the effectiveness of killing bugs and we need to know that. We are looking at a real competitive advantage out there in the market."* Case A - Disinfection light solutions

In order to capture such value outcomes, Case A is undergoing production activities to **manufacture** and **test** the remote monitoring prototype and problem-solving activities to **target customers** in the food industry as well as to **manage the data** from the pilot.

The lack of required human and intellectual resources to complete such activities, together with the newness of Case A in the food industry call for collaboration in the value capture process.

Internally, Case A's **workforce** are working within both the traditional offerings across the automotive, aerospace and healthcare industries and the advanced services offering in the food industry:

*"[…] it's prioritising, in a small business one of the main issues is finding the capacity to move forward. It is always something to be mindful of in small businesses"* Case A - Disinfection light solutions

Mindful of its size and internal capacity, Case A understands **outsourcing low value** production **activities** such as the electrical assembly as a way to **optimise** the completion of the pilot:

*"Building a prototype…getting the parts, building a prototype, testing it, refining it, building a second prototype…you know it's very iterative […] we may outsource some of it, some of the electrical outputs; we could outsource some of it to speed things up a little bit."* Case A - Disinfection light solutions

Whereas high value problem-solving activities, such as data management, need collaborative partnerships from **digital industries** to integrate the **specialised knowledge** required to successfully **collect and analyse** the pilot **data**:

*"how we deal with the data. Because we know we can make the measurements and we know we can get a number of outcomes of that, and then it is how we…how to*

*analyse it, what we do with it. […] we need a strategic alliance partner to collect the data and some form of platform"* Case A - Disinfection light solutions

Externally, its **newness** in the food industry leaves Case A in a difficult position to **target** potential **customers**, the supermarkets' suppliers, challenging the advanced services pilot:

*"[…] we are so new in the food industry, it's kind of been related diversification I guess. And that is quite a difficult thing to do, when you diversify a new product under a new market I guess."* Case A - Disinfection light solutions

In order to offset this disadvantageous position, Case A is developing a partnership with a supermarket **MNC** to **access** potential customers within its interconnected and extended supply chain in the market:

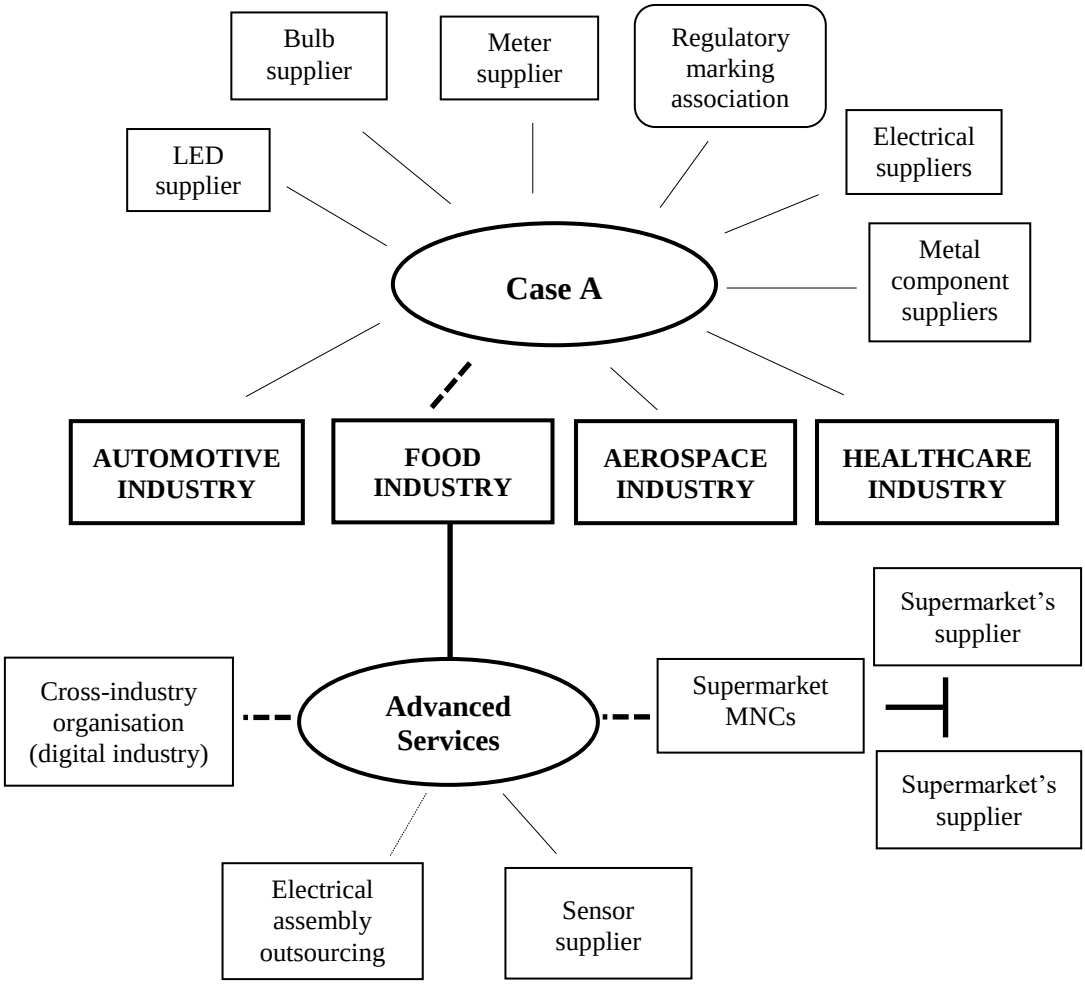
*"Of course, the customers' customer in a lot of the cases, they are the big supermarkets. And ideally if we get the big supermarkets and say to their customers "look, I want you to use UV, because it gives benefits to our customers", the consumers. That is beginning, just beginning to happen […] That would be the ultimate goal, if lots of supermarkets tell their suppliers "you need to use a UV lamp". Then they have no choice, they have to do what the supermarkets tell."* Case A - Disinfection light solutions

### 5.1.2 The ego-network structure and composition

The ego-network of Case A is mainly composed by suppliers on one side and customers on the other. Suppliers can be differentiated among those providing specialised or commoditised components, whereas customers range from small to big organisations within the automotive, aerospace and healthcare industries. Due to the high variety of industries covered, Case A is in contact with an advisory association in relation to compliance with regulatory marking requirements. Apart from a big organisation in the healthcare industry, current customers are mainly characterised by being non-recurrent and of low economic value. In this context, the food industry represents the opportunity of repeatable businesses through advanced services.

Figure 5 shows Case A ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 5. Case A ego-network




Structurally, Case A ego-network is characterised by a structural hole between the manufacturer and its potential customers in the food industry, the supermarket's suppliers.

Due to the newness of Case A in the food industry there is currently no actor holding a brokerage position in-between Case A and the supermarkets' suppliers. Instead, the supermarket MNCs hold a **bridge position** for being part of the clusters of food industry supply chains where a wide variety of suppliers are concentrated serving the same supermarket:

> *"the focus is going into the food industry […] that you do one particular food line and then there are extra production lines in the same company or there's a whole load of different sites. […] value will be larger. For example you can supply whole conveys of UV lights as part of a process"* Case A - Disinfection light solutions

Another **structural hole** is identified between traditional and new cross-industry partners being Case A the **brokerage position** between them, exercising the control over the exchange of resources.

Moving on to the composition, Case A maintains the same **transactional** relationships with the established traditional partners that were already supplying components to the traditional product-centric offerings. **Intensity** and roles for such already established suppliers do not change:

> *"they are our supplier, they do what we ask them to do, we pay them on time, everyone is happy […] the only feedback we have is that we pay them […] No, no. nothing would change there. It's an additional component we build into the equipment to measure what's happening."* Case A - Disinfection light solutions

Similarly, relationships with current customers remain transactional across the automotive, aerospace and healthcare industries:

> *"because we just supply, we never get involved. We supply one particular customer, and then, other"* Case A - Disinfection light solutions

New partnerships, on the contrary, emerging to support the manufacturer's value capture process in advanced services are based on relational intensity with collaborative and more intense ties being formed:

> *"There's a number of different ones that we want to talk to, we need to pick one that we are going to work with, we always pick one that we want to work closely with […] We will stick with them"* Case A - Disinfection light solutions

## 5.2 Case B: Rice milling solutions

### 5.2.1 The value capture process

Case B is at the stage of piloting the advanced services offering in the UK. At this stage, strategic and knowledge value outcomes emerge from advanced services. In order to capture such value outcomes, Case B is undergoing production and problem-solving activities. Collaboration is required to integrate financial and intellectual resources and to reduce risks associated with a previous failure and with the peculiarities of customers' mindset in the rice industry.

Table 18 shows a summary of Case B value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) and external needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Strategic: uncertainty reduction | Production: manufacturing first mill | **Internal** | Financial resources: money | Integration: funding body |

| | | | | |
|---|---|---|---|---|
| Knowledge: market intelligence – benchmark | | **External** | Previous failure | Risk reduction: funding body |
| | Problem-solving: data management | **Internal** | Intellectual resources: specialised knowledge | Integration: cross-industry organisation |
| | Problem-solving: targeting customers | **External** | Customers' inertia and cost-driven mindset | Risk reduction: academia and digital MNCs |

Table 18. Case B value capture process

Regarding value outcomes, proving the success of the pilot provides Case B with the figures and messages to demonstrate the viability of the advanced services offering in the market. That **physical evidence** strategically **reduces the uncertainty** associated with the adoption of a new technology in the rice industry:

> *"It is kind of getting this conceptual idea to be adopted. These millers […] it is a difficult idea for them to understand and it is difficult for them to adopt a new technology because nobody has seen anything like this before. […] The game is about demonstrating the added value […] it is about having the right messages and the right data and the right demonstrators to prove that point"* Case B - Rice milling solutions

The pilot at the same time, increases Case B's market intelligence through unique **performance data** to develop a **benchmark** in the rice industry:

> *"We just do test to get our benchmark on it. […] It's about benchmarking best practice. It's about me identifying we have a problem with that machine, you have a problem with that miller, or you have fundamentally something wrong that you need to solve in your mill. You are not performing against the benchmark of all the other mills. Why is that? How can we correct that? So we can maximise that by sharing best practices."* Case B - Rice milling solutions

In order to capture such value outcomes, Case B is undergoing production activities to finalise **manufacturing** the first mill machine and problem-solving activities to **target customers** in the rice industry as well as to **manage the data** from the pilot.

Case B's limited financial resources, the previous failure driven by the lack of control in China and the peculiarities of customers' mindset call for collaboration in the value capture process.

Internally, Case B lacks the **money** to **manufacture** a full mill as well as the **specialised knowledge** required to satisfy the **data management** activities for the full mill to be tested in the UK:

> *"So there is the machine side and the data side. […] we have been in the valley of death for probably 20 years, and the one thing that stops us being successful is we don't have a full scale pilot mill. […] we do not have the resources to give the customer a full mill."* Case B - Rice milling solutions

A **funding body** has facilitated the integration of the required financial resources to finish the mill through a collaborative **publicly funded** project:

> *"Now the [UK public funding body] project, where some of the partners are funded 70% like ourselves SMEs; some other partners, […] they get 50% funded. But what it does is it gives them a cost effective way into the project, so they can have a look at it whether they'll be fully committed. So it's a cost effective way for them to say yes I want to be more involved. Because the 50% they are not funded they can claim out taxes."* Case B - Rice milling solutions

Case B has also partnered with digital **cross-industry organisations** (MNCs) to integrate their **specialised knowledge** and experience in the digital field:

> *"Then we have others in terms of digital and servitization requirements, we are working with [Digital MNC 1], [Digital MNC 2], [Digital MNC 3] and people like that."* Case B - Rice milling solutions

Externally, Case B has suffered the consequences of a previous failure of a joint venture with a mill in China, which is affecting the credibility of Case B in its current pilot mill project:

> *"But in China we couldn't control what they did. […] they promised to do more than what they can do, which is more than what they need to do. So that caused us a problem. […] to alleviate the fears that they are going to be let down…and that feeling is fed by our competitors and to certain extent by our performance in China till date. The issues we had of promises and not delivering"* Case B - Rice milling solutions

The funding body has reduced the risks associated with lack of control for Case B, providing the **transparency** for the development of trust among the actors participating in the pilot mill project:

> *"Because we are fundamentally building a communal trust. And the [UK public funding body] project has been incredibly useful for this bonding, trusting. Because we hold review meetings. Review meetings are held in rotation so we had one first meeting was in [Commercial partner 1], the next will also be*

*[Commercial partner 1] and we had one in [Commercial partner 2], with the manufacturers. So all of the partners see the other partners in action."* Case B - Rice milling solutions

Finally, the low differentiation and high competition dominating the rice industry leads the traditional **cost-driven mindset** of millers not willing to adopt new technologies:

*"Our problem is, we are not a technology company right now. We are a culture change company. So what we have tried to change here is their mindset. […] The whole rice industry is driven by tonnage. […]We don't have to mill at the same capacity you mill at to produce that same output. So you are looking at the wrong thing, measuring the output and not the input. But that goes back to the cultural change"* Case B - Rice milling solutions

Case B has partnered with **academia** to accredit the benchmark for the rice industry as a way to offset the lack of trust that millers have in new technologies through the **credibility** of repute independent validation:

*"by going to the pilot mill and demonstrating and having external validation by universities and customer references in Europe and in the UK and India […] Here is the data that we have produced that has been validated by these independent universities, all of repute. So it is about giving the customer that confidence."* Case B - Rice milling solutions

Case B partnership with digital **MNC**s also allows the SME to leverage on their brand and recognition in the market, which gives **credibility** to the technology that Case B is trying to introduce in the rice industry:

*"And also by bringing in partners like [Digital MNC 2] and [Digital MNC 1], it gives us as a small company a credibility burst that we don't have. Because by virtuing the fact that they are dealing with us gives us credibility in the market."* Case B - Rice milling solutions

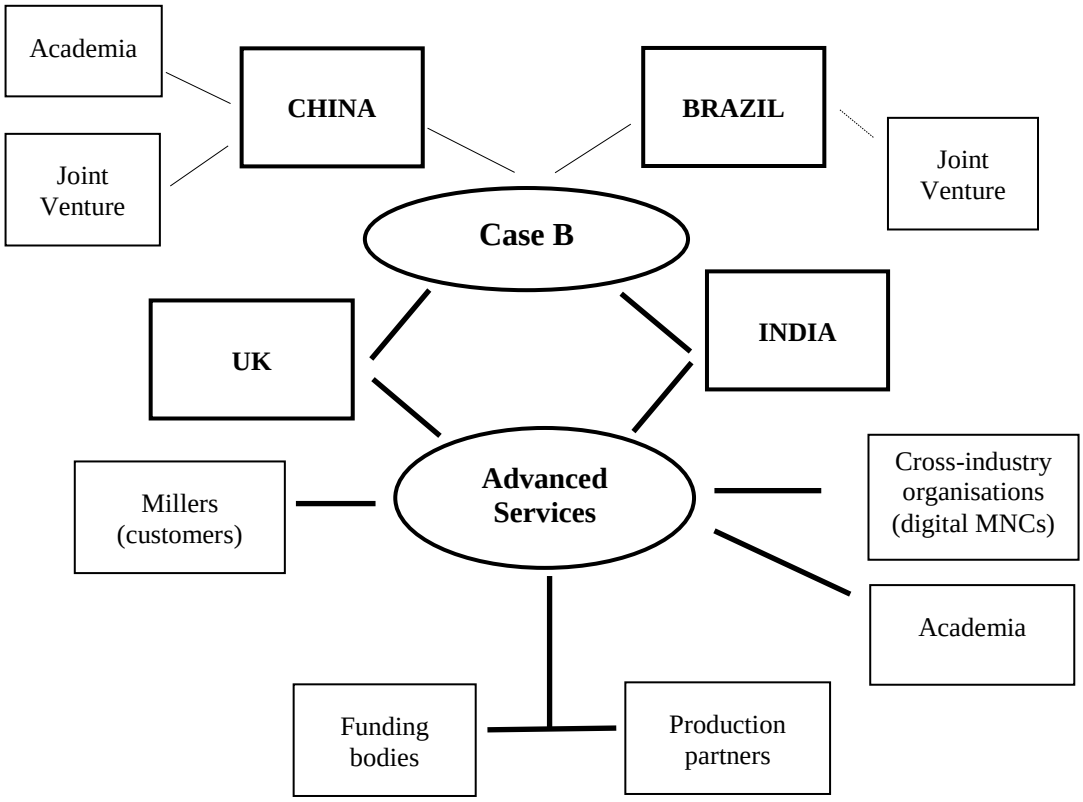
### 5.2.2 The ego-network structure and composition

The ego-network of Case B is divided between academic, commercial and joint venture partners. Academic partners are Universities located in the UK, India and China; commercial partners include those manufacturing organisations that provide resources and activities for production and those cross-industry organisations that provide digital resources for data management; joint ventures refer to the partnerships established in foreign locations. Case B is also in contact with funding bodies in each country to economically support advanced services projects. Due to the traditional rice industry mind-set, where millers focus on costs rather than efficiency and on inputs

rather than outputs, most of Case B current customers are low value and high maintenance. Case B is targeting advanced services to such customers in the UK and India to take advantage of the already available infrastructure.

Figure 6 shows Case B ego-network diagram, with thicker line representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 6. Case B ego-network




Structurally, Case B operates in four different countries, India, China, UK and Brazil. Partnerships in the form of joint ventures are established abroad:

> *"So we have a factory joint venture in china for the Chinese and Asian markets. And then because of the nature of the business you need to have something in the territory to serve the machines. […] And then we've got, we have a project running in India, so we have sort of JV in India. And at some point we will have the same again in Brazil."* Case B - Rice milling solutions

Joint ventures can hold a brokerage position abroad. As occurred in China before, joint ventures hold an advantageous position to control and exploit resource diffusion being the connecting point between Case B and the millers abroad.

*"But in China we couldn't control what they did. So they tried to push the tonnage, which was unnecessary, and then doing that, the way they built the machines, they overpromised the customer what they can do. And they wanted to deliver it. […]The issues we had of promises and not delivering"* Case B - Rice milling solutions

Collaboration across India and UK is established in the development of advanced services projects, where **funding bodies** hold a **bridge position** being part of several external clusters, facilitating networking opportunities with likeminded partners:

*"So basically what we are doing now in the UK, we have this new project which brings together a consortium of 13 entities in India and the UK. Funded by [UK public funding body] and [India public funding body]."* Case B - Rice milling solutions

Advanced services projects are also developed in collaboration with cross-industry organisations and academia. **Structural holes** are identified with the rest of the ego-network, being Case B the **brokerage point** with the ego-network.

Moving to the composition, Case B aims to transform current **transactional intensity** with **established partners** into more intense and long-term interactions through advanced services.

*"No, no at this stage. […] They will build ten machines and give me an invoice. […] What we are trying to build is a consortium a likeminded…it is a value driven consortium. It is not doing it for the money, there is a greater good."* Case B - Rice milling solutions

Likewise, relationships with advanced services customers is envisaged towards relational intensity with long-term partnerships.

*"And again it is not about selling the machine, get to the 12 months and then it is not your problem. We are looking to create long term partnerships."* Case B - Rice milling solutions

**Multiplexity** of roles is observed in two actors, the **digital cross-industry MNCs** and the UK **funding body**. Digital MNCs provide Case B with extensive specialised knowledge on digital aspects of advanced services while increasing its credibility due to the recognition of their well-known brands in the market. Likewise, the funding body holds a double role as economic and partnership facilitator, reducing the risk and uncertainty and facilitating the integration of partnerships through financial resources and transparent agreements.

## 5.3 Case C: Premium cycling equipment

### 5.3.1 The value capture process

Case C's advanced services division is currently at the stage of developing a pilot of 20 bikes with early adopter customers. At this stage, knowledge and strategic value outcomes emerge from advanced services. In order to capture such value outcomes, Case C is undergoing production activities. Collaboration is required to support the limitations regarding intellectual and financial resources.

Table 19 shows a summary of Case C value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Knowledge: market intelligence – accuracy<br>Strategic: strategic position – first mover | Production: safety tests and manufacturing bikes | **Internal** | Intellectual resources: specialised knowledge | Integration: academia and cross-industry organisation |
| | | | Financial resources: money | Efficiency: established traditional partner and cross-industry organisation |

Table 19. Case C value capture process

Regarding value outcomes, proving the success of the pilot provides Case C with unique **customers' usage experiences data** increasing its market intelligence to ensure the **accuracy** of a hassle free bike over cycles of usage:

> *"get good feedback quite quickly about how they're coping with them and how they are to live with. […] understand what might go wrong or what might need to be adjusted so we can address that for future design iterations, so it takes us closer to our goal of having a hassle free bike"* Case C - Premium cycling equipment

The **uniqueness** of the advanced services offering in the cycling industry and its **alignment** with sustainable industry trends and customers' readiness, also provides Case C with a strategic position as a **first mover** in the industry:

> *"And we differ from quite a few businesses in the cycle industry […] the bike we've developed is quite different in specification to our current range which we sell to people […] we think that there will be a point in the future where it's not really viable just to buy the bike outright, just renting would just be what you do. […]*

*I've got a list that's maybe 3,000 strong, with people that are specifically interested."* Case C - Premium cycling equipment

In order to capture such value outcomes, Case C is undergoing production activities to finalise the safety **testing** of the new bike prototype and to **manufacture** the first batch of bikes:

*"So at this stage we've been manufacturing frames and forks only which have been going to the test house […] we're confident that the design that we have will go through that safety test and we've just got the final few to send and we will have to send complete bikes"* Case C - Premium cycling equipment

Case C's intellectual resource needs and financial constraints call for collaboration in the value capture process.

Internally, Case C's advanced services offering implies a holistic transformation which requires **specialised knowledge** beyond traditional manufacturing:

*"There's a lot of things that we want to implement that we have no previous experience of as a business […] we're trying to do something that's, it's a simple concept but it's very complex in the execution"* Case C - Premium cycling equipment

In order to address this need, **academic** partnerships with Universities allow Case C to keep moving forward integrating the required specialised knowledge in a time-effective manner:

*"When we need something we need to be able to access answers quite quickly and in a way that doesn't involve excessive time so that we can move onto the next step […] over the two years is getting external support and particularly academic support. […] We're currently looking at developing, it's a confidential project actually, but with the [University research centre] and we're looking to harness some of their expertise"* Case C - Premium cycling equipment

Similarly, the unusual characteristics of the new bike requires **specialised knowledge** in order to address the design and production requirements beyond traditional **testing**:

*"Our biggest challenge really is how we go beyond the standards that we're currently using as our benchmark […] we can quite easily put a bicycle together that would pass. It's a little more challenging to put together a bicycle that will pass but it also a lighter weight and nice to ride."* Case C - Premium cycling equipment

In order to address the shortage of **specialised knowledge** within the cycling industry, **cross-industry** partnerships with automotive and motor organisations support Case C integrating the required manufacturing and technical knowledge to move forward:

> *"We're working with several different businesses […] There's a business called [Automotive organisation] they make a lot of parts for the auto industry like brake linings and components for cars. […] there's a big manufacturing business called [Motor organisation], they do a lot of castings, again a lot for the motor industry […] And we have been able to sort of partner with them"* Case C - Premium cycling equipment

Case C's advanced services offering also implies a high degree of **financial commitment** as it requires a completely new product design and development, which together with the lack of expected revenues in the short term, challenge the completion of the pilot:

> *"It's expensive, we're making a lot of prototypes, use materials that we're using, experimenting with. We try to be economical but it's a real commitment for the business. We're not, at the moment, we're not generating any income for the business"* Case C - Premium cycling equipment

The **adaptation** and alignment of Case C's established supply chain, especially its overseas factory and its UK-based tubing supplier, has helped to **optimise** the deployment of internal resources:

> *"we have shared our aspirations, this is the project, with our factory and we have a very good relationship with them, they've been very positive about it. And actually they have been supporting us in terms of being able to supply some parts to specifications that we want at this early stage. […] [Tubing supplier] actually been very supportive of us, they've actually manufactured some one-off tube sets for us to enable us to do our prototypes and have been very accommodating"* Case C - Premium cycling equipment

The challenge of financially committing to the advanced services project is further exacerbated by the uncertainty over internalising or outsourcing of activities:

> *"we've purposely not invested in a lot of machinery, partly because the cost but also partly because we don't ultimately fully know what we need to manufacture here or it might be done by a partner or if we do it here. And also what we need because we haven't got the finished solution yet."* Case C - Premium cycling equipment

**Access** over investment arise as an effective **optimisation** of resources through the cross-industry partnership in the motor industry. Case C can leverage on **specialised assets** of a **cross-industry organisation** without having to compromise the value capture through large investments at early stages:

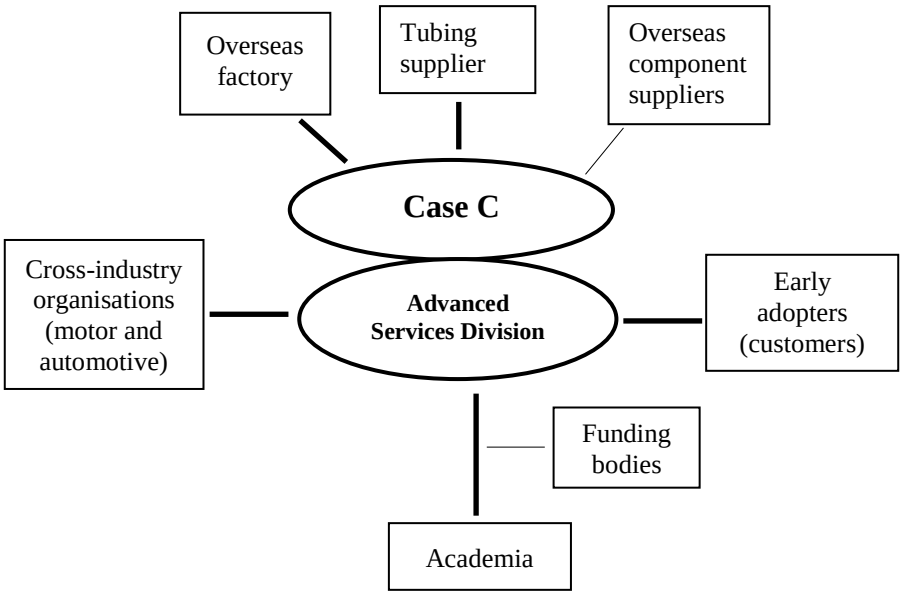
*"the [Motor organisation], and what they're trying to address is the shortage of engineering expertise, particularly in rural areas. […] And we have been able to sort of partner with them and that gives us access to a great workshop, so it gives us access to physical machinery […] that partnership is very valuable because we have access to their expertise in modern manufacturing techniques […] we have a mentor who is an experienced engineer."* Case C - Premium cycling equipment

### 5.3.2 The ego-network structure and composition

The ego-network of Case C is divided between the traditional manufacturing business and the advanced services project division. Case C counts with an international supply chain where bikes are designed in the UK and manufactured in South East Asia. In the advanced services division, Case C works closely with several Universities across the UK and cross-industry organisations that support the advanced services prototyping and piloting. Case C is in contact with funding bodies that support and provide access to resources and organisations to further develop the advanced services project.

Figure 7 shows Case C ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 7. Case C ego-network




Structurally, Case C's advanced services offering is currently developed through parallel projects within the advanced services division where **structural holes** remain between new and already established partnerships. Case C holds a **brokerage position** between partners:

*"at the moment yeah, we would be the central point. […] eventually we want to set up a sort of a cross communication but we're not there yet, no"* Case C - Premium cycling equipment

The partnership with the **cross-industry organisation 2** in the motor industry holds a **bridge position** due to its connection within several manufacturing, training and engineering clusters:

*"it's also kind of a gateway to a network of businesses in the area, so different engineering companies with expertise in all sorts of areas. So in the future when we start to tackle like certain components, it might be we need to have a casting or a forging of a part, there's a resource that we can go to, to find someone, you know, locally that could do it for us."* Case C - Premium cycling equipment

Whereas **funding bodies'** embeddedness in external academic **clusters** acts as a **bridge** between the advanced services division and the academic partner required for the specific project.

*"So we've got an ongoing project, so through [UK public funding body] we are connected with the [University manufacturing group] and we carried out, we collaboratively carried out a materials project."* Case C - Premium cycling equipment

Moving to the composition, regarding the intensity of ties, Case C already differed from traditional bike manufacturers in its customer and supply chain management. Instead of transactional, relationships with existing customers have been based on availability and access before, during and after purchase, with some customers coming back for advice regarding riding performance. Besides, Case C aims to increase such relational intensity with early adopters in the advanced services project.

*"these early adopter customers need to have a specific set of characteristics because it's really important for us in developing the product that we get very close feedback about the performance and various aspects of the product and ultimately actually the service […] So there's, we're going to have perhaps a closer relationship with those customers"* Case C - Premium cycling equipment

Similarly, Case C's **relational intensity** of ties with **established** UK and foreign members of its supply chain has increased with the advanced services project, where adaptation and alignment of goals has led to more frequent interactions in order to satisfy the new requirements of the bike design and production:

*"we're lucky we've had a long standing close relationship with [Tubing supplier] and without their support actually we probably would struggle to get off the ground."* Case C - Premium cycling equipment

And intense ties also prevail within the specific advanced services projects with cross-industry and academic partnerships where collaboration and continuous feedback help to get closer to the desired outcomes.

**Multiplexity** of roles is observed in **funding bodies** acting as economic integrator and partnership facilitator with regards to the development of advanced services projects. Multiplexity is also identified in the **established relationship** with the UK tubbing supplier which currently acts as a double supplier for the traditional and the advanced bikes becoming crucial for Case C's value capture process:

> *"a business called [Tubing supplier]who supply our tubing for the bicycles […] So this is sort of outside of their usual remit and they're a very busy business and they continue to support us. […] We've had some quite significant engineering challenges with the material that we've chosen and that's caused them quite a few headaches but you know, they've been fantastic, so yeah, and without them we don't have a frame and without a frame we can't build a bike, so."* Case C - Premium cycling equipment

## 5.4 Case D: Transit packaging solutions

### 5.4.1 The value capture process

Case D is currently at the stage of exploring market opportunities and transforming current transactional customers into advanced services partnerships in the automotive industry. At this stage, strategic value outcomes emerge from advanced services. In order to capture such value outcomes, Case D is undergoing problem-solving activities. Collaboration is required to integrate intellectual resources and to offset the risks associated with the peculiarities of customers' mindset in the transit packaging industry.

Table 20 shows a summary of Case D value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) and external needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Strategic: strategic position – power balance | Problem-solving: data management | **Internal** | Intellectual resources: specialised knowledge | Integration: academia and cross-industry organisations |
| Strategic: uncertainty reduction | Problem-solving: targeting customers | **External** | Customers' inertia and cost-driven mindset | Risk reduction: Automotive MNC |

Table 20. Case D value capture process

Regarding value outcomes, transforming current transactional customers into advanced services partnerships provides Case D with **physical evidence** of the viability of the offering, which helps to **reduce the uncertainty** for further potential customers' adoption of advanced services across industries:

> *"And then physical evidence is where the service takes place and kind of exhibit what happens in terms of, it could be a case study to improve […] you know it's tangible you could say. And say the service is a little bit less tangible. […] so it's all about physical evidence and that's the way I approach it really."* Case D - Transit packaging solutions

Such **transformation** of current transactional customers in a **commoditised industry** allows Case D to reduce inequalities and to achieve a **power balanced** strategic position in the relationship:

> *"So a transaction […] you'll be more important as a customer than I will be as a supplier because okay, we can't supply you, you'll go to ten other people who supply, get the same product, you know, so we're less important to them as they are to us. […] so they could use us if you know what I mean. […] try to get to the part where, you know, you're working in partnerships, it's about how valuable your relationship is both ways."* Case D - Transit packaging solutions

In order to capture such value outcomes, Case D is undergoing problem-solving activities to address the **data management** requirements of advanced services while **targeting** current transactional customers.

Case D's intellectual resource needs together with the peculiarities of the transit packaging customers' mindset call for collaboration in the value capture process.

Internally, Case D has adopted a scientific approach with data being at the base of advanced services design and development. Such approach requires **specialised knowledge** and expertise beyond traditional manufacturing:

> *"Because we need ... because basically it's new expertise, you know, you've got kind of like your core activities and you're manufacturing products […] But to supply services it's more, you know through technology […] you want to know what happens when you put a tonne of it, you need to know all the scientific part of it, about how that timber reacts. So that data is really important to us, that is probably our most valuable piece of data, but we need to get that in collaboration with other people."* Case D - Transit packaging solutions

In order to integrate such specialised knowledge, Case D has hired expert human resources; developed a **cross-industry** partnership with a software supplier to **test and collect data**; and established agreements with **academia** to use their facilities:

> *"we had a PhD materials specialist in the company and a person who is an external materials consultant and all that kind of stuff"* Case D - Transit packaging solutions

> *"so materials testing and gathering data about materials, I do with [Software supplier]."* Case D - Transit packaging solutions

> *"then we might use lamp, like we used to use, the laboratory of [University 1] over the road. At the moment I'm currently talking to [Manufacturing group] at [University 2] to use their labs."* Case D - Transit packaging solutions

Externally, the **inertia and cost-driven mindset** of customers in the packaging industry challenges their transformation into advanced services partnerships:

> *"Most people don't see the value in doing that I don't think because they don't see the value that we could probably provide. […] They see the value when they've got a problem […] When you're offering that service, which might lead to them having to pay more money for the product then, you know, they don't want to do it but when they have a problem they don't mind spending that extra bit of money on the product then to take that problem away so it becomes quite difficult."* Case D - Transit packaging solutions

Case D partnership with an automotive **MNC** allows to leverage on its interconnected and extensive supply chain to **access** customers in the industry reducing the risks associated with their reticence towards advanced services:

> "*So if you go to one customer and say "We already do work with this customer, this customer, this customer", who are already in the same supply chain, you know, it helps, it gives you competitive advantage because they think well, you know, if you're in, I know I keep mentioning, but if you're in [Automotive MNC] supply chain there's certain demands that they push back through the supply chain that are common between all their suppliers"* Case D - Transit packaging solutions

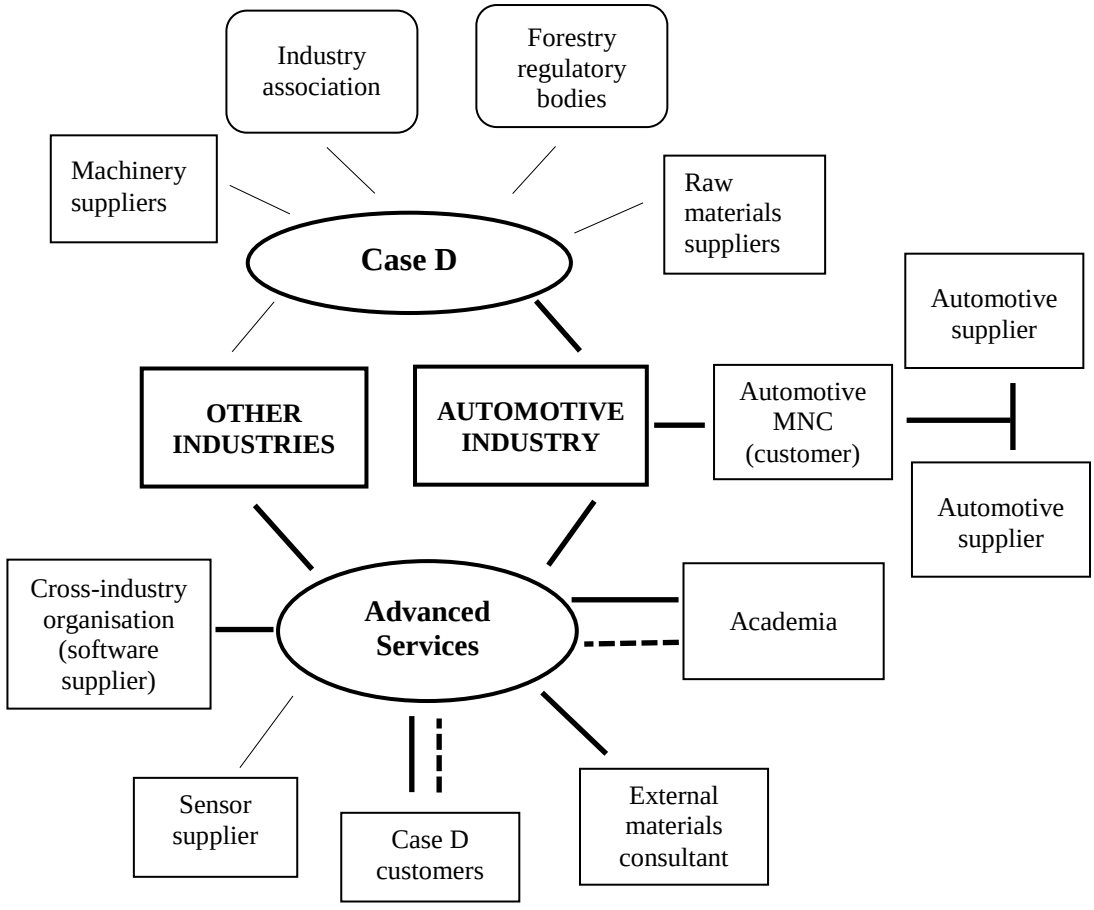
### 5.4.2 The ego-network structure and composition

The ego-network of Case D is mainly composed by suppliers on one side and customers on the other. Suppliers can be differentiated among those providing technology, raw materials and machinery, whereas customers range from small to big organisations within the automotive, glass, household cooking appliances and construction industries. Relations are also established with

academic and cross-industry partners who provide technical expertise and support with advanced services. Case D forms part of an industry association and it is in contact with regulatory bodies for FSC and PFC approved packaging and ISPM 15 compliance through the Forestry Commission.

Figure 8 shows Case D ego-network diagram, with thicker line representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 8. Case D ego-network




Structurally, **structural holes** are present between the advanced services partnerships and the rest of the ego-network where collaboration is led by non-disclosure agreements and no information sharing takes place beyond the dyadic relationships with Case D:

> *"No, no, there's non-disclosure agreements and everything in place, yeah, I made them sign non-disclosure agreements before they even started the project".* Case D - Transit packaging solutions

Case D, thus, holds a **brokerage position** between partners reducing the opportunistic behaviours in the ego-network. For instance, value sharing is decided by Case D as the only actor with full information about costs and profits:

> *"we'll do a baseline, we'll identify the areas where you could make improvements, that will be this cost. And then if you want us to measure what that impact is that's another cost. If you want us to take that problem away that's another cost. […] we would lead it and we would invoice the customer, we would charge the customer and we would pay them for their services, so the sub-contractor I guess."* Case D - Transit packaging solutions

The automotive **MNC** customer holds a **bridge position** between Case D and its cluster of interconnected supply chain members, connecting Case D with a big percentage of traditional customers:

> *"maybe 65% of our customers are automotive now and that's generally down to [Automotive MNC] because a lot of them are in [Automotive MNC]'s supply chain and that got us stuff."* Case D - Transit packaging solutions

Moving to the composition, regarding intensity of ties, Case D's customised advanced services offerings imply different frequency of interaction in the ego-network according to each specific customer's needs. However, whereas **transactional intensity** with already **established partners** does not change:

> *"Yeah, no, it doesn't affect like materials, suppliers or anything like that."* Case D - Transit packaging solutions

New academic and cross-industry partnerships are characterised by high intensity ties with frequent and collaborative interactions to further customise advanced services to satisfy specific customers' needs:

> *"the guy who owns that company [Software supplier] has seen a big opportunity in things like IoT and servitization and industry 4.0, so he's acquired a couple of companies. […] So I'm starting to look at working, you know, where we can work together and collaborate on other projects for our customers"* Case D - Transit packaging solutions

## 5.5 Case E: Industrial sensors platform

### 5.5.1 The value capture process

Case E is currently at the stage of transforming current transactional customers into advanced services partnerships. At this stage, strategic and knowledge value outcomes emerge from

advanced services. In order to capture such value outcomes, Case E is undergoing platform activities. Collaboration is required to overcome the challenges presented by the market competition as well as the lack of alignment with advanced services across platform members.

Table 21 shows a summary of Case E value capture process identifying the emerging value outcomes and key activities, highlighting the external needs for collaboration and the key partnerships supporting them.

<table>
<tr><th colspan="5">Value capture process</th></tr>
<tr><th>Value Outcomes</th><th>Key activities</th><th colspan="2">Need for collaboration</th><th>Key partnerships</th></tr>
<tr><td rowspan="2">Strategic: uncertainty reduction<br>Knowledge: market intelligence – accuracy</td><td>Platform: platform configuration</td><td rowspan="2">External</td><td>Competition</td><td>Risk reduction: cross-industry organisation and funding body</td></tr>
<tr><td>Platform: platform implementation</td><td>Platform members' lack of alignment</td><td>Risk reduction: higher-level organisms</td></tr>
</table>

Table 21. Case E value capture process

Regarding value outcomes, the adoption of advanced services by current customers increases the pool of **physical evidence** through success stories demonstrating the viability of advanced services, which allows Case E to **reduce the uncertainty** of further potential customers' adoption across industries:

> *"What we try to do is to show them success stories from other organisations and we try to show those which are closer to their industry. […] if I have more than one customer in the brick manufacturing industry, I will go to another one because I am going to have a better knowledge to tell them "look, the problems that you may have are these and these". So they will see that there is a previous knowledge from [platform brand] side and we can show more confidence. […] if we go to a completely new industry where we don't know about their problems, then, you give them success stories from other stuff, and it may not work"* Case E - Industrial sensors platform (translated)

Transforming current relationships with customers into advanced services partnerships also allows Case E to increase its market intelligence improving the **accuracy** of the offering based on unique **customers' usage experiences data**:

> *"there's customers that are more relevant, […] due to their innovative capacity, you can learn a lot from them. Because they bring a lot to a conversation, as I was telling you, the one that is more critic or the one that is more demanding, at the end is the one that adds more. […] they pose different challenges, let's say […] at*

*the end, those improvements that we have been adding for each customer, within the next offering, a lot of them, if they request the same, those are already included in the offering since the beginning. […] they help us to improve and to offer a better product and service."* Case E - Industrial sensors platform (translated)

In order to capture such value outcomes, Case E is developing platform activities by **configuring** the platform to best address customers' needs and **implementing** the platform with current customers.

*"we make a presentation of all the possibilities and we adapt them to the customer, to the needs of the customer. The product is the same, and the proposition is different because it responds to different needs."* Case E - Industrial sensors platform (translated)

The intense market competition together with the difficulties of overcoming the lack of alignment of current customers call for collaboration in the value capture process.

The easy access and spread of technology lowers the entry barriers for advanced services' **competition**, challenging Case E's ability to capture the value outcomes:

*"a lot of clients are already implementing this, we have even arrived late. In some cases there's been others who arrived before us. […] because that is something that is kind of easy to copy or that can be done by other companies. Like there's no barrier of entry to competition. And we are realising that there are a lot of competitors. […] because these new technologies are becoming more accessible to everyone. Everyone knows them and doing just that, you are not a specialist. It's a really diverse market let's say."* Case E - Industrial sensors platform (translated)

Consequently, Case E is currently developing synergetic collaborations that **build barriers** through complementary partnerships with **cross-industry organisations** reducing the risks associated with competition in the configuration of the platform:

*"I see opportunities in collaborating with other organisations that complement what we are doing. […] so we can complement them. Well, and they can complement us. […] We are already negotiating with two, one is more advanced and the other one we are looking at product prospects and building trust […] they consider our platform a good product and they see a good synergy in collaborating with us, and that is why we are negotiating."* Case E - Industrial sensors platform (translated)

Case E is also embarked in **publicly funded** innovation and R&D projects for the configuration of the platform reducing the risks associated with competition by **building barriers** through market differentiation:

> *"we have received support, well we are, regarding [platform brand], in a bi-annual innovation project […] we have received now a grant by the [National R&D centre] […] and that allows us to keep developing a product. And then, if it can lead to a patent or something that does not exist in the market, that doesn't limit you to simple sensors […] so for us to excel or to stand out in some way, these R&D projects are good."* Case E - Industrial sensors platform (translated)

Regarding the **lack of alignment of platform members**, Case E is facing two main challenges with current customers. First, current customers lack to understand the potential of a platform which is not essential in the production process:

> *"we see that there's still a lot of them that are reticent to take the step […] they are focused in producing. And one of the barriers that I have encountered is that this doesn't directly help production. I mean, it is not an element that you install and then it helps you to produce more. In the future it will help you produce more if you use it correctly. But it is not an element, like an engine, that you specifically need to be able to produce"* Case E - Industrial sensors platform (translated)

And second, current customers fear that the platform can become a replacement of their job roles as advisory services take on their decision making capabilities:

> *"What I see is that if their job role or responsibility is to drive the organisation forward and to improve its productivity, and that is their responsibility and that it could be delegated, they cannot be advised by others, because that would be like saying that they are not doing their job properly or something like that. Far from that, it is a support and an increase in the amount of information available to do a better job, because at the end it is them who are going to improve the job, having a different kind of information to carry on their duty."* Case E - Industrial sensors platform (translated)

To tackle this situation, the promotion of such type of platform-based advanced services from **higher level organisms**, such as governmental bodies and business associations, with a wide reach and power in the region, allows Case E to **influence** customers increasing their confidence in advanced services and reducing the risks associated with their current lack of alignment:

> *"In [Region] the government has allocated I don't know how many millions of euros to all this kind of programs for R&D projects. […] that this gets promoted through institutions, like [Regional business association] or the [Region]*

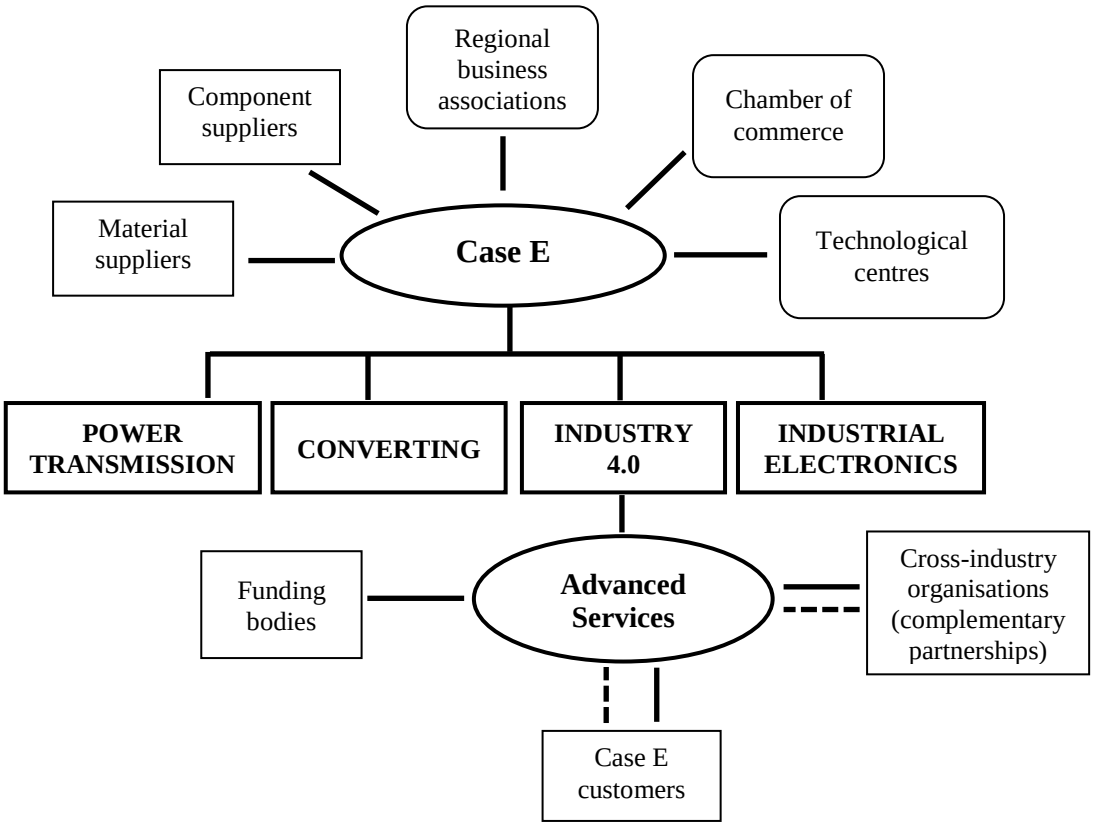
*government and that. Because there is a strong conviction and a call to organisations that it is needed to collaborate […] to make them understand that, if there is that much support and that many organisations are starting to integrate this, if I do not jump in now, I'm going to be left out."* Case E - Industrial sensors platform (translated)

### 5.5.2 The ego-network structure and composition

The ego-network of Case E is composed by a wide variety of suppliers and customers as the manufacturer is present in many industries. Case E maintains long-term relationships with suppliers which, due to their collaboration, responsiveness and openness to innovation, many are considered as crucial as customers. Customers can be divided between recurrent and single one-off transactions, with the first ones being a relevant asset for Case E due to their resilience, technical skills and potential to innovate. Case E maintains links with several higher-level organisms in the region. Case E is developing synergetic collaborations with cross-industry complementary organisations for the improvement of the platform configuration.

Figure 9 shows Case E ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 9. Case E ego-network



Structurally, **structural holes** exist between already established and new cross-industry complementary organisations in the configuration of the platform. In this case, Case E holds a **brokerage position** between traditional and new partnerships being in control of the collaboration and resource exchange.

Partnerships with complementary **cross-industry organisations** hold a **bridge position** to connect Case E with potential customers outside the already known customer base due to their embeddedness in different industrial clusters:

> *"Yes, it can also lead to the entrance of different customers. […] it can help to provide access to certain organisations."* Case E - Industrial sensors platform (translated)

Case E forms part of several **clusters** with **higher-level organisms** like business associations, technological centres and the chamber of commerce, each of them connecting diverse organisations, innovation and business support services.

Moving to the composition, regarding intensity of ties, Case E's relationship with traditional customers has been more transactional and less frequent, which is changing towards close relationships with their transformation into advanced services customers:

> *"With some it has improved, because many, there's many organisations that call us only when they need a replacement, when they have problems and they need some sort of fast solution, some material. But this is more going to the customers' location, installing it, understanding which are their needs, it is a closer relationship."* Case E - Industrial sensors platform (translated)

Intensity of ties with advanced services customers evolve from initial weekly visits to ensure a seamless implementation to quarterly interaction driven by customers' dynamic needs:

> *"At the beginning, weekly in order to know more if the data collection is being useful, if they need some support in data treatment. And from there, then whenever the customer needs an improvement or whenever there is a problem too, it would be more or less on a quarterly basis."* Case E - Industrial sensors platform (translated)

Regarding suppliers, **relational interaction** takes place daily, being the closer the relationship the higher the number of projects developed with the supplier. Similarly, relationships with complementary partnerships are based on mutual value and close collaboration.

Regarding higher-level organisms, Case E maintains a relational intensity with ongoing relationships with frequent interaction for the collaborative development of innovation projects and to leverage on training and business advice:

*"In the case of [Regional business association] it is a continuous interaction and also in the Chamber of Commerce due to continuous formation and also relevant information about legal aspects, to be on top of such issues […] to have more points of view, more information to make decisions. Because many organisations go through them and they have a lot of experience with success cases."* Case E - Industrial sensors platform (translated)

**Multiplexity** of roles is observed in those **established suppliers** which are currently part of both offerings, through their continuous role in supplying traditional customers and their support and flexibility with regards to the implementation of the platform:

*"What I value the most is their collaboration and their problem resolution, […] their product innovation, that they are also implementing sensors and connectivity […] their responsiveness is very high. […] That is very important to be flexible in the market and to be able to offer the customer what they need."* Case E - Industrial sensors platform (translated)

## 5.6 Case F: Commercial blinds solutions

### 5.6.1 The value capture process

Case F is currently at the stage of working on the development of an advanced services pilot in the healthcare industry. At this stage, strategic and knowledge value outcomes emerge from advanced services. In order to capture such value outcomes, Case F is undergoing problem-solving and production activities. Collaboration is required to integrate financial and intellectual resources as well as to reduce the risks associated with the competition and customers' mindset in the healthcare industry.

Table 22 shows a summary of Case F value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) and external needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Strategic: uncertainty reduction<br>Knowledge: market intelligence – accuracy | Problem-solving: data management | **Internal** | Intellectual resources: specialised knowledge | Integration: academia |
| | Production: manufacturing | **Internal** | Financial resources: money | Integration: funding bodies |

| | | | | |
|---|---|---|---|---|
| | | **External** | Competition | Risk reduction: established traditional partner |
| | Problem-solving: targeting customers | **External** | Customers' inertia and cost-driven mindset | Risk reduction: academia |

Table 22. Case F value capture process

Regarding value outcomes, proving the long-term benefits of advanced services with a pilot in one public health unit allows Case F to demonstrate the viability of the offering through **physical evidence** to **reduce the uncertainty** associated with its higher costs in the healthcare industry:

> *"We have tried to stick with quality over low cost and that's what's proven very difficult because the [Public health sector] would often going to buy the cheapest and even though they don't work they still can't be persuaded at the moment to swap to us. […] once we get our applied services into one [Public health unit] […] I'm sure they would be our blank sheet to demonstrate other [Public health units] the advantages of what we can provide."* Case F- Commercial blinds solutions

Piloting advanced services also increases Case F market intelligence providing a competitive advantage through an **accurate** offering in an industry where access to **customers' usage experiences data** is not easy to achieve:

> *"in understanding a little bit more about what our customers', the hospitals' problems are […] and adapt our product to services towards helping them. […] to make a massive difference to us and our saleability or our attractiveness"* Case F- Commercial blinds solutions

In order to capture such value outcomes, Case F is undergoing problem-solving activities to **manage the data** required to identify and to **target** the specific needs of customers and production activities to **manufacture** the advanced services offering to be piloted in the health industry.

Case F's need for financial and intellectual resources in an industry dominated by large competitors and a cost-driven mindset call for collaboration in the value capture process

Internally, Case F needs to **collect and analyse** specific **data** in the healthcare industry to understand and address specific customers' needs:

> *"we want to establish the research first of all. […] we are looking to explore to talk to three different groups […] within [Public health unit] and what they need"* Case F- Commercial blinds solutions

Case F collaborates with **academia** integrating their **specialised knowledge** and research skills in order to successfully leverage the potential of data:

> *"And then, once we've gathered the information about what their needs are, then the academics at the university will help us to look at [Confidential innovation] and any other innovative ideas we've got"* Case F- Commercial blinds solutions

Case F's limited **financial resources** can challenge the development of the required innovations to provide advanced services:

> *"The challenges would be for us to find the money to bring our innovative ideas to life."* Case F- Commercial blinds solutions

Case F location within a considered deprived area in the UK provides an advantageous position to apply for and integrate **public money** from **funding bodies**:

> *"But we are well used to applying for grants and we are well situated […] There's lots of things like that that makes us attractive for the government scheme grants."* Case F- Commercial blinds solutions

Externally, Case F is conscious of the bigger capacity of large **competitors** in the health sector to materialise innovations in a shorter period of time, challenging its ability to capture the value emerging from the pilot:

> *"Because we are a SME we don't have the financial backing. Many of our competitors are now part of multimillion of billion groups and as soon as, if we make any innovative ideas but we can't get to market quick enough, we can have the idea patented but it is very difficult to defend patents, it's not often a way forward. You just have to be at the market ready to go first."* Case F- Commercial blinds solutions

Case F's **established relationships** in a slow industry such as the health sector represent a **barrier of entry** reducing the risks associated with bigger competitors:

> *"I must admit the [Public health sector] is a huge beast, you know, such an infinitely huge machine to deal with and so, perhaps it is not to our disadvantage. In that way that it is such a slowed turning machine so I don't think anything else is going to quickly come in and disrupt our potential market. […] At the end of the day we've been doing this the longest, […] we know it inside out. We've worked inside hospitals, on wards all the time in the other part of our business."* Case F- Commercial blinds solutions

The health sector is also characterised by a **cost-driven mindset** where decision making is handled by procurement managers, who do not consider the long-term benefits of advanced services. Under these conditions, Case F struggles to **target current** customers:

> *"probably the biggest challenge of all is getting in front of the end user […] we would absolutely love to collaborate more with the end user. It is so frustrating, it is so annoying, that we can't actually get in front of the end user and talk to them about their day to day issues and find out exactly what product, what services, they would help them to deliver the best care to the patients. […]I think they think it is a waste of time because it's all down to price at the end of the day."* Case F- Commercial blinds solutions

The independent research with **academia** allows Case F to **confidently** target customers reducing the risks associated with the lack of willingness of end users to collaborate with commercial organisations:

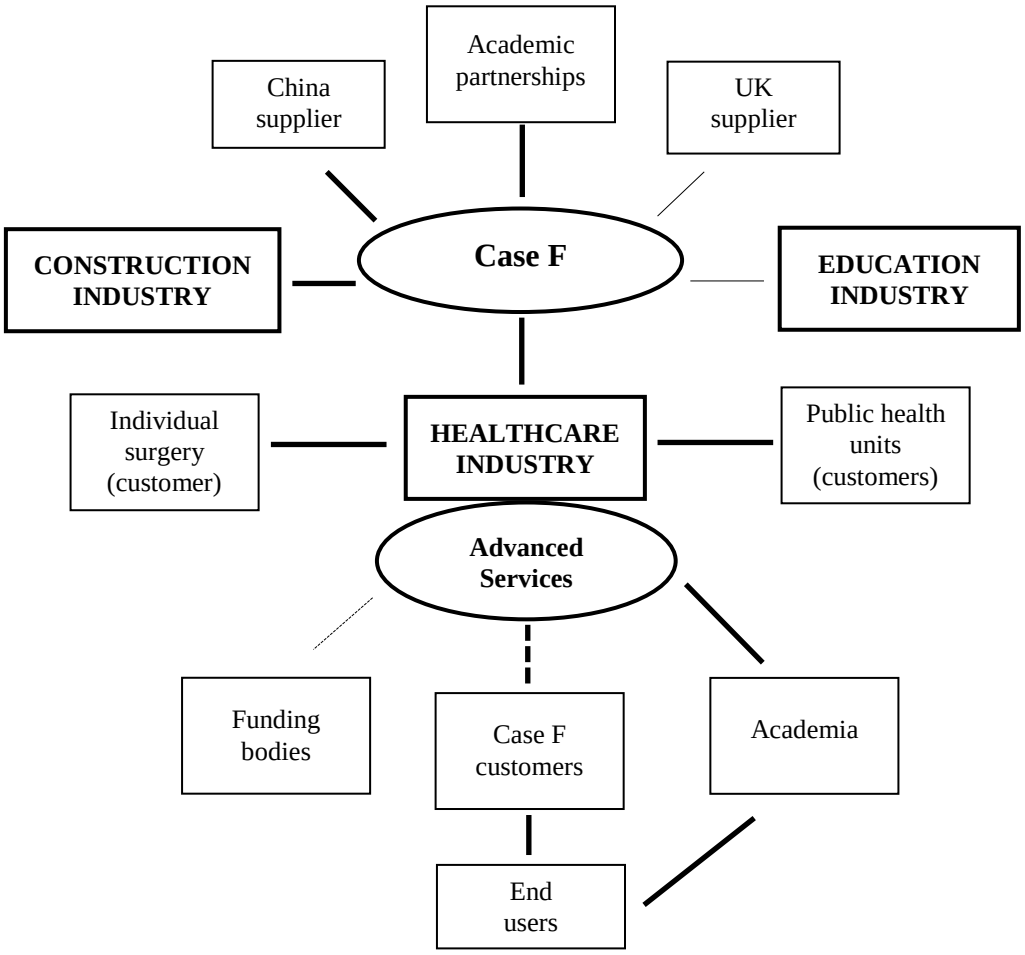
> *"[University] are going to conduct some market research […]. And they are going to find out exactly what the hospitals need. […] to deliver the best product and then the best service. To present a package."* Case F- Commercial blinds solutions

### 5.6.2 The ego-network structure and composition

The ego-network of Case F is mainly composed by a diversified conglomerate of big and small customers across industries, and two main suppliers. Customers can be divided between single and recurrent, either requiring new or replacement products, being the second ones the most valued and predominantly found within the healthcare industry. Case F's main supplier is located in China, whereas special product requests are sourced from a different partner in the UK. Regarding funding bodies, Case F location represents an advantage for the application and concession of public grant schemes. Case F has developed several collaborative research projects with universities, being the support of an academic partner a fundamental pillar for the introduction stage of advanced services provision.

Figure 10 shows Case F ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 10. Case F ego-network




Structurally, a structural hole prevails between Case F and end users due to the lack of decision making power given to the latest in the public sector. The peculiarities of the healthcare industry imply that no other commercial organisation can either hold a brokerage position between both ends. Instead, an academic partner is currently connecting with end users on behalf of Case F.

**Structural holes** exist between new advanced services partnerships and those already established in the ego-network. Case F holds a **brokerage position** being in control of the collaboration in advanced services projects.

Moving to the composition, regarding the intensity of ties, Case F interaction with customers in the health industry varies depending on the type of contract, from single to recurrent businesses:

> *"Yeah it would be about, if it was a new build hospital and we were tendering for a large contract, we probably only come into contact with about 3 times within a 12 month period in order to do that work. But, if it is a hospital that are regularly replacing their curtains then we would probably be in touch about every 12 weeks, as they renew and refresh their curtains."* Case F- Commercial blinds solutions

The long-standing relationships and embeddedness within the public health sector in the UK provides Case F's with a resilient position in the market. The current aim is to establish long-term contracts with higher relational intensity to capture the value of advanced services:

> *"It has the potential to give us longer contracts. […] It certainly gives us more security as an SME, we can get longer contracts with [Public health unit], […] if we can get longer contracts, where they can forecast their demand then we can place our orders with China with more confidence."* Case F- Commercial blinds solutions

Regarding suppliers, Case F maintains a close **relational intensity** with its supplier for disposable curtains in China, with frequent interactions to place orders as well as personal visits:

> *"We do go to China and our Chinese suppliers came over to see us just last month, so there's a lot of interaction and it's probably built up over the last 3 years. […] you need somebody you can rely on all that way away to understand what you are to deliver and who can be as responsible as possible to what our needs are. So for example, we had our biggest customer in Ireland […] So we have to liaise with them […]. And they were absolutely brilliant over in China"* Case F- Commercial blinds solutions

Regarding academic partnerships, Case F has interacted in the past with universities being the intensity of ties currently higher with regards to the collaboration taking place for the development of advanced services:

> *"But at the moment we are working with [University] to join a pilot to see, to make sure we understand fully what our customers need before we go any further with it. […] So we are certainly open to, we collaborated with Universities a few times. […] That was really really interesting, it was a really valuable experience. […] Definitely collaborating with Universities can be very beneficial."* Case F- Commercial blinds solutions

Indeed, **multiplexity** of roles is observed in the **academic partnership** collaborating with Case F. Integration of resources together with the provision of credibility to access to the end user make of the university a crucial partner supporting the value capture process of Case F. **Multiplexity** of roles is also observed in the **established suppliers** which are supporting both the traditional and the advanced services side of the business.

## 5.7 Case G: Automotive mobility solutions

### 5.7.1 The value capture process

Case G follows a systemic approach developing parallel steps in its journey towards advanced services provision. Case G is currently at the stage of developing a beta test of 20 cars which feeds into the simultaneous development of a circular value network. At this stage, knowledge, strategic and economic value outcomes emerge from advanced services. In order to capture such value outcomes, Case G is undergoing production and problem-solving activities. Collaboration is required to integrate physical and financial resources and to reduce risks associated with the automotive industry suppliers' mindset.

Table 23 shows a summary of Case G value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) and external needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Knowledge: market intelligence – accuracy<br>Strategic: uncertainty reduction and strategic position – first mover<br>Economic: cost reduction | Production: manufacturing cars | **Internal** | Physical resources: specialised components | Integration: cross-industry organisations |
| | | | Financial resources: money | Integration: funding bodies |
| | Problem-solving: targeting suppliers | **External** | Suppliers' inertia and risk aversion mindset | Risk reduction: funding bodies and higher-level organisms |

Table 23. Case G value capture process

Regarding value outcomes, the beta test increases Case G market intelligence improving the **accuracy** of the advanced services offering based on unique **customers' usage experiences data**:

> *"all tech companies really, beta test their product at an early stage of development, except the car industry, the car industry never lets a customer anywhere near a new car until it's ready for production. […] we believe that by bringing the customers in earlier to the development process we'll end up with a better car […] a better service proposition. […] we do want to work with the customers to refine the customer proposition, how we deliver it, how we bill it, how we support the cars in service."* Case G - Automotive mobility solutions

The **uniqueness** of the advanced services offering in the automotive industry together with the **alignment** with sustainable industry trends, allows Case G to achieve a strategic position as a **first mover** ahead of regulatory pressures in the industry:

*"So it keeps us ahead of the regulations […] it's align your interest with our customers, with our suppliers, with infrastructure providers and with regulators and policy makers, we are profiting from all the things that policy makers are wanting to enforce and regulate […] turning those into sources of competitive advantage"* Case G - Automotive mobility solutions

In parallel, economic value outcomes in the form of **cost reductions** arise from the development of a **circular value network** transforming Case G transactional sourcing costs into advanced services contracts:

*"I mean the cars cost about 150 grand each to make at the moment and we're aiming to get down to a billed cost of 30 grand. […] we want to get them on board with selling us service rather than selling us components […] if we secure a few servitization contracts with suppliers it will take a disproportionate amount off our bill of materials cost"* Case G - Automotive mobility solutions

Proving the success of the beta test also allows Case G to strategically **reduce the uncertainty** of potential suppliers to join the circular value network through **physical evidence** of its viability and potential benefits in the market:

*"it's to prove the investment case, it's to refine the customer proposition, it's to work with our suppliers through this demonstrating how it would work if we servitized their product."* Case G - Automotive mobility solutions

In order to capture such value outcomes, Case G is undergoing production activities to **manufacture** the cars and problem-solving activities to develop the circular value network for volume production **targeting** advanced services to **suppliers**.

Case G's component needs and financial constraints together with the peculiarities of the mindset predominant in the automotive industry call for collaboration in the value capture process.

Internally, several product **components** need to be redesigned in order to be able to **manufacture** the car in volume production:

*"the vehicle package is designed for volume production, the individual components are not, it's all a hand built thing at the moment.[…] we've got an optimal system but the components in the system are not optimised at all."* Case G - Automotive mobility solutions

In order to address this need, Case G collaborates with several **cross-industry organisations** in the development of technologies to be integrated in the production of the commercial version of the car:

*"So in that we are collaborating with a number of companies to help us develop the technology. […] we've got maybe half a dozen suppliers […] they're all kind of signed up to, not only developing a technology but developing new value propositions and business models that align with our business model."* Case G - Automotive mobility solutions

Case G advanced services offering also requires considerable **financial resources** to be deployed in the production of cars, manufacturing facility, infrastructure and technology innovations:

*"that's probably the biggest barrier is that generally these innovations require investment so it's who is going to make the investment. […] And our progress has been very constrained over the 18 years by funds. So money is always ... and it's the corniest thing in the world to say it, but it really has been a huge constraint."* Case G - Automotive mobility solutions

In order to progress, Case G relies in the integration of financial resources from emerging innovative **funding** calls as a way to unlock the development of key activities:

*"we've got an offer of support from the [Region] government for 45% for that facility […] we secured through crowd funding and grant, grant investment, from the EU."* Case G - Automotive mobility solutions

On the other hand, the **mindset** of the automotive industry, dominated by inertia and lack of holistic understanding, challenges Case G ability to convince **suppliers** to join the circular value network:

*"it's very, very, difficult to get people to understand that however brilliantly refined the auto industry is, it's completely unfit for purpose. […] they confuse risk and uncertainty. […] when you're optimising a mature system […] by changing multiple things simultaneously you reduce risk and you reduce barriers and people find that very difficult to understand. And that is the core of the barriers that we have faced over 15 years in getting anything to happen, any relationship is all constrained by that cultural mindset."* Case G - Automotive mobility solutions

Apart from obtaining physical evidence with the validation of advanced services in the market of the long-term resilience of the model for suppliers:

*"it's based on is designing a model that gets to commercial revenue streams, commercially profitable revenue streams with the lowest possible level of speculation. […] when you see these economic downturn people, although they stop buy cars, they don't stop driving them, and we're selling the mileage not the*

*cars. So we're much more resilient, our revenues are much resilient in economic cycles."* Case G - Automotive mobility solutions

Case G believes that the change must also be driven by **higher level organisms** and is collaborating with well-known regional and international clusters whose wide reach and power promoting circular economy provides the **influence** to reduce the risks of such mindset:

*"So we do have good relationships with, for example, the [Sustainable automotive organism] […] share this thinking amongst the whole automotive supply chain in [Region] […] and the more people who've got that mindset, the more easier it is for us to implement our model. […] because the more bodies on the chair the more easier it is for us."* Case G - Automotive mobility solutions

*"there's been a lot of, I think, work in the area, so there's been EU programmes, […] the [CE foundation] do really a lot in this area. […]I think the ideas underpinning it existed but what's changed is that's kind of been packaged and communicated to a business audience in a more effective way."* Case G - Automotive mobility solutions

Similarly, **higher level organisms** in the local government also help to reduce the risks perceived by infrastructure providers regarding the feasibility of single filling stations:

*"We're also talking increasingly to city councils around the country because we've got to develop a deployment plan. […] one filling station can create a market […] each filling station is a different market and so we want to work out where the Councils are that are supportive of this and where we're pushing against open doors basically. […] there's lots of minor things that help grease the wheels and we want to be working in cities where the Council are supportive basically."* Case G - Automotive mobility solutions

**Funding bodies** provide a **transparent** cost-effective way for partners to join the circular value network reducing the perceived risks associated with such systemic change in the industry:

*"at the moment all we're asking them to do is leverage basically public investment and our investment and some of their investment […] that lowers the risk for them so they're willing to make the investment."* Case G - Automotive mobility solutions

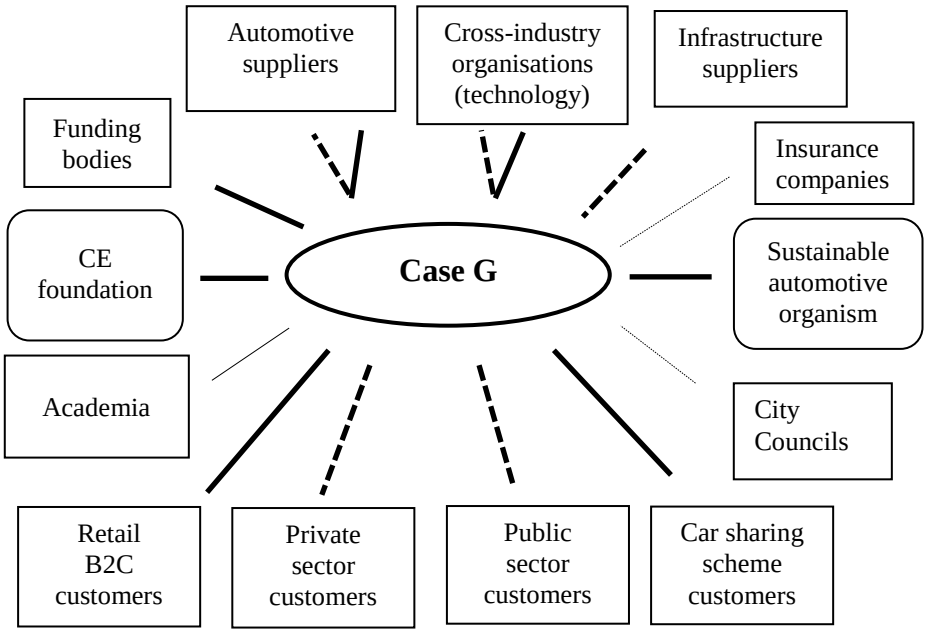
### 5.7.2 The ego-network structure and composition

The ego-network of Case G is mainly composed by customers, suppliers, academic partnerships, funding bodies and higher-level organisms. The supply chain is currently composed by 30 key component and technology suppliers, from which, some are well-stablished organisations within the automotive industry whereas others are new and immature technology organisations. Case G

also collaborates with several universities as well as funding bodies within and outside the UK to access resources and potential partners. Case G forms part of a sustainable automotive organism and an international CE foundation and is in talks with car insurance companies with regards to the customer value proposition.

Figure 11 shows Case G ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 11. Case G ego-network




Structurally, Case G remains as the central position where parallel steps in the advanced services journey are developed with different partners which, at the moment, do not collaborate between them. Due to the innovative design of the car, whose components and technology are not common in the automotive industry, suppliers belong to several industries. Structural holes remain between partners with Case G holding a **brokerage position** between them.

Case G is developing an integrated circular value network where all partners can collaborate and share resources:

> *"At the minute we are. Longer term I would expect them to interact with each other more, particularly thinking about… So, for example, two key interface in the power train is the power electrons and the fuel cell and we have both those partners involved in this project that we're going to run and yeah, I would expect them to start working more and more closely together."* Case G - Automotive mobility solutions

Case G is embedded since inception in **clusters** of **higher-level organisms**, formed by the groups of actors connected through the CE foundation and the sustainable automotive organism.

Moving to the composition, regarding the intensity of ties, Case G focuses on four main customer segments, retail, public and private sector and car sharing schemes, with whom interactions have started but more frequent relational intensity has been developed with individual retail customers and car sharing schemes.

In the circular value network, interactions with newly established cross-industry organisations take place more often and in more collaborative terms than with well-settled automotive industry organisations due to the openness to innovative ideas of the first ones:

> *"with fuel cells and electric motors and things like that we are much more able to have a conversation with those suppliers than we are with people like [MNC] who've been in the car industry for years and make windscreen wiper motors or something"* Case G - Automotive mobility solutions

Due to the immaturity and evolution of technologies, frequency of interactions can widely vary in short periods of time and even terminate:

> *"I've been working here four years and you know partners we had and we thought would follow us into production have changed […] It's an example of just how quickly the technology is moving […] So we got, this company is called [Company name] in [City] and they got interested in the circular supply but then we moved to a different supplier."* Case G - Automotive mobility solutions

Relational intensity through frequent collaborative interactions take place for the development of innovation research projects with several academic partners within and outside the UK.

**Multiplexity** of roles is observed in the **funding body** acting as a resource integrator and partnership facilitator, through the integration of financial resources and the provision of transparency for partners to join the circular value network.

## 5.8 Case H: Re-usable commercial packaging solutions

### 5.8.1 The value capture process

Case H is currently at the stage of exploring market opportunities and building an initial customer base across various industries. At this stage, knowledge and strategic value outcomes emerge from advanced services. In order to capture such value outcomes, Case H is undergoing problem-solving activities. Collaboration is required to offset the newness of Case H as well as to reduce the risks associated with the particular mindset of customers in the construction industry.

Table 24 shows a summary of Case H value capture process identifying the emerging value outcomes and key activities, highlighting the external needs for collaboration and the key partnerships supporting them.

| Value capture process | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Knowledge: market intelligence – benchmark<br>Strategic: strategic position – first mover | Problem-solving: targeting customers | **External** | Newness in the industry | Risk reduction: Parent company |
| | | | Customers' inertia and cost-driven mindset | Risk reduction: construction MNC |

Table 24. Case H value capture process

Regarding value outcomes, developing a base of industrial customers provides Case H with unique **performance data** increasing its market intelligence to achieve an industrial re-usable packaging **benchmark**:

> *"and get the work and experience and a deeper understanding and then we can create the solutions that can be standardised and so on."* Case H - Re-usable commercial packaging solutions

The **uniqueness** of the advanced services offering together with its **alignment** with sustainable industry trends allows Case H to achieve a strategic position as **first mover** in the re-usable packaging industry being ahead of potential competitors:

> *"the timing at the moment, we are now, it's the sweet spot in the time, timing wise that everybody's waking up to this sustainability thinking […]and this is our business so we are quite ahead, had a good head start from our possible competitors which we actually don't have at all at the moment"* Case H - Re-usable commercial packaging solutions

In order to capture such value outcomes, Case H is currently exploring several industries to **target** advanced services to **customers**, with a focus on the sub-contractors providing materials (e.g. windows) in the construction industry.

The peculiarities of the mindset dominating the construction industry together with the newness of Case H in such environment call for collaboration in the value capture process.

Externally, Case H development of partnerships with potential customers is challenged by the lack of experience with industrial companies, whose characteristics and needs are **new** to Case H:

"*So we've just been doing like cold calls to the companies that we assume might benefit most from this. And this has been quite difficult because we don't have that good insight what is happening. We have been calling to many kind of companies"* Case H - Re-usable commercial packaging solutions

Parent Case H (parent company) represents a way to reduce the risks associated with Case H's newness in such industries, leveraging on the accumulated specialised knowledge as well as the **credibility** of a well-established brand:

*"we already know so much about reusability. We know more than our customers, we know more about reusable packaging than anybody else at the moment. […] our company name is [Case H], so we want to combine that to the old [Parent Case H] somehow because it's a good name of course and we want to be, of course, part of that and […] it does work making that name famous so we get like a double effect on that"* Case H - Re-usable commercial packaging solutions

Re-usable packaging is also faced with the inertia of the construction industry **mindset** where sustainable needs are relegated to a second place in favour of traditional packaging, challenging the ability of Case H to build its customer base:

*"the biggest problem so everything is moving really slow. […] they are so fixed to the idea that yeah, this is how it was and it works quite okay and I don't see the benefits for our company, so they decide to postpone or then just don't see that it's important for them. And of course, yeah, yeah, it might be a cultural thing that like the sustainable thinking has not reached every company."* Case H - Re-usable commercial packaging solutions

Case H partnership with a construction **MNC** helps to **access** potential customers leveraging on the MNC's supply chain cluster of sub-contractors reducing the risks associated with such mindset:

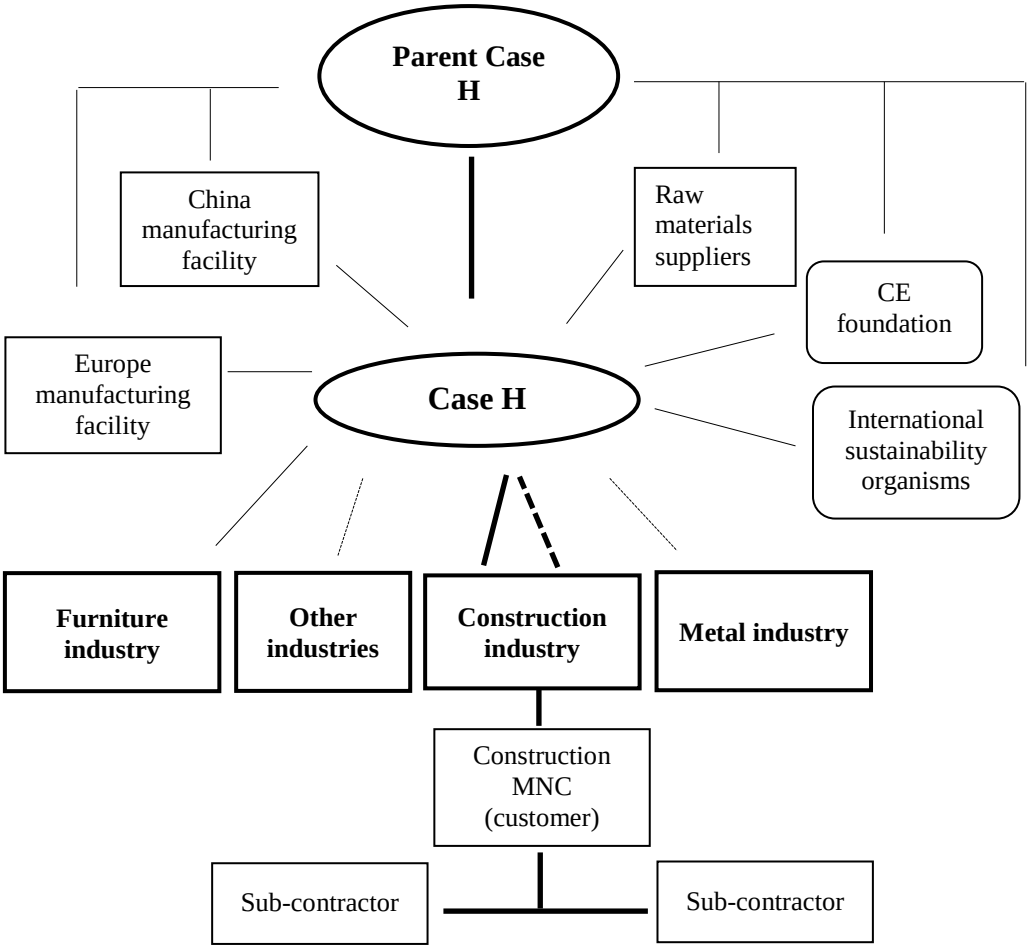
*"So we have a long period relationship with some bigger construction company. […] they are not the ones who actually create the disposable packages, those are their sub-contractors which provide the windows and doors and any other construction element on the construction site. So through these construction companies we can get our hands to their, like suppliers and they can force their suppliers to use reusable solutions."* Case H - Re-usable commercial packaging solutions

### 5.8.2 The ego-network structure and composition

The ego-network of Case H is currently under development, with customers being the most important actors. Case H internally designs and tests the customised packaging which then is manufactured either in Finland or Europe for small batches and in the manufacturing facility in China for over 1000 units. Parent Case H, the parent company, remains an important part of the ego-network, sharing the same suppliers and facilities as well as its embeddedness within CE and sustainability clusters of higher-level organisms.

Figure 12 shows Case H ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 12. Case H ego-network




Structurally, **structural holes** prevail in the customer side between Case H and end users. Case H does not get involved with its customers' customers, being the take back scheme as well as end users' usage and return experiences responsibility of the industrial customer.

*"the end customer actually never see us […] in these industrial cases, we are not going to that direction because it's quite time consuming to start your own customer service. […] But of course if they contact us, we are happy to answer but we are not like selling that kind of service at the moment."* Case H - Re-usable commercial packaging solutions

As a consequence, industrial **intermediate customers** hold a **brokerage position** to control information that can affect Case H's value capture process. For instance, miscommunication of packaging usage instructions to the end user has previously led to misuse and damage to the product reducing its intended life-cycle:

*"I designed like a pallet hoods for company and their sub-contractor just treat those hoods like very badly and half of those are already ripped and I don't know what are they doing with those but yeah. […] Because of course their normal tools when they open the packages are like they've got a cutter and ah, or a knife or whatever."* Case H - Re-usable commercial packaging solutions

Case H is embedded since inception in the **cluster** of actors of the **parent company**, Parent Case H, involving the manufacturing facilities that produce both the e-commerce and the industrial packaging solutions as well as the **clusters** of **higher-level organisms**.

A **bridge position** is observed in a construction **MNC** linking Case H with its cluster of interconnected sub-contractors:

*"So we have a long period relationship with some bigger construction company. Because the construction companies are, they are not the ones who actually create the disposable packages, those are their sub-contractors which provide the, and yeah, like windows and doors and any other construction element on the construction site."* Case H - Re-usable commercial packaging solutions

Moving to the composition, regarding intensity of ties, Case H's maintains a frequent interaction with the cluster of actors of Parent Case H, currently collaborating in the development of several projects:

*"both companies have their own like focus area and of course we are not competing with each other, […] and we have a very good cooperation going on doing several projects at the moment together"* Case H - Re-usable commercial packaging solutions

In the case of customers, the development of long-term partnerships requires relational intensity ties, where Case H needs to frequently meet and interact with potential customers:

*"the project that already we have done a lot of work meeting these guys and discussing maybe several times"* Case H - Re-usable commercial packaging solutions

## 5.9 Case J: Food packaging platform

### 5.9.1 The value capture process

Case J is currently working on the development of a pilot to test advanced services in the market. At this stage, strategic and knowledge value outcomes emerge from advanced services. In order to capture such value outcomes, Case J is undergoing platform activities. Collaboration is required to reduce the risks associated with the lack of alignment of members with the platform.

Table 25 shows a summary of Case J value capture process identifying the emerging value outcomes and key activities, highlighting the external needs for collaboration and the key partnerships supporting them.

<table>
<tr><th colspan="5">Value capture process</th></tr>
<tr><th>Value Outcomes</th><th>Key activities</th><th colspan="2">Need for collaboration</th><th>Key partnerships</th></tr>
<tr><td rowspan="2">Strategic: uncertainty reduction<br>Knowledge: market intelligence – accuracy</td><td>Platform: platform configuration</td><td rowspan="2">External</td><td rowspan="2">Platform members' lack of alignment</td><td>Efficiency: end users</td></tr>
<tr><td>Platform: platform implementation</td><td>Risk reduction: higher-level organisms</td></tr>
</table>

Table 25. Case J value capture process

Regarding value outcomes, proving the success of the pilot provides Case J with the required **physical evidence** to demonstrate the viability of advanced services increasing Case J's confidence and strategically **reducing the uncertainty** associated with the novelty of the technology in the food industry:

*"it is a concept that is new and it has not been tried out yet but I believe that once we do the pilot and we prove it is good there will be no problem"* Case J - Food packaging platform

That pilot at the same time, provides Case J with unique **data** about the producer's, retailer's and shoppers' **usage experiences** increasing its market intelligence to ensure the **accuracy** of the advanced services offering:

*"So in the supermarket [platform brand] can either be in the whole supermarket, the system is very modular. Or it can be inside a supermarket and still have some of the products in the traditional way along with that […] it needs to be tested in reality to see how it works"* Case J - Food packaging platform

In order to capture such value outcomes, Case J is undergoing platform activities to finalise the **configuration** of the platform's App and to **implement** the modular platform with the producer, retailer and shoppers to pilot in the market.

The lack of alignment across platform members call for collaboration in the value capture process.

The **lack of alignment** of lower capacity small retailers to deal with shoppers' food orders through the App challenges the readiness to market the latest version:

> *"I think that the most challenging part for us right now is the application actually. Because in some stores, specially the small ones, they do not want to sell in the way that it was originally designed you know. Like the customer only orders via the application and then someone else, the store staff prepares the order for them. They do not want that, they want like a self-service, […] dispensing the product and all that to be made by the customer."* Case J - Food packaging platform

Case J leverages on the direct contact and feedback from **end users** (food shoppers) to improve the App and make it adaptable to the specific needs of big and small retailers in the market:

> *"we have our technology display in our showroom. We invite the people here and we test the application with them and we can trial the whole shopping experience here. […] Well we test the application with them, we collect the feedback […] and according to that we will make the very final version."* Case J - Food packaging platform

Case J **implementation** of the platform in the food industry also requires the education of customers and end users to be able to leverage its potential:

> *"Because this is a new system and if you want the people to adopt it, you need to educate them."* Case J - Food packaging platform

The embeddedness of Case J within several clusters of **higher level** CE and sustainability **organisms** provides the **influence** to achieve alignment through the education of food retailers, producers and shoppers in the field of waste prevention:

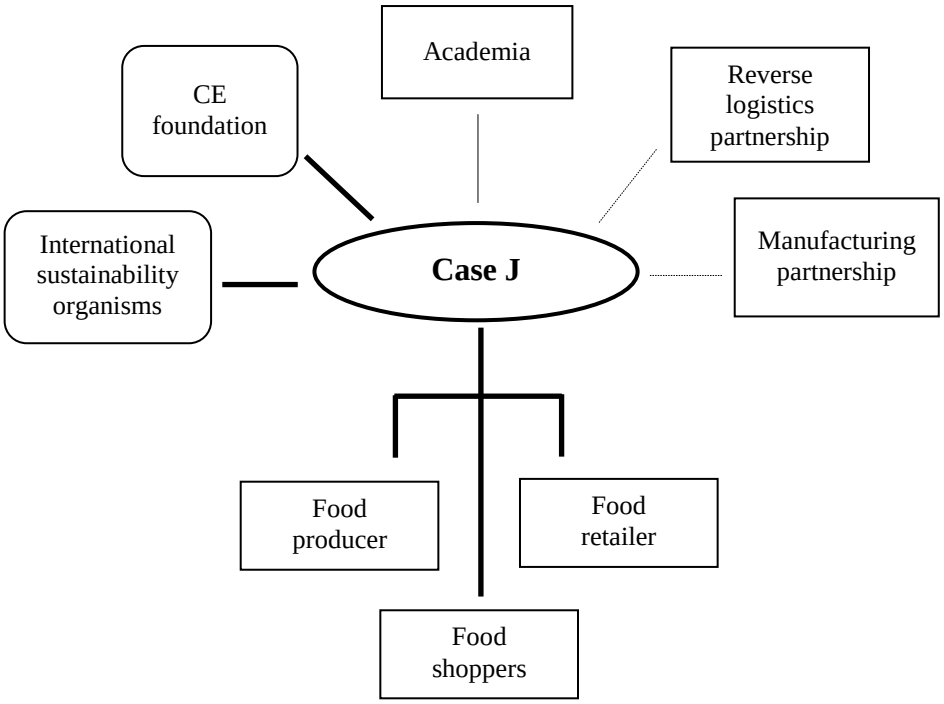
> *"we do a lot of stuff in the field of education. To spread the knowledge about prevention, waste prevention is the main idea behind [platform brand]. And we organise events, and we are part of many international organisations, the [CE Foundation], the [International sustainability organism] […] The reactions from the people are very positive. […] in the last 2 or 3 years the difference is just enormous I would say, it has changed a lot."* Case J - Food packaging platform

### 5.9.2 The ego-network structure and composition

The ego-network of Case J is composed by the ecosystem of actors taking part of the food supply chain, involving food producers, retailers and shoppers. Case J also collaborates with an academic partner in the development of the technology and is looking for partners to collaborate in the manufacturing of the module and the reverse logistics. Case J forms part of international higher-level CE and sustainability clusters of organisms connecting with supportive and like-minded organisations. As a growing innovative sustainable start-up, Case J has been part of Accelerator programs to further develop the business idea and modular platform.

Figure 13 shows Case J ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 13. Case J ego-network




Structurally, no relevant structural holes and brokerage positions have been identified in Case J ego-network.

The nature of the platform-based offering brings together a cluster of actors in the customer side, connecting food producers, retailers and shoppers. Thus, Case J holds a bridge position being part of several clusters of customers.

Case J is also embedded since inception in **clusters** of **higher-level organisms**, composed of diverse CE and sustainability actors where Case J connects with like-minded organisations and start-ups.

Moving to the composition, regarding intensity of ties, Case J maintains **relational intensity** with all platform members, being the producer and the retailer the most relevant actors for the development of the pilot.

Similarly, and linked to the educational work that Case J develops to create awareness regarding waste prevention, relational interactions also take place with clusters of higher-level organisms as well as end users and organisations within the food industry.

**Multiplexity** of roles is observed in food shoppers which act as **end users** as well as collaborators in the development of the platform App.

## 5.10 Case K: Promotion and marketing platform

### 5.10.1 The value capture process

Case K is currently at the stage of testing the scalability of the platform technology through several pilots. At this stage, knowledge and strategic value outcomes emerge from advanced services. In order to capture such value outcomes, Case K is undergoing production and platform activities. Collaboration is required to integrate intellectual and financial resources as well as to reduce the risks associated with the lack of alignment of platform members.

Table 26 shows a summary of Case K value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) and external needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Knowledge: market intelligence – benchmark<br>Strategic: strategic position – first mover | Production: feasibility tests | **Internal** | Intellectual resources: specialised knowledge | Integration: academia |
| | | | Financial resources: money | Integration: funding bodies |
| | Platform: platform implementation | **External** | Platform members' lack of alignment | Risk reduction: higher-level organisms |

Table 26. Case K value capture process

Regarding value outcomes, piloting advanced services provides Case K with unique **performance data** increasing its market intelligence to achieve a proof of concept to **benchmark** in the market:

*"So we, the on-off printing of textiles does not exist at scale, like you cannot remove a print or a dye from a textile and maintain the integrity of the textile itself. […] we'll do a pilot […] And just like really round out a proof of concept. […] proof concept for the collection and reprocessing technologies."* Case K - Promotion and marketing platform

The **uniqueness** of the platform-based offering together with the **alignment** with the sustainable trends in the industry, also provides Case K with a strategic position to create awareness and gain visibility as a **first mover** in the promotion and marketing industry:

*"And then we'll do a case study and publish it […] It's about definitely getting attention. Also in the network, also in the extended Circular Economy network, so outreach. […] promotion of the concept and the idea. […] We also aren't putting it out, we aren't like prospecting a bunch of companies. The ones that are close to the project would see value in this anyway. That's one of the reasons we need to do those pilots is to get that visibility"* Case K - Promotion and marketing platform

In order to capture such value outcomes, Case K is undergoing the feasibility **testing** required to refine the technology and identifying potential pilot partners to **implement** he platform.

*"so once we get a feasibility study, depending on how it's looking, we'll either do another to refine the technology or go to a pilot"* Case K - Promotion and marketing platform

Case K's need for intellectual resources and financial constraints together with the lack of alignment of platform members to join the pilot call for collaboration in the value capture process

Internally, Case K needs **specialised knowledge** to upgrade the current technology to pilot advanced services at a scaled level in the market:

*"we realised we are not able to do it on, with the technology we had"* Case K - Promotion and marketing platform

In order to address this need, Case K collaborates with **academia** to integrate their **specialised knowledge** in the process:

*"we had to go back and look for researchers to develop technology which will be more scale, medium-industrial scale […] we are in contact with two different research institutions"* Case K - Promotion and marketing platform

Case K requires considerate financial resources to deploy the feasibility **testing**:

> *"To get the feasibility studies funded. Because they're very expensive, actually. Last time happened to be very expensive."* Case K - Promotion and marketing platform

In order to proceed, Case K relies on the integration of **public funding** as a way to unlock the development of technology:

> *"there's only so many grants out there, so you just kind of have to wait for one to pop up and then decide if you want to go for it or not. […] we just don't really want to go to private investors, like we'd rather get it from grants because there's a lot of money in sustainability right now and we also don't really want to have to answer to other people who want their money back on their terms."* Case K - Promotion and marketing platform

Case K's advanced services relies on a distributed platform system where several partners collaborate in the application of the technology. Pilot partners', thus, need to be **aligned** in order to successfully test the offering in the market:

> *"So it's not just like us holding a monopoly on the thing, it's like us sharing the technology with people who've been operating in this space for some time, family businesses, you know, in a local capacity […] we're planning on utilising people that already specialise in that to offer those services."* Case K - Promotion and marketing platform

The embeddedness of Case K within several **clusters** of **higher level** CE and sustainability organisms provides the **influence** to reduce the risks of misalignment through the word-of-mouth of like-minded organisations:

> *"We work in the industry so just kind of like wider circular fashion industry. We're part of the [CE SME support program] start-up […] the [Regional sustainable fashion organism 1], the [Regional sustainable fashion organism 2] board, the initiative on Circular Economy, we're also part of their network. And actually we also, through one of our research partners, we know that there is a corporate partner who might be interested in implementing the technology.*" Case K - Promotion and marketing platform

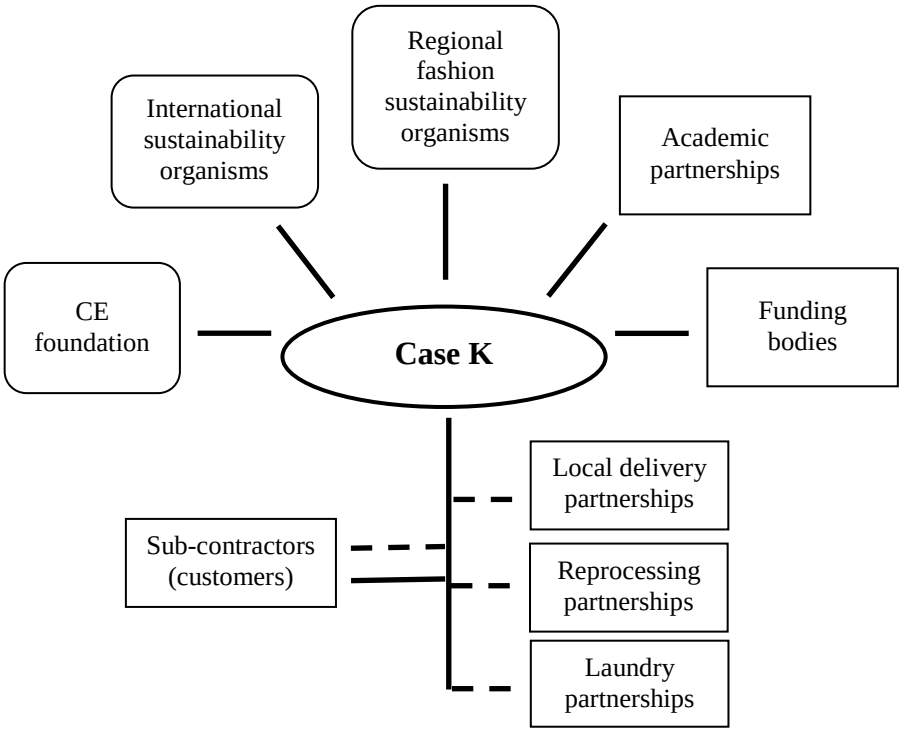
### 5.10.2 The ego-network structure and composition

The ego-network of Case K is composed by the partners collaborating in the technology development and those involved in the implementation and application of the platform. Academia and funding bodies are crucial from the technological side, whereas sub-contractors partners can

be distinguished among the distributed platform implementation side of the ego-network. Case K is part of several clusters of higher-level international and regional CE and sustainability organisms connecting with supportive and like-minded organisations in the field of sustainable fashion.

Figure 14 shows Case K ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 14. Case K ego-network




Structurally, **structural holes** remain between Case K and end users, as the manufacturer's aim is to promote and increase its customers' interaction with end users rather than assuming that role through advanced services:

> *"But more of the USP is helping the companies we work with facilitate those types of conversations with their own customers."* Case K - Promotion and marketing platform

Consequently, intermediate customers hold a **brokerage position** to control the flow of information between them:

> *"We will have our message spread to the end customers because we will have the message of how much savings in terms of the environmental impact has been created through the use of our products. And actually so through social media and*

*hashtags, we will also have the experience of the end users. And by getting the collected product, again we will have this also where we can have contact with the end users."* Case K - Promotion and marketing platform

The nature of the platform-based offering brings together a cluster of actors in the customer side, connecting sub-contractors, reprocessing, laundry and delivery partners. Thus, Case K holds a bridge position being part of several clusters of customers:

*"We don't want to just take over and, you know, ourselves, the promotional materials market, we want to help upscale the people that are already operating in the space and that helps fulfil a more localised solution because you can buy-in production facilities closer to venues. So we're looking at renting shops, re-processers, laundry, people that have the capabilities to deal with like medium-scale industrial production."* Case K - Promotion and marketing platform

Case K is embedded since inception in several **clusters** of **higher-level organisms**, including a regional cluster of organisms supporting sustainable fashion development as well as international CE and sustainability clusters:

*"We're in a lot of kind of networking groups, […] Yeah, they are, you know, they all, they have their own network but there is overlap in some way, in some ways. It's not like, yeah, it's a wider eco-system that has some crossover, I would say."* Case K - Promotion and marketing platform

Moving to the composition, regarding intensity of ties, Case K's maintains relational interactions with academic partners currently collaborating in the development of the technology:

*"There's a few researchers at, that are working on it but it's very much at lab scale. So we are in conversations with them […] Yeah, so we, we are in contact with two different research institutions"* Case K- Promotion and marketing platform

Relational interactions also take place within the clusters of higher-level organisms in which Case K is embedded, often participating in awards and events:

*"We are often also participating in contests and awards, applying for awards."* Case K - Promotion and marketing platform

## 5.11 Case L: Wearable technology

### 5.11.1 The value capture process

Case L is currently at the stage of building an initial customer base launching the offering in the market with early adopters. At this stage, strategic value outcomes emerge from advanced

services. In order to capture such value outcomes, Case L is undergoing production activities. Collaboration is required to integrate financial resources and to optimise the production of the final prototype to meet stakeholders' interests.

Table 27 shows a summary of Case L value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) and external needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Strategic: strategic position – first mover | Production: hardware, software, feasibility tests and certification | **Internal** | Financial resources: money | Integration: investors |
| | | **External** | Stakeholders' interests | Efficiency: end users |

Table 27. Case L value capture process

The **uniqueness** of the advanced services offering together with its **alignment** with the digital trends provides Case L with the opportunity to achieve a strategic position as a **first mover** launching the product in the market:

> *"and we want to be one of the first movers in that new era where people are aware of the value of their data as a commodity."* Case L - Wearable technology

In order to capture such value outcome, Case L is undergoing **production** activities to finish the prototype, the software, the **testing** and the **certifications** required to market advanced services.

> *"like the production-ready prototype will be completely finished, software will be done, it'll be fully tested, it'll be fully certified and all the rest of it."* Case L - Wearable technology

Case L's financial constraints together with the need to meet stakeholders' interests call for collaboration in the value capture process.

Internally, Case L requires **money** in order to finalise the development phase:

> *"we haven't got any consistent development flow, because of money. […] so it's been get lots of money, get lots of money, get lots of money, spend it all. Get some more, get some more, get some more, spend it all."* Case L - Wearable technology

In an industry dominated by intangible offerings, Case L recognises a higher degree of difficulty to prove the viability of the business for public funding:

*"It's much more difficult because it takes a lot more effort to test it. With an application, you can smash together a proof of concept in a week. We took three years to build our first proof of concept and that turned up last week. Yeah. So the thing is, as well as proving the concept, you have to prove the market need and you have to prove the underlying technology works and all this stuff and it costs a huge amount of money to do it."* Case L - Wearable technology

Case L, however, has found a lot of support in **investors** from well-established high-tech MNCs to integrate the required financial resources:

*"they want to do it because they feel like they're with technology, that they're pushing technology, you know, that they can be part of it. And it's really, really great working with these people in this sector that, you know, everyone has a certain level of vision which is really, really cool. […] My feeling is that they just want to do something interesting. […] they're not worried about revenue. You know, these are multi-billion-dollar companies."* Case L - Wearable technology

Externally, given the time and money required to work on advanced services, Case L is facing the need to set an aggressive timeline to finalise the development phase in order to provide **stakeholders** with a tangible advanced services offering from concept to reality:

*"But, yeah, so in the next six weeks to two months, we'll have a large tranche of money comes in and then at that point, we will be, we have a very, very aggressive production schedule, R&D schedule […] Yeah, we can't afford any longer. Yeah, we need to do it as efficiently and as aggressively as possible."* Case L - Wearable technology

In order to satisfy such timeline, Case L's direct contact with **end users** (early adopters) has emerged as a supportive resource to **optimise** the testing protocol through direct feedback outside of lab premises:

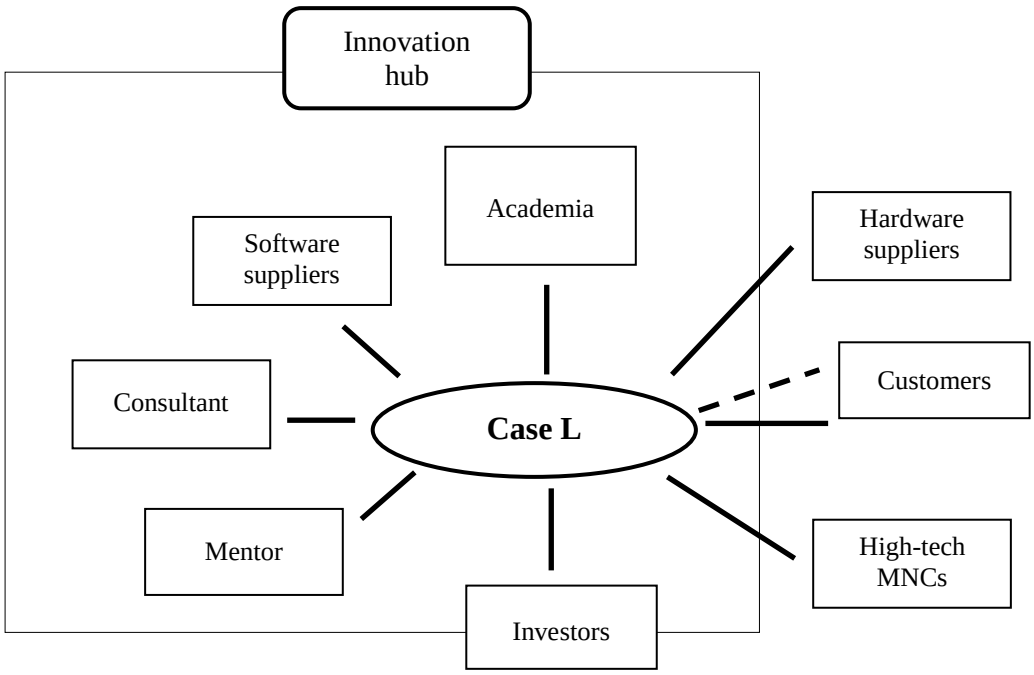
*"in terms of actual user testing, we, because of this relationship we've got with all these people from the crowd-funding campaign, […] We've got, we've had good conversations and done video chats with specific individuals from the campaign who are going to be wearing the device and we'll be able to stay with them during the, because there's no point doing it in a laboratory. We'll go out with them, try and keep a low profile and see how they use the device during the day, debug it on the fly, work out what usability issues there are and stuff like that."* Case L - Wearable technology

### 5.11.2 The ego-network structure and composition

The ego-network of Case L has been developed under the umbrella of an innovation hub in the UK characterised by interconnected actors and a supportive mindset towards innovative ideas. Under such ecosystem, connections have been established with suppliers, consultants, academia, and mentorship. Case L is embedded in international high-tech clusters of like-minded organisations. Case L orchestrates this network of actors leveraging on their expertise and integrating key activities and resources to best achieve its goals.

Figure 15 shows Case L ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Figure 15. Case L ego-network




Structurally, the nature of Case L location and embeddedness implies that all ego-network actors are somehow connected with no relevant structural holes or brokerage positions identified.

Case L is embedded since inception in the **cluster** of the **Innovation hub** in which is located, where a variety of actors collaborate in parallel projects:

> *"outside our project, yeah, definitely. I mean, some of them, obviously certain large operating system providers, for example, [Software supplier] they ship billions of products and they're in everything, in every phone, every light switch."*
>
> Case L - Wearable technology

Case L is at the same time embedded within a global **high-tech cluster** of actors linked through their industrial activity. Such cluster is characterised by high-tech MNCs and investors supporting emerging projects in the industry:

> *"And it's really, really great working with these people in this sector that, you know, everyone has a certain level of vision which is really, really cool.* […] *the bottom line is important but when hi-tech is, I like technology when, at its purest, which is just when you're doing it for the sake of it, because it's cool, you know, and it excites people and it excites the people who work in this arena."* Case L - Wearable technology

The Innovation hub stands out as a relevant bridge in the ego-network as it has provided links to external research clusters for further partnerships with Case L:

> *"we've got the other potential project with [University]. […] yeah, so that's an [European funding body], for the time being, funded project in healthcare. […] And it just turned out that we were like, "Well, that sounds like a nice thing to do. Let's do that, because it's worthwhile," probably do some development off the back of it, be able to share our findings and, you know, be further involved in the community."* Case L - Wearable technology

Moving to the composition, regarding the intensity of ties, Case L frequency of interaction with software and hardware suppliers has been dependent on funding:

> *"That varies. That varies because we haven't got any consistent development flow, because of money […] But whilst we're… when we have got money, these conversations will be going on all the time. Yeah, we don't just lose contact with everyone, we like to keep talking."* Case L - Wearable technology

Case L recognises that the collaborative spirit of all of them has been crucial for the development of advanced services as Case L heavily relies on the specialised knowledge of external parties:

> *"The collaborative spirit. It's more important than anything else. […]Yeah, so we wouldn't say any one of say, any one of the people there on that page is more crucial than any of the others, it's all part of a big tapestry. […] I mean, we can integrate them all together but only the third parties know how to get the absolute best out of their systems."* Case L - Wearable technology

Regarding customers, Case L maintains **relational intensity** through close and collaborative interactions with **early adopters**, whose continuous feedback and support has been crucial to reach the current final phase:

*"We've got nearly 600 of them and they are exactly, you know, there's a varied bunch of people but they are tech-savvy, early adopters, exactly the B2C customer that we envisage […] we know who our customers are, we know what our market is. Yeah, we know them by name"* Case L - Wearable technology

Interactions with academia are also frequent due to the intrinsic presence of universities within the Innovation hub in which Case L is located:

*"everybody's intrinsically linked to the, you know, to the universities. […] so we end up talking to loads of people and then you find out that you're not really talking to a person, you're talking to them as a representative of their department."* Case L - Wearable technology

An important mention must be made to the multiplexity of the Innovation hub which provides Case L with more than an office space but an embedded community of actors sharing a likeminded innovative and collaborative spirit, which has opened many doors supporting Case L development:

*"So I think without everything we've talked about, this would just be an idea. We've been really aggressive about getting those people interested, you know, finding those people and getting them interested. A very big part of that has been coming here. [Innovation hub] really, the glue that…Yeah, definitely, for building, for opening doors and building connections. All of the relationships, well, not all of the relationships, the hardware relationships we'd already established but the other relationships from the local community around here, you know, they've all stemmed from being embedded into this environment."* Case L - Wearable technology

**Multiplexity** of roles is also observed in **end users** which act as customers as well as collaborators in the testing of the final prototype.

## 5.12 Case M: E-commerce packaging platform

### 5.12.1 The value capture process

Case M has developed a pilot with 13 medium-sized apparel brands to validate the offering in the market and it is currently at the stage of applying the learnings to start growing the business. At this stage, economic and personal value outcomes emerge from advanced services. In order to capture such value outcomes, Case M is undergoing production and platform activities. Collaboration is required to integrate financial resources as well as to reduce the risks associated with the lack of alignment of platform members.

Table 28 shows a summary of Case M value capture process identifying the emerging value outcomes and key activities, highlighting the internal (key resources) and external needs for collaboration and the key partnerships supporting them.

| **Value capture process** | | | | |
|---|---|---|---|---|
| **Value Outcomes** | **Key activities** | **Need for collaboration** | | **Key partnerships** |
| Economic: market share<br>Personal: referrals | Production: upgrading advanced services | **Internal** | Financial resources: money | Integration: investors |
| | Platform: platform implementation | **External** | Platform members' lack of alignment | Risk reduction: platform members |

Table 28. Case M value capture process

Applying the learnings from the pilot allows Case M to increase its **market share** expanding its **customer base** to current single-use packaging users:

> *"We're seeing that a lot where people are trying to, kind of waking up to the fact that their current practices are not sustainable and not scalable and looking for a more sustainable alternative to that. […] it's a problem within the industry right now, so we're really trying to provide that technology to solve for a lot of those problems"* Case M - E-commerce packaging platform

Personal value outcomes in the form of **referrals** also emerge from the development of a larger **customer base**:

> *"all the customer companies that we worked with for our pilot year actually came to us, so all just word of mouth […] so the more shippers we have out there, the more it touches and then the more that people talk about it and then it kind of just starts to spread."* Case M - E-commerce packaging platform

In order to capture such value outcomes, Case M is currently **upgrading** the product and technology to expand advanced services and selecting the adequate partners to **implement** it.

> "*So we're continuing to expand with our customers and we're also expanding the shipper offering and then expanding the data that we're providing them. So our 2019 focus is really developed on taking all those learnings from 2018 and tweaking that foundation so we can scale even more."* Case M - E-commerce packaging platform

Case M's financial constraints together with the lack of alignment of potential platform members call for collaboration in the value capture process.

Internally, Case M requires **financial resources** in order to upgrade the packaging and platform technology to expand the current advanced services offering:

> *"So part of our pilot experience was kind of talking to them more about what would be useful and helpful information […] So we've created a roadmap with what the brands have been asking us in mind, so it's kind of a question of how quickly we can get those out and available and start collecting that additional information."* Case M - E-commerce packaging platform

In order to progress in the customer base growth, Case M relies in the integration of **investors**' money raising funds as a way to unlock the development of key activities:

> "*I do believe that it should be supported by grants and things like that too but it should be just as likely to get conventional funding and resources because of the fact that it makes sense on a business level […] So we're raising a round of funding"* Case M - E-commerce packaging platform

Externally, Case M growth is challenged by the **lack of alignment** of end users, whose behaviour is stagnated within the linear usage model of use and dispose (or recycle) rather than re-use threatening Case M advanced services offering's life cycle:

> *"the two that I was kind of really listing that we continue to see in our learnings of last year, which is the consumer behaviour change and then also just the shift in the return process […] that's a huge educational piece for the consumer behaviour change."* Case M - E-commerce packaging platform

Collaboration with **platform members** represents a way to reduce the risks associated with end users' behaviour, leveraging on their resources and direct contact to **train** them in the use of the platform:

> *"some of our subscription companies that had already trained the customer to return the product because they were renting it, that we only had 1% shipper loss and our return rate was four times in one month versus traditional ecommerce companies, we had anywhere from 5% to 10% shipper loss and the return rate was twice per month. So it shows that consumers are trainable and that they will shift over time, it just takes that education."* Case M - E-commerce packaging platform

Case M has also face the inertia in the logistics of larger customers, where changes in their already established systems are seen as a time consuming burden:

> *"Yeah, it's mostly just the workflow logistical changes […] some of these more medium-to-large companies, that they've spent so much time implementing*

*logistics and operations that sometimes they're hesitant to change at all, knowing that it does take time to do it."* Case M - E-commerce packaging platform

Part of Case M advanced services is the **training** and assistance to help customers' figure out their logistics requirements and implementation, which in close collaboration with **fulfilment centres** reduces the risks associated with their **lack of alignment**:

*"with that subscription, it includes the shipper rental, the maintenance of those shippers, the logistics, so helping them figure out logistics at the fulfilment centres […] So when we're working with those fulfilment centres, it's about making sure that that process […] is either made quicker or at least the same when you switch over to putting it into one of our shippers. So if at any point that that becomes less efficient, then we need to work through that"* Case M - E-commerce packaging platform

### 5.12.2 The ego-network structure and composition

The ego-network of Case M is divided between the customer-side integrated platform of organisations and the production and repair centres. The technology allows current customers (apparel brands) and end users, together with their respective fulfilment and distribution centres, to leverage on the accumulated platform data. Case M has developed partnerships with 2 factories in Mexico and China for the production of the packaging and one US-based repair centre to maintain the quality of packaging over cycles. Design, prototypes and testing of new packaging are developed in-house before scale production in the factories. Case M forms part of clusters of higher-level organisms composed by international sustainability organisms and like-minded organisations. As a growing innovative sustainable start-up Case M has been part of Accelerator programs to further develop the business idea.

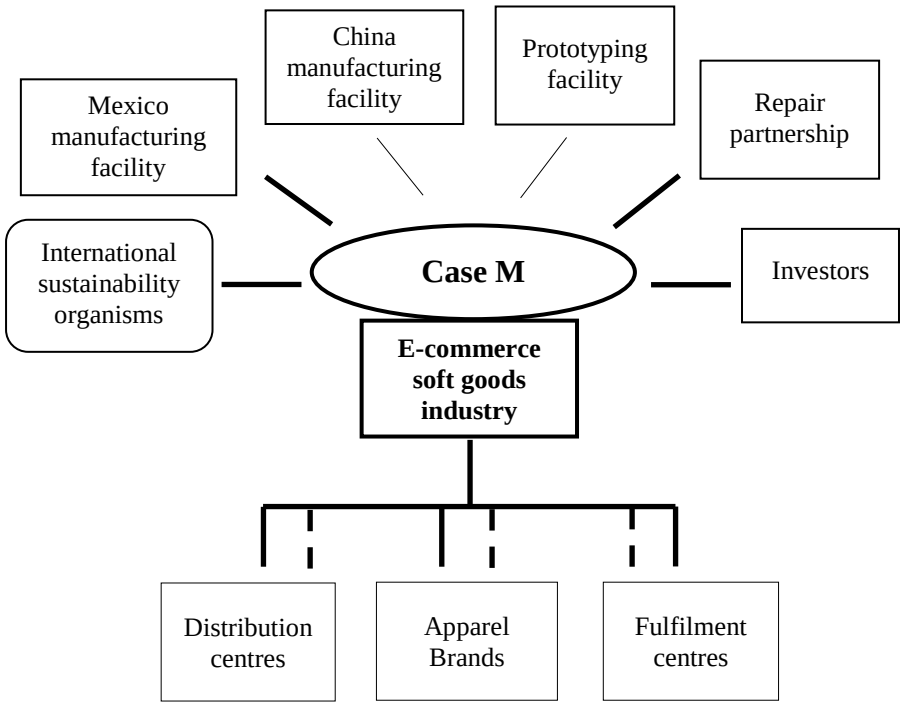
Figure 16 shows Case M ego-network diagram, with thicker lines representing strong ties and dotted lines representing under development ties. The following paragraphs describe the main structure and composition characteristics in relation to advanced services.

Structurally, **structural holes** are present in the customer side between Case M and end users. Case M does not want to interfere in the relationship between customers and end users leaving end users' communication and experiences in the hands of apparel brands. Thus, customers hold a brokerage position being able to control the flow of information between them.

*"So it's through the brands at the moment […] If anything, part of the reason why we kept our bag so agnostic and not so like branded in a lime green layer or anything is that we're kind of meant to be the packaging supplier, we're not meant*

*to interfere with that relationship when it comes between the brand and consumer."* Case M - E-commerce packaging platform

Figure 16. Case M ego-network




Powered by the nature of the platform-based offering, Case M holds a bridge position being part of several clusters of customers comprising apparel brands, fulfilment and distributing centres and end users:

*"It's the same across the board, so everyone has access to the information around their fleet of shippers, the environmental impact and tracking, and label creation, so it's kind of shipping procedures. […] So the fulfilment centre has their own log-in, the brand does and then the consumer does as well, the end consumer."* Case M - E-commerce packaging platform

Case M platform also allows customers to connect to other brands in the apparel industry:

*"it allows them to connect with other brands and integrate everyone's data in one place. So I think, for us, it's about being able to make that data available to each brand, whether they're small or large, in a way that's most useful for them in their growth goals."* Case M - E-commerce packaging platform

Case M is also embedded since inception in **clusters** of **higher-level organisms** supporting the development of innovative sustainable start-ups and connecting Case M with like-minded organisations:

*"a lot of the companies, well, all the customer companies that we worked with for our pilot year actually came to us, so all just word of mouth, so I think they were all different companies that had been already looking for a sustainable alternative, so it was an easy match."* Case M - E-commerce packaging platform

Moving to the composition, it is important to note that the nature of the platform-based offering and the embeddedness of Case M promotes a shared sustainable mindset across partnerships facilitating goal alignment and collaboration:

*"And so when we talked to the brands about our plans for future rollouts and future data collection, they've been really excited because it's already in line with the things that they've been trying to figure out or try to sort out."* Case M - E-commerce packaging platform

*"a commitment and their values in sustainability. And, you know, a lot of these factories and the people we work with, it's just a real collaborative, you know, environment as well, so we're all working together towards those same values. So it makes it usually a really successful partnership with our objectives and goals."* Case M - E-commerce packaging platform

Regarding frequency, relational intensity takes place with platform members in general, where interactions vary across the implementation. With customers, it evolves from weekly to monthly once the initial implementation phase of advanced services are developed:

*"So at the beginning stages, I would meet with a lot of them weekly and now, as we've worked together for a year, I meet with them either bi-monthly or once a month just to have those general conversations of how things are going within the fulfilment centre, with logistics"* Case M - E-commerce packaging platform

With fulfilment centres, there is a high frequency at the beginning when logistics need to be figure out and more assistance and training is required:

*"basically what we do is we train them in the beginning, so everyone knows how to handle packages from the very beginning […] So that's something that's part of the logistic help that we help them with, on-boarding the fulfilment centre so they understand the new workflow."* Case M - E-commerce packaging platform

With production factories and the repair centre, frequency varies from daily to monthly dependent on product quality needs as well as on new prototyping requirements:

*"Well, it just depends on the phase that we're in. So if we're in a prototyping phase, we are interacting with them daily to ensure that those prototypes are going well. And then as we go into production, that we're maybe weekly, bi-weekly, and*

*then as the shipment starts to come over, we're interacting a little bit more regularly. So, all in all, it just depends on that cadence of where we are in the development phase"* Case M - E-commerce packaging platform

Multiplexity of roles can be observed in the production factories regarding the sourcing of materials. Case M shippers are made of recycled billboard material which is sourced by the Mexican factory which also produces the final product:

*"So our, part of our manufacturer, that's part of their task as well, so our manufacturer works directly with the supplier to get the materials. And the one in Mexico, I believe they work with somebody who pulls it from the dump before it gets tossed in […] and then the manufacturer kind of works around what parts of it are still reusable versus what might have been too tattered."* Case M - E-commerce packaging platform

Some customers apparel customers also hold a double role in which Case M has agreed to collect their used billboards as material sourcing for prototyping in the US:

*"Yeah, all the ones we receive, we can reuse and then we're actually starting to brand partner a little bit with our current brands who are using billboards for their marketing and we can use those on the lower scale, for all of our prototyping, so all those billboards go to our prototyping facility in [City]."* Case M - E-commerce packaging platform

## 5.13 Summary

This chapter has reported the insights of the within-case analysis and provided an in-depth understanding of each of the cases comprising this study. Value capture and ego-network narrative stories have been described and illustrated through tables and figures within each of the case sections.

The value capture narrative story has provided a detailed account of the manufacturer's process at the introduction stage of advanced services provision. Value outcomes, key activities and key partnerships have been identified highlighting the collaborative nature of the value capture process for each of the cases. The ego-network narrative story has provided an in-depth view into the manufacturer's extended embedded context, highlighting the structure and composition characteristics with regards to advanced services.

The insights provided through within-case stories comprise the context-specific knowledge required for the understanding of the following chapter's higher-level cross-case presentation.

# CHAPTER 6 CROSS-CASE ANALYSIS AND FINDINGS

This chapter reports the insights of the analysis providing a comparison and interpretation of data across cases. The chapter is divided into three main sections according to the research questions:

- RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?
- RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?
- RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?

Within each section, main insights and relationships across cases are identified and explained. Concluding each section, insights and relationships supported by evidence from a larger number of cases are retained and condensed into the answers to the research questions presenting the findings of the study.

## 6.1 Value capture process: forms of value

This cross-case analysis looks for patterns through the comparison of value outcomes across cases. The objective is to identify the main forms of value and how those emerge for the manufacturer introducing advanced services in the market. To do so, strategic, knowledge, economic and personal value outcomes are examined and compared highlighting and explaining main insights and relationships across cases. Table 29 provides a summary of the value outcomes and how those emerge through specific sources of value for manufacturers.

| | Value outcomes | | Sources of value | Cases |
|---|---|---|---|---|
| **Strategic** | Strategic position | First mover | Uniqueness of the advanced services offering and alignment with industry trends | C, G, H, K, L |
| | | Power balance | Transformation of current transactional customers of commoditised products into advanced services partnerships | D |
| | Uncertainty reduction | | Physical evidence of the advanced services offering viability in the market | A, B, D, E, F, G, J |
| **Knowledge** | Market intelligence | Accuracy | Customers' usage experiences data | C, E, F, G, J |
| | | Benchmark | Product-service performance data | A, B, H, K |
| **Economic** | Cost reduction | | Expansion of advanced services supplier base (circular value network) | G |
| | Market share | | Expansion of advanced services customer base | M |
| **Personal** | Referrals | | Expansion of advanced services customer base | M |

Table 29. Value outcomes and sources of value for manufacturers

### 6.1.1 Strategic value outcomes

Strategic value outcomes emerge for manufacturers as an opportunity to achieve an increased competitiveness in the market (section 2.2.6). For instance, the achievement of a strategic market position or the access to otherwise unavailable resources can constitute strategic value outcomes for manufacturers. The analysis shows that strategic value outcomes emerge for 10 cases, where the increase in competitiveness is achieved through **uncertainty reduction** and the achievement of a **strategic position**.

**Uncertainty reduction** emerges through **physical evidence** from the viability of the advanced services offering in the market. The intangibility of services challenges the ability of manufacturers to demonstrate its added value to customers in comparison to products. Physical evidence, such as the *success stories* of participants in a pilot, serves to demonstrate the viability of the specific advanced services offering in the market. Such physical evidence allows to reduce the external reticence of current and potential customers (and suppliers) to adopt advanced services.

The analysis shows how Case A, B, F and J pilot with customers in the market increases the confidence and reduces the uncertainty of potential customers to adopt advanced services. For Case G, whose customers are ready to adopt advanced services, the **physical evidence** allows to reduce the **uncertainty** of suppliers instead (see circular value network in section 5.7.1). Case D and E transformation of transactional customers into advanced services partnerships also serves as **physical evidence** to reduce the **uncertainty** of further customers to adopt advanced services.

The achievement of a **strategic position** emerges due to an increase of **power** for the manufacturer. The increase of power can take place indirectly, when others decrease their power, or directly, when the manufacturer increases its own power in the market. An existent unequal relationship with transactional customers can be balanced through their transformation into advanced services partnerships as customers decrease their bargaining power. The introduction of advanced services also allows manufacturers to directly increase their power becoming a **first mover** in the market.

The analysis shows how Case D is able to achieve a **power balance** in the relationship with transactional customers through their **transformation** into advanced services partnerships. As a **commoditised** manufacturer, Case D finds the opportunity to become a more valuable partner for its customers. Case C, G, H, K and L are able to increase their power in the market becoming **first movers** in their respective markets. The **uniqueness** of the advanced services offering together with its **alignment** with industry trends provides the right scenario to build barriers of entry against competitors as a first mover introducing advanced services in the market.

Comparing strategic value outcomes across cases, uncertainty reduction and the achievement of a strategic position are influenced by the target market where advanced services is introduced. The reduction of uncertainty is more prone to emerge for those cases introducing advanced services to current transactional customers or in markets where customers are reticent to adopt the offering. The same applies to the achievement of a power balance position, but in this case, the target market is characterised by the provision of a highly commoditised product. In contrast, a first mover position is more prone to emerge for those cases introducing advanced services to supportive early adopters or in markets where customers are open to adopt the offering.

### 6.1.2 Knowledge value outcomes

Knowledge value outcomes emerge for manufacturers as an opportunity to achieve an increased innovativeness (section 2.2.6). For instance, the co-development of advanced services with customers or the integration of an innovation to implement advanced services in the market can constitute knowledge value outcomes for manufacturers. The analysis shows that knowledge value outcomes emerge for 9 cases, where the increase in innovativeness is achieved through the accumulation of **market intelligence**.

**Market intelligence** emerges through the collection of **performance data** and **customers' usage experiences data**. The accumulation of market intelligence through performance and usage data allows manufacturers introducing advanced services to be a step ahead of competitors. Such unique data provides the required information to establish first-time advanced services **benchmarks** in the market and to continuously increase the **accuracy** of advanced services adapting the offering to customers' dynamic needs.

Leveraging on **performance data**, the analysis shows how Case A, B, H and K are able to establish a **benchmark** for advanced services in a market where no similar offering is available. The knowledge on the product-service performance acquired with the introduction of advanced services allows the manufacturer to quickly establish thresholds to which competitors must adhere acting as a barrier of entry.

Case C, E, F, G and J are able to better understand and to identify how to accurately satisfy specific customers' needs leveraging on unique customer's usage experience data. The knowledge on **customers' usage experiences** acquired with the introduction of advanced services provides the manufacturer with the opportunity to increase the **accuracy** of the advanced services offering through unique information otherwise unattainable by competitors acting as a barrier of entry.

Comparing knowledge value outcomes across cases, the accumulation of market intelligence is influenced by the nature of the value proposition and customers' usage experiences. The establishment of a benchmark and the increase in accuracy are more prone to emerge at the introduction stage of advanced services for those cases whose value proposition applies across

customers (i.e. Case E customisation of platform configuration to address customers' specific needs and operations). In other words, the higher degree of contextual variety in customers' usage experiences (i.e. Case D and L) would require manufacturers to collect data over a longer period of time and over a larger customer base in order to be able to capture similar market intelligence value outcomes. Additionally, the establishment of a benchmark is conditional to the lack of similar alternative offerings in the market.

### 6.1.3 Economic value outcomes

Economic value outcomes emerge for manufacturers as an opportunity to achieve a financial benefit (section 2.2.6). For instance, increased profits or an increase in market share can constitute economic value outcomes for manufacturers. The analysis shows that economic value outcomes emerge for 2 cases only, where the financial benefit is achieved through **cost reductions** and an increased **market share**.

**Cost reductions** emerge as a result of **expanding** the advanced services **supplier base** (see circular value network in section 5.7.1). Transforming transactional sourcing costs into advanced services contracts allows manufacturers to reduce costs aligning the implementation of advanced services along upstream and downstream ends of the supply chain. Unique across cases, the analysis shows how Case G leverages on the beta test of the mobility offering to implement advanced services upstream the supply chain. Consequently, Case G reduces the higher costs of manufacturing a product designed with cross-industry technology and materials.

An increased **market share** emerges as a result of **expanding** the advanced services **customer base**. Expanding the introduction of advanced services to markets currently supplied by traditional offerings allow manufacturers to increase market share. A step beyond other cases, the analysis shows how Case M has already piloted advanced services in the marked and built an initial customer base. Case M is currently applying the learning of the pilot into expanding its market share targeting customers in markets that are being supplied by traditional offerings.

Comparing economic value outcomes across cases, cost reductions and an increased market share are conditional to the validation of advanced services in the market. Other cases are yet to capture the strategic and knowledge value outcomes emerging from the pilot or initial customer base, whereas Case G (simultaneously) and Case M are already expanding the adoption of advanced services beyond initial targets. Both Case G and Case M economic value outcomes emerge through the application of the outcomes from the beta test and pilot, respectively. Thus, the capture of the value outcomes emerging from the **validation of advanced services in the market** is a pre-requisite for the emergence and capture of economic value outcomes.

### 6.1.4 Personal value outcomes

Personal value outcomes emerge for manufacturers as an opportunity to leverage on the legitimacy of the relationship with advanced services customers (section 2.2.6). For instance, locking customers in through long-term contracts or being referred to potential customers can constitute personal value outcomes for manufacturers. The analysis shows that across cases, personal value outcomes emerge for 1 case only, where the legitimacy is achieved through **referrals** for Case M.

**Referrals** emerge as a result of **expanding** the advanced services **customer base**. Expanding the introduction of advanced services across markets increases the chances of referrals from a wider variety of customers. The analysis shows how Case M leverages on the word-of-mouth of the pilot companies and subsequent number of customers adopting advanced services to obtain referrals in a market where potential customers are looking for sustainable alternatives.

Comparing personal value outcomes across cases, referrals are conditional to the validation of advanced services in the market. As occurred with economic value outcomes, Case M personal value outcomes emerge through the application of the outcomes from the pilot. Other cases are yet to demonstrate the viability of the advanced services offering to potential customers, whereas Case M is already expanding its customer base after proving the success of the pilot. Consequently, the capture of the value outcomes emerging from the **validation of advanced services in the market** is also pre-requisite for the emergence and capture of personal value outcomes.

### 6.1.5 RQ1. Findings: strategic, knowledge and economic value outcomes

Retaining the insights and relationships supported by evidence from a larger number of cases, Table 30 shows the forms of value emerging for manufacturers introducing advanced services in the market.

| **Forms of value emerging for manufacturers** | |
|---|---|
| **Strategic value outcomes** | **Source of value** |
| Uncertainty reduction | Physical evidence of the advanced services offering viability in the market. |
| Strategic position – first mover | Uniqueness of the advanced services offering and alignment with industry trends |
| **Knowledge value outcomes** | |
| Market intelligence – benchmark | Product-service performance data |
| Market intelligence – accuracy | Customers' usage experience data |
| **Economic value outcomes** | |
| Market share<br>Cost reductions | Value outcomes from the validation of advanced services in the market |

Table 30. RQ1 Findings: Forms of value emerging for manufacturers

In essence, the forms of value emerging at the introduction stage of advanced services provision comprise strategic, knowledge and economic value outcomes, answering the first research question as follows:

- RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?

Uncertainty reduction emerges for those manufacturers whose target customers are reticent to adopt advanced services. The physical proof of the advanced services offering viability in the market allows manufacturers to reduce the uncertainty of current and potential customers.

A strategic position emerges for those manufacturers whose target customers are open to adopt advanced services. The uniqueness of the advanced services offering in the market and the alignment with industry trends allows manufacturers to achieve a first mover position.

Market intelligence emerges for those manufacturers whose value proposition applies across customers (i.e. customisable platform configuration). Data on product-service performance and customers' usage experiences collected allows manufacturers to establish benchmarks as well as to increase the accuracy of the offerings to satisfy customers' needs creating barriers of entry to competitors.

Market share and cost reductions emerge for those manufacturers whose advanced services have been validated in the market. The application of the learnings from the validation in the market allows manufacturers to expand the adoption of advanced services across upstream and downstream targets.

## 6.2 Value capture process: actions

This cross-case analysis looks for patterns through the comparison of key activities across cases. The objective is to identify the actions developed in collaboration with partners by the manufacturer to capture the emerging forms of value. To do so, production, problem-solving and platform key activities are examined and compared highlighting and explaining main insights and relationships across cases.

Table 31 provides a summary of the actions and manufacturers' needs for collaboration, classified as internal if referring to availability of key resources or external if referring to circumstances beyond the boundaries of the manufacturer.

| | Key activity | Internal need for collaboration | Cases | External need for collaboration | Cases |
|---|---|---|---|---|---|
| **Production** | Manufacturing | Human resources: workforce | A, B | Previous failure | B |
| | | Physical resources: components | G | | |
| | | Financial resources: money | B, C, F, G, L | Competition | F |
| | | Intellectual resources: specialised knowledge | C | | |
| | Testing | Human resources: workforce | A | | |
| | | Intellectual resources: specialised knowledge | C, K | | |
| | | Financial resources: money | C, K, L | Stakeholders' interests | L |
| | Certifying | Financial resources: money | L | Stakeholders' interests | L |
| | Upgrading | Financial resources: money | M | | |
| **Problem-solving** | Data management | Intellectual resources: specialised knowledge | A, B, D, F | | |
| | Targeting customers | | | Newness in the industry | A, H |
| | | | | Customers' inertia and cost-driven mindset | B, D, F, H |
| | Targeting suppliers | | | Suppliers' inertia and risk aversion mindset | G |
| **Platform** | Platform configuration | | | Competition | E |
| | | | | Platform members' lack of alignment | J |
| | Platform implementation | | | Platform members' lack of alignment | E, J, K, M |

Table 31. Actions and need for collaboration

### 6.2.1 Key production activities

Key production activities refer to the actions involving the design, production or delivery of an output (section 2.3.2). For instance, the attachment of sensors into a product or the assembly of components can constitute a key production activity. The analysis shows that key production activities are taken by 7 cases, involving the **manufacturing** of the product, the **testing**, the **certifying** and the **upgrading** of the advanced services offering.

**Manufacturing** the product comprises the production of the physical part of the advanced services offering. The resource intensive nature of manufacturing reveals as the activity where collaboration becomes essential due to manufacturers' size and capacity constraints. Internally,

manufacturers' limited availability of key resources challenges the completion of manufacturing, being the lack of **money** the most crucial need for collaboration across cases. Externally, specific past business experiences and current market conditions also call for collaboration. The analysis shows how Case B's joint venture **failure** lowered the credibility of its current manufacturing project whereas market **competition** puts pressure over Case F's speed of production.

**Testing** and **certifying** comprise the activities allowing manufacturers to safely and legally introduce the advanced services offering in the market. Internally, the costs and special requirements of advanced services to be deemed safe and feasible in comparison to traditional offerings call for collaboration due to manufacturers' need for **money** and **specialised knowledge**. Externally, specific demands from interest groups call for collaboration. The analysis shows how **stakeholders' interests** put pressure over Case L's readiness to introduce the offering in the market needing collaboration to optimise the process.

**Upgrading** comprise the improvement of the advanced services offering after its validation in the market. A step beyond other cases, the analysis shows how Case M has already piloted the offering in the market and is currently upgrading the offering according to the feedback and results of the participant companies. As occurred with manufacturing, **money** arises as the key financial resource needed to complete the upgrading of the advanced services offering.

Comparing key production activities across cases, manufacturing, testing, certifying and upgrading reflect a common internal need for collaboration with regards to financial resources. Such situation is driven by the low available liquidity of manufacturing SMEs unable to face the costs and investment required for production activities at the introduction stage of advanced services provision.

### 6.2.2 Key problem-solving activities

Key problem-solving activities refer to the actions involving the creation of new solutions to specific customer problems (section 2.3.2). For instance, manufacturers' visits to customers' premises to understand their needs can constitute a key problem-solving activity. The analysis shows that key problem-solving activities are taken by 6 cases, involving **data management** and **targeting** advanced services to **customers** and **suppliers**.

**Data management** comprises the collection and analysis of the product-service performance and customers' usage experiences data. The digitally-driven nature of advanced services requires the development of problem-solving activities that lie beyond the remit of traditional manufacturing. Internally, this situation calls for collaboration in order to deploy the **specialised knowledge** required to accomplish them. The analysis shows how data management arises as a new activity for Case A, B, D and F, calling for collaboration to offset their lack of digital experience and knowledge needed to address customers' problems through advanced services data.

**Targeting customers** comprises the actions involving the identification and reach of a specific market to whom the introduction of the advanced services offering is aimed at. Targeting the advanced services offering to customers imply a novelty for both manufacturers and customers. Internally, the service culture already present in SMEs shows that manufacturers are ready to target advanced services whereas externally, the specific characteristics of the market calls for collaboration. Markets currently sourced by traditional offerings are characterised by **customers' inertia and cost-driven mindset**, challenging manufacturers' ability to target advanced services. Collaboration is also needed for manufacturers entering **new industries** in order to effectively identify and reach potential customers.

**Targeting suppliers** mirrors the actions involving targeting customers, but advanced services are aimed to the upstream part of the supply chain. Unique across cases, Case G is targeting the advanced services to suppliers in the automotive industry in order to develop a circular value network. As occurred with targeting customers, the external need for collaboration reflects the challenge associated with the target market. Collaboration is needed to overcome the **inertia and risk aversion mindset** predominant in the traditionally transactional automotive industry.

Comparing key problem-solving activities across cases, the need for collaboration is influenced by the manufacturer's business background. The **commitment with a traditional manufacturing business side** challenges manufacturers' capacity to internalise the specialised knowledge required for data management activities. The commitment with a traditional customer base challenges manufacturers' ability to target advanced services beyond their current transactional customers, whose mindset is not yet aligned with the offering. This situation occurs **across cases operating B2B**, where customers' switching costs are higher than those of end users (i.e. early adopters in B2C Case C).

In contrast, manufacturers which are not transitioning but starting an advanced services business since inception have a higher degree of freedom to internalise resources and to select their target market. For instance, Case J, K and M have built its advanced services offering around platform-based technologies being their specialised digital knowledge a distinctive competitive advantage. Case G and L have already selected and reached out to early adopters among a pool of available willing customers to test and adopt their advanced services offerings.

Exceptions to such premise can be found in Case E and Case H as follows. Case E's early adoption of digital skills motivated the development of the advanced services offering. Thus, Case E has transformed what it seems to be a weakness for traditional manufacturers into its internal strength to compete in the market through specialised digital knowledge without the need for collaboration. Case H is targeting the market of industrial customers whose mindset resembles that of traditional manufacturing. Nevertheless, it is important to mention that Case H has only

moved to such reticent market as an extension to the success already achieved by Parent Case H in a more receptive market of e-commerce customers.

### 6.2.3 Key platform activities

Key platform activities refer to the actions involving the management of platform systems (section 2.3.2). For instance, the implementation of the platform-based offering in customers' operations can constitute a key platform activity. The analysis shows that key platform activities are taken by 4 cases, involving the **configuration** and the **implementation** of the platform.

**Platform configuration** comprises the actions setting the advanced services offering to meet the specific needs of customers. Internally, manufacturers offering platform-based advanced services are digitally ready to configure the platform whereas externally, specific market conditions and platform members' characteristics call for collaboration. The analysis shows how the rapid spread of new technologies challenges the ability of Case E to configure a platform ahead of bigger capacity **competitors** in the market. The **lack of alignment** of platform members due to their diverse sizes and capacity challenges Case J's ability to configure a platform App able to meet their specific needs.

**Platform implementation** comprises the actions allowing customers to experience the advanced services offering. Internally, manufacturers offering platform-based advanced services are digitally ready to implement the platform in customers' operations whereas externally, specific platform members' characteristics call for collaboration. The analysis shows how the **lack of alignment** of platform members challenges manufacturers' ability to address their diverse needs, constraining the ability to experience the full potential of the platform.

Comparing key platform activities across cases, the need for collaboration in platform implementation is influenced by **the degree of innovativeness of the advanced services offering in comparison to market alternatives**. In other words, the innovativeness of the platform-based offering affects the ability of members to understand and to properly use the platform given their lack of previous experience with the technology. Internally, manufacturers do not require collaboration as their specialised knowledge covers the functioning, application and potential of the innovative platform-based offering. In contrast, externally, manufacturers need to collaborate to educate on its use and to promote its added value to ensure that members are able to experience its full potential.

### 6.2.4 RQ2. Findings: production, problem-solving and platform activities

Retaining the insights and relationships supported by evidence from a larger number of cases, Table 32 shows the collaborative actions developed by manufacturers in their value capture process highlighting the characteristics that drive the collaboration.

| **Collaborative actions taken by manufacturers** | |
|---|---|
| **Production activity** | **Characteristics driving collaboration** |
| Manufacturing, testing, certifying, upgrading | Low financial liquidity of SMEs |
| **Problem-solving activity** | |
| Data management | Commitment with a traditional manufacturing business side |
| Targeting customers | Commitment with a traditional manufacturing B2B customer base |
| **Platform activity** | |
| Platform implementation | Innovativeness of platform-based advanced services in comparison to market alternatives |

Table 32. RQ2 Findings: Collaborative actions taken by manufacturers

In essence, specific circumstances drive the collaborative development of specific production, problem-solving and platform actions by the manufacturer to capture the forms of value emerging at the introduction stage of advanced services provision, answering the second research question as follows:

- RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?

Manufacturing, testing and certifying activities are developed by manufacturers to finalise the initial or upgraded version of the offering. The low liquidity of SMEs requires the collaboration of partners in production activities to overcome the lack of financial resources.

Data management is developed by manufacturers to collect and analyse the data on product-service performance and customers' usage experiences. The commitment with a traditional manufacturing business requires the collaboration of partners to overcome the lack of specialised digital knowledge.

Targeting advanced services to customers is developed by manufacturers to achieve the validation of advanced services in the market. The commitment with a traditional manufacturing B2B customer base requires the collaboration of partners to overcome current customers' inertia and cost-driven mindset.

Platform implementation is developed by manufacturers to achieve the validation of advanced services in the market and to expand the customer base. The innovativeness of platform-based advanced services in comparison to market alternatives requires the collaboration of partners to overcome the lack of alignment of platform members.

## 6.3 Value capture process: partners' impact

This cross-case analysis looks for patterns through the comparison of key partnerships and ego-networks across cases. The objective is to identify the way in which the nature of the relationship with its partners impact the manufacturer's value capture process. To do so, the extended embedded context is examined and compared according to key partnerships and ego-network characteristics.

### 6.3.1 Key partnerships: roles and partners

Efficiency, integration and risk reduction key partnerships are examined and compared highlighting and explaining main insights and relationships across cases. Table 33 provides a summary of key partnerships according to the partner's role in the value capture process.

| | Role | Partner | Cases |
|---|---|---|---|
| **Efficiency** | Development of low-value activities | Outsourcing organisation | A |
| | Adaptation to advanced services | Established traditional partner | C |
| | | End users | J, L |
| | Access over investment | Cross-industry organisation | C |
| **Integration** | Integration of specialised knowledge | Cross-industry organisation | A, B, C, D |
| | | Academia | C, D, F, K |
| | Integration of specialised components | Cross-industry organisation | G |
| | Integration of public funds | Funding body | B, F, G, K |
| | Integration of private funds | Investors | L, M |
| **Risk reduction** | Provision of transparency | Funding body | B, G |
| | Provision of influence | Higher-level organisms | E, G, J, K |
| | Provision of credibility/confidence | Academia | B, F |
| | Provision of access to customers | MNC | B |
| | | Parent company | H |
| | | MNC | A, D, H |
| | Provision of barriers of entry | Cross-industry organisation | E |
| | | Funding body | E |
| | | Established traditional partner | F |
| | Provision of training | Platform members | M |

Table 33. Key partnerships: motivation, roles and partners

### 6.3.2 Key efficiency partnerships

Key efficiency partnerships are motivated by the achievement of resource and activity optimisation (section 2.3.2). For instance, the outsourcing of low-value activities or the development of several activities by the same partner can constitute key efficiency partnerships. The analysis shows that key efficiency partnerships impact the value capture process of 4 cases,

through the **outsourcing of low-value activities**, the **adaptation to advanced services** and the **access to specialised assets**.

The **outsourcing of low-value activities** allows manufacturers to optimise available human resources focusing on those activities that have a higher impact over the value capture process. The analysis shows how Case A's product assembly is delegated to an **outsourcing organisation**.

The **adaptation** of **established traditional partners** to advanced services and the **access** to specialised assets allows manufacturers to optimise available financial resources avoiding extra costs and investments. The analysis shows how Case C offsets its manufacturing costs through the adaptation of a long-term supplier to the requirements of advanced services' components and the access provided by a **cross-industry organisation** to otherwise costly production facilities and machinery.

The **adaptation** of **end users** to advanced services allows manufacturers to optimise the completion of specific value capture process deadlines. The analysis shows how end users' participation and feedback allow manufacturers to optimise the completion of the advanced services' configuration and testing activities.

### 6.3.3 Key integration partnerships

Key integration partnerships are motivated by the acquisition of particular key resources (section 2.3.2). For instance, the co-development of an innovative project with multiple actors can constitute a key integration partnership. The analysis shows that key integration partnerships impact the value capture process of 9 cases, through the integration of **specialised knowledge** and **components** and of **public** and **private funds**.

The integration of **specialised knowledge** and **components** allow manufacturers to acquire the required intellectual and physical resources from academia and cross-industry organisations. Advanced services differ in many aspects to traditional manufacturing offerings, requiring specialised resources beyond those exploited by the manufacturer or its manufacturing industry. The analysis shows how academic research and practice and cross-industry experience beyond manufacturing represent the preferred sources of **specialised knowledge** and **components** for manufacturers. In addition, their diverse fields of expertise highlight the non-commercial and non-competitive nature of the relationships with **academia** and **cross-industry organisations**, respectively.

The integration of **public** and **private funds** allow manufacturers to acquire the required financial resources from funding bodies and investors, respectively. The low liquidity of SMEs challenges the completion of resource intensive actions at the introduction stage of advanced services provision. The analysis shows how **public** calls for **funding** are more sought than private sources

of funding as manufacturers are able to maintain equity and control over the emerging forms of value. The **investor** culture predominant in Case L's high-tech industry and Case M's home country explain the integration of **private funds** instead.

### 6.3.4 Key risk reduction partnerships

Key risk reduction partnerships are motivated by the reduction of risks and uncertainty associated with particular circumstances (section 2.3.2). For instance, collaborating with a well-known brand to gain credibility in the industry can constitute a key risk reduction partnership. The analysis shows that key risk reduction partnerships impact the value capture process of 10 cases, through the provision of **transparency**, **influence**, **credibility**, **access**, **barriers of entry** and **training**.

The provision of **transparency** allows manufacturers to reduce the risks associated with the reticence of partners to join advanced services projects. The analysis shows how the development of specific advanced services projects with **funding bodies** provides a transparent and cost-effective way for suppliers to collaborate reducing their lack of confidence in advanced services at the introduction stage.

The provision of **influence** allows manufacturers to reduce the risks associated with the lack of alignment of platform members. The analysis shows how partnering with **higher-level organisms** represents a source of influence for the manufacturer due to their wide reach and power in the industry. The analysis shows how governmental bodies, CE and sustainability organisms, chambers of commerce, technological centres and business associations can help increase the awareness and willingness of customers to implement platform-based advanced services. Such influence is also valued by Case G, whose development of a circular value network requires the wider reach of **higher-level organisms** to create awareness among suppliers.

The provision of **credibility** and **access** to customers allows manufacturers to reduce the risks associated with the reticence of customers to adopt advanced services. The analysis shows how partnering with **academia** represents a source of credibility for the manufacturer due to their reputation as education institutions reducing customers' lack of confidence in advanced services. Similarly, partnering with **MNCs** represent a source of credibility due to their reputation as a well-known brand in the industry as well as a direct access to customers through their interconnected and extended supply chains.

The provision of **barriers of entry** allows manufacturers to reduce the risks associated with intense market competition. The analysis shows how Case F's **established** long-term **partnership** with key industry actors acts as a barrier of entry in the public sector. The co-development of **publicly funded** R&D projects with **cross-industry organisations** provides Case E with market differentiation building a barrier of entry against competitors.

The provision of **training** allows manufacturers to reduce the risks associated with the lack of alignment of platform members. The analysis shows how Case M's relationship with **platform members** has developed into a close-knit partnership after piloting advanced services in the market. After the validation, cascade training takes place from more experienced members to those not being able to effectively exploit the potential of the platform-based offering.

### 6.3.5 Ego-network characteristics: structure and composition

The analysis has identified established traditional partners, academia, cross-industry organisations, funding bodies, end users, MNCs and higher-level organisms as the main partners impacting the manufacturer's value capture process across cases. In order to achieve a comprehensive understanding of their impact, there is a need to further analyse the nature of the relationship according to their position in the manufacturer's ego-network (section 3.5.3). Table 34 provides a summary of the relevant ego-network characteristics in relation to the main partners identified.

| Partner | Ego-network structure and composition | Cases |
|---|---|---|
| Established traditional partner | Transactional intensity | A, B, D |
| | Relational intensity<br>Multiplexity | C, E, F |
| End users | Relational intensity | C, G, J, L |
| | Multiplexity | J, L |
| | Structural hole between manufacturer and end users<br>Brokerage position for intermediate customer | H, K, M |
| Academia | Structural hole with the rest of the ego-network<br>Brokerage position for the manufacturer | B, C, D, F, K |
| Cross-industry organisation | Structural hole with the rest of the ego-network<br>Brokerage position for the manufacturer | A, B, C, D, E |
| MNC | Bridge to external clusters of potential customers | A, D, H |
| Funding body | Bridge to external clusters of potential partners<br>Multiplexity | B, C, G, K |
| Higher-level organisms | Clusters (manufacturer's embeddedness) | E, G, H, J, K, L, M |

Table 34. Partners and ego-network characteristics

### 6.3.6 Established traditional partners and end users

Established traditional partners comprise those organisations which were part of the manufacturer's ego-network before the introduction of advanced services. End users comprise those individuals experiencing the advanced services offering. In the ego-network, **intensity** and **multiplexity** are identified in the analysis as the composition characteristics influencing the nature of the relationships with established traditional partners and end users.

**Relational intensity** refers to interactions that take place regularly and/or involve a collaborative exchange whereas **transactional intensity** refers to those that occur occasionally and/or do not involve a collaborative exchange (section 3.7.3). **Multiplexity** of roles highlight those partners which have multiple roles in the manufacturer's ego-network. The analysis determines that the intensity of interactions influences the impact of established traditional partners and end users in the manufacturer's value capture process through multiplexity.

Manufacturers whose relationships with **established traditional partners** are based on **relational intensity** have been able to leverage on their expertise and resources to collaborate in both the traditional and advanced services offerings. If based on **transactional intensity**, manufacturers have not leveraged on their relationship with established traditional partners but rather developed new partnerships to support the value capture process. Therefore, the intensity of the relationship with established traditional partners allow manufacturers to address the value capture process requirements through their **multiplexity** of roles without having to duplicate the deployment of resources.

Manufacturers maintaining relational intensity with **end users** have been able to leverage on their advanced services' usage experiences to act as both a customer and a partner providing the feedback required to progress in the production and configuration of the offering. If a **structural hole** exists between manufacturers and end users, such multiplexity of roles cannot be leveraged as end users' usage experiences take place independently of the manufacturer. In other words, there is no direct contact for the manufacturer to communicate with end users and vice versa.

The consequences of a structural hole can be aggravated by the presence of intermediate customers as **brokerage positions**. The lack of direct contact between manufacturers and end users can threaten manufacturers' capture of value outcomes if intermediate customers are not able to act as a link between them. The analysis shows how Case H's intermediate customer failed to provide essential information required for end users' exploitation of the full potential of the advanced services offering.

In conclusion, maintaining relational interactions with established traditional partners and end users strengthen the relationship allowing for multiplexity of roles in the manufacturer's ego-network. In contrast, transactional interactions or structural holes with established traditional partners and end users challenges manufacturers' ability to leverage on the relationship and in some cases, to keep control over their effect on the value capture process (i.e. presence of brokerage positions). Consequently, the relational intensity of the relationship with established traditional partners and end users allows manufacturers to **optimise available resources** in the completion of value capture activities.

### 6.3.7 Academia and cross-industry organisations

Academia comprise universities and research centres. Cross-industry organisations comprise organisations working in industries different from that of the manufacturer (e.g. software developer). In the ego-network, **structural holes** and **brokerage positions** are identified in the analysis as the structural characteristics influencing the nature of the relationships with academia and cross-industry organisations.

**Structural holes** represent a lack of connection in the manufacturer's ego-network whereas **brokerage positions** are assumed by the actor placed between both ends of a structural hole (section 3.5.3). The analysis determines that the structural holes of academia and cross-industry organisations with the rest of the ego-network influence the manufacturer's control over the value capture process through the adoption of a brokerage position.

Manufacturers' relationships with academia and cross-industry organisations are motivated by the collaboration in specific advanced services projects. **Structural holes** exist between such partnerships and the rest of the ego-network which is not involved in the project. Consequently, manufacturers, by holding a **brokerage position**, have the opportunity to coordinate and take control over the exchange of resources within and outside the partnership. The analysis shows how such partnerships are widely deployed in the development of confidential innovations and high-value activities due to their non-commercial and non-competitive nature.

In conclusion, holding a brokerage position in-between the relationship with academia and cross-industry organisations and the ego-network allows manufacturers to be in a power position controlling the development of advanced services projects. In contrast, a similar collaboration with an industry supplier is more open to opportunistic behaviours given the supplier's commercial interests and possible connections with competing customers, challenging the manufacturer's value capture process. Consequently, the structural holes between academia and cross-industry organisations and the rest of the ego-network provide the manufacturer with an opportunity to develop **innovative advanced services projects** reducing the risks of opportunistic behaviours in the value capture process.

### 6.3.8 MNCs and funding bodies

MNCs comprise organisations with a big size and a wide presence across markets. Funding bodies comprise official organisations appointed to allocate public money for the development of specific projects. In the ego-network, a **bridge** position is identified in the analysis as the structural characteristic influencing the nature of the relationships with MNCs and funding bodies.

A **bridge** position is achieved by being part of several clusters or groups of highly connected actors (section 3.5.3). The analysis determines that the bridge position of MNCs and funding bodies influences their impact in the manufacturer's value capture process.

**MNCs** hold a **bridge** position in the ego-network by being part of external clusters of interconnected and extended supply chains in the industry. The manufacturer's partnership with a MNC allows to connect with clusters of potential customers as the MNC cascade its needs along its supply chain. The analysis shows how MNCs' bridge position represents an avenue for manufacturers' introduction of advanced services to customers. For instance, Case D long-term relationship with a well-known MNC in the industry provides access to potential customers that are part of the MNCs' supply chains.

**Funding bodies** hold a **bridge** position in the ego-network by being part of external clusters of publicly funded projects across industries. The manufacturer's partnership with a funding body allows to connect with clusters of potential partners as the funding body facilitates cross-industry and cross-organisational collaboration. The analysis shows how funding bodies' bridge position represents an avenue for manufacturers' introduction of advanced services to partners. For instance, Case B's publicly funded pilot project provides the financial conditions and transparency to create interest across potential partners beyond the manufacturer's ego-network.

In conclusion, the bridge position of MNCs and funding bodies in the ego-network allows manufacturers to leverage on their connections with external clusters of customers and partners. The limited reach of manufacturers is expanded through the wider connections provided by MNCs and funding bodies across markets and industries. Consequently, the bridge position of MNCs and funding bodies in the ego-network **diminishes the impact of reticent customers and partners** in the manufacturer's value capture process.

### 6.3.9 Higher-level organisms

Higher-level organisms comprise organisations that represent a set of values and exert influence and power at a regional or international level. Higher-level organisms can include governmental institutions, CE and sustainability organisms, business associations and innovation hubs, among others. In the ego-network, a **cluster** is identified in the analysis as the structural characteristic influencing the nature of the relationships with higher-level organisms.

A **cluster** refers to a high number of connections between actors in comparison to other areas of the ego-network (section 3.5.3). The analysis determines that the manufacturer's embeddedness in clusters of higher-level organisms influence their impact in the manufacturer's value capture process.

**Manufacturers embedded** in **clusters** of **higher-level organisms** are able to leverage on the connections with like-minded organisations. The analysis shows that at the introduction stage of advanced services provision, such clusters facilitate the establishment of collaborative relationships with both partners and customers limiting the amount of support needed from outside the ego-network. The embeddedness also facilitates the access to specific growth and training programs unknown to those organisations outside such clusters.

In conclusion, the embeddedness in clusters of higher-level organisms allows manufacturers to be in an advantageous position in comparison to those outside the cluster. The connections available within the cluster allow for a smarter resource deployment in comparison to those manufacturers needing to actively search for collaboration beyond the ego-network. In addition, the embeddedness with like-minded organisations facilitates the alignment across partners and customers with innovative advanced services offerings. Consequently, the manufacturers' embeddedness in clusters of higher-level organisms facilitates the **implementation of advanced services** through the alignment and support from like-minded organisations.

### 6.3.10 RQ3. Findings: partners' roles and ego-network characteristics

Retaining the insights supported by evidence from a larger number of cases, Table 35 shows the impact of partners in manufacturers' value capture process according to their roles and ego-network characteristics.

| Partner | Partner's role | Ego-network characteristics | Impact |
|---|---|---|---|
| Academia<br>Cross-industry organisations | **Integration**<br>Specialised knowledge beyond traditional manufacturing | **Structural holes**<br>Non-competitive and non-commercial nature<br>**Brokerage**<br>Manufacturer's control | Satisfaction of specific innovative advanced services projects |
| Funding bodies | **Integration**<br>Public funds<br>**Risk reduction**<br>Provision of transparency | **Bridge position**<br>Embedded in external clusters of potential partners | Satisfaction of resource-intensive actions<br>Diminish the impact of reticent partners to collaborate |
| MNCs | **Risk reduction**<br>Provision of access | **Bridge position**<br>Embedded in external clusters of potential customers | Diminish the impact of reticent customers to adopt advanced services |
| Higher-level organisms | **Risk reduction**<br>Provision of influence | **Cluster**<br>Manufacturer's embeddedness | Implementation of innovative platform-based advanced services |
| End users<br>Established traditional partners | **Efficiency**<br>Adaptation to advanced services requirements | **Relational intensity**<br>Trust and interest alignment<br>**Multiplexity**<br>Development of multiple roles | Optimisation of available resources |

Table 35. RQ3 Findings: Partners' impact, roles and ego-network characteristics

In essence, partners' roles and ego-network characteristics determine the impact of the manufacturer's relationship with partners in the development of actions to capture the value emerging at the introduction stage of advanced services provision, answering the third research question as follows:

- RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?

The integration of specialised knowledge beyond traditional manufacturing from non-commercial and non-competitive partners, such as academia and cross-industry organisations, supports the satisfaction of specific innovative advanced services' projects controlled by the manufacturer.

The integration of public funds from transparent funding bodies, operating across clusters of potential partners, supports the satisfaction of resource-intensive actions while diminishes the impact of reticent partners to collaborate with the manufacturer.

The provision of access to clusters of potential customers through MNCs' interconnected and extended supply chains, diminishes the impact of reticent customers to adopt advanced services.

The embeddedness of the manufacturer in clusters of higher-level organisms, with a wide reach and power in the industry, influences the alignment of customers and partners facilitating the implementation of innovative platform-based advanced services.

The relational intensity of the manufacturer with established traditional partners and end users allows for multiplexity through their adaptation to the requirements of advanced services, optimising the deployment of available resources.

## 6.4 Summary

This chapter has reported the insights of the cross-case analysis and provided the findings of the study answering the research questions. The chapter was divided in three main sections according to each research question. Comparisons and connections were illustrated through tables within each of the sections.

The first section reported the cross-case comparison of the strategic, knowledge, economic and personal value outcomes emerging for manufacturers introducing advanced services in the market. The second section reported the cross-case comparison of the production, problem-solving and platform key activities developed by manufacturers to capture the emerging forms of value. The third section reported the cross-case comparison of the integration, risk reduction and efficiency key partnerships and ego-network characteristics having an impact in the manufacturer's value capture process.

At the end of each of the sections, most evidenced insights were retained to answer the research questions. A summary of the answers is provided in the following statements:

RQ1. Which forms of value emerge for a manufacturer when introducing advanced services in the market?

- Uncertainty reduction emerges for those manufacturers whose target customers are reticent to adopt advanced services.
- A strategic position emerges for those manufacturers whose target customers are open to adopt advanced services.
- Market intelligence emerges for those manufacturers whose value proposition applies across customers (i.e. customisable platform configuration).
- Market share and cost reductions emerge for those manufacturers whose advanced services have been validated in the market.

RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?

- Manufacturing, testing and certifying activities are developed by manufacturers to finalise the initial or upgraded version of the offering.
- Data management is developed by manufacturers to collect and analyse the data on product-service performance and customers' usage experiences.
- Targeting advanced services to customers is developed by manufacturers to achieve the validation of advanced services in the market.
- Platform implementation is developed by manufacturers to achieve the validation of advanced services in the market and to expand the customer base.

RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?

- The integration of specialised knowledge beyond traditional manufacturing from non-commercial and non-competitive partners, such as academia and cross-industry organisations, supports the satisfaction of specific innovative advanced services' projects controlled by the manufacturer.
- The integration of public funds from transparent funding bodies, operating across clusters of potential partners, supports the satisfaction of resource-intensive actions while diminishes the impact of reticent partners to collaborate with the manufacturer.
- The provision of access to clusters of potential customers through MNCs' interconnected and extended supply chains, diminishes the impact of reticent customers to adopt advanced services.

- The embeddedness of the manufacturer in clusters of higher-level organisms, with a wide reach and power in the industry, influences the alignment of customers and partners facilitating the implementation of innovative platform-based advanced services.
- The relational intensity of the manufacturer with established traditional partners and end users allows for multiplexity through their adaptation to the requirements of advanced services, optimising the deployment of available resources.

The following chapter discusses the above research findings in relation with established literature and theoretical perspectives.

# CHAPTER 7. DISCUSSION

This chapter theoretically grounds the present study in the literature. The chapter is divided in three main sections that highlight how answering the research questions addressed the research gaps of this study regarding the dynamic, subjective and collaborative nature of value in advanced services. In each section, findings are discussed with regards to established literature and theoretical perspectives. As a result of the discussion, this study expands current knowledge in advanced services, and more specifically with regards to S-D logic, servitization, contingency and collaboration in advanced services.

## 7.1 The dynamic nature of value in advanced services

The present study focused on the early stages, particularly exploring the introduction stage of advanced services provision. By answering *RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?*, this study has filled the gap in knowledge regarding the success of manufacturers which are yet to achieve traction in the market. Consequently, the findings of RQ1 allow to expand current knowledge regarding the dynamic nature of value in advanced services. In particular, this study shows how value in advanced services builds up as manufacturers' and customers' needs are satisfied over time advancing knowledge under the S-D logic. The findings of this study are also linked to the transformation view of servitization literature, expanding the knowledge about turning points in the progression.

Prior research has mostly focused on already experienced MNCs, whose success in the exploitation of product-service offerings prompted the interest towards the new forms of value emerging from advanced services (e.g. Rapaccini (2015); Steiner et al. (2016)). The extant literature offers evidence on how advanced services allow manufacturers to achieve superior performance through sustained competitive advantages in the industry. Coreynen et al. (2017), for instance, highlight how monitoring of customers' usage allows manufacturers to constantly customise their advanced services offerings, building barriers to competition through innovation. Considering the introduction stage of advanced services provision has allowed this study to expand current knowledge into the value emerging for the manufacturer at an early stage.

Established literature has discussed how the presentation format (Steiner et al., 2016), pricing strategy (Rapaccini, 2015) or organisational design (Ambroise et al., 2018) influences manufacturers' capture of value. Whereas such factors may have a deeper impact at later stages, the present study highlights the crucial role of manufacturer's perceived risks and uncertainty for the capture of value at the introduction stage of advanced services provision. In line with the findings of Visnjic et al. (2017) regarding *accountability value*, this study shows how the management and elimination of risks and uncertainty lead to strategic and knowledge value

outcomes for the manufacturer. It also supports Lusch et al. (2010: 22) claims, showing how the outcome of value capture "is not necessarily only profits or cash flow, but feedback or learning".

Manufacturers face increased levels of complexity as the provision of advanced services progresses, which can affect their ability to capture value over time (Cui et al., 2019). As one might expect, there is evidence of manufacturers' need to minimise risks and reduce uncertainty in order to successfully exploit the potential of advanced services, especially when such issues can lead to increased costs or negatively impact performance (Erkoyuncu et al., 2013). While it is recognised that inappropriate risk and uncertainty management can lead to bankruptcy (Benedettini et al., 2015), this study demonstrates how its mitigation is a necessary step in the manufacturer's value capture process at the introduction stage of advanced services provision. Consequently, this study expands the understanding on value in advanced services advancing knowledge under the S-D logic.

This study expands the knowledge on the evolution of value under the S-D logic, which argue that *value-in-use* evolves according to the shift in customers' goals from preventative to promotional as the former are satisfied (Macdonald et al., 2011). The findings of the present study unpack the shift in value for the manufacturer, which interestingly mirrors that of customers. While customers are recognised to tackle points of pain before being able to follow their desires (Macdonald et al., 2011), this study shows how manufacturers need to tackle risks and uncertainties before being able to satisfy expansion goals. In particular, the findings of this study identified that the increase in market share (economic value) requires the manufacturer's reduction of uncertainty (strategic value) and increase of market intelligence (knowledge value) to emerge.

The findings of this study also strengthen servitization literature regarding the transformation journeys of manufacturers. Even though researchers have discussed the presence of stages in servitization (Martinez et al., 2017, Lütjen et al., 2017), there is a lack of evidence about manufacturers' progress along those stages over time. A deeper insight is provided by Baines et al. (2020), identifying four stages and several turning points along the transformation of MNCs. The present study agrees on the need to pilot the product-service offering for the manufacturer's progression in the provision of advanced services. But, whereas Baines et al. (2020) highlights the achievement of internal buy-in as the turning point, this study points to the achievement of external validation in the market. Such difference could be explained due to their focus on MNCs in comparison to this study's analysis of SMEs.

In conclusion, taking into account the dynamic nature of value in advanced services has allowed to shed light into the emergence and capture of value for manufacturers. While the extant literature has focused on the relevance of customers' changing needs and expectations for the creation and

delivery of value (Raja et al., 2013, Sjödin et al., 2016), the findings of this study offer complementary evidence on the relevance of manufacturers' mitigation of risks and uncertainties for the capture of value in advanced services. In this light, it is possible to argue that the manufacturer's ability to progress in advanced services is contingent upon the achievement of a turning point that mitigates the perceived level of risk and uncertainty at each stage of advanced services provision.

## 7.2 The subjective nature of value in advanced services

The present study focused on value for the manufacturer, particularly exploring the value capture process of SMEs. By answering *RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?*, this study has filled the gap in knowledge regarding the specific configuration leading the capture of value in advanced services. Consequently, the findings of RQ2 allow to expand current knowledge regarding the subjective nature of value in advanced services. Particularly, this study shows how the value capture process is contingent on the organisation's size, business background and type of customers.

Prior research has mostly focused on the creation and delivery of value to the customer, which prompted the direction of research towards the ways in which manufacturers can support customers' operations (Kohtamäki and Partanen, 2016, Raja et al., 2013). The advanced services literature provides extant examples of how manufacturers deploy certain resources, such as digital and information technologies (Cenamor et al., 2017), and develop specific activities, such as the product-service design and implementation (Song et al., 2016), to satisfy customers' needs. Considering the value capture process has allowed this study to expand current knowledge beyond the needs of the customer and into those of the manufacturer in the development of specific value capture activities.

Based on the experiences of SMEs, the findings of this study evidence the contingency on size of the manufacturer's development of production activities. Baines and Lightfoot (2014) suggest manufacturers' backward integration to keep control of the exploitation of the product-service improvements and best production practices. In contrast, the findings of this study showed how the limited liquidity of SMEs constrains their investment capacity and internalisation of resource-intensive activities. Instead, securing public funding enables SMEs to develop advanced services projects in a cost-effective manner. In line with previous research, such evidence confirms SMEs' dependency on the mobilisation of external actors due to the lack of necessary resources (Kowalkowski et al., 2013, Gebauer et al., 2012), highlighting its role for the capture of value.

Based on the experiences of product-centric and new venture SMEs, the findings of this study evidence the contingency on the business background of the manufacturer's development of specialised problem-solving activities. The extant literature offers contradictory evidence on the

best strategic choice for manufacturers to address the development of activities that lie beyond the remit of traditional manufacturing. Visnjic et al. (2018) highlight the role of partnerships with specialised organisations for manufacturers' development of complex service activities, whereas Bustinza et al. (2019) suggest that critical service capabilities should be kept in-house in order to protect manufacturers' competitive advantage.

The findings of this study showed how whereas collaboration is required by product-centric SMEs (already established manufacturers), whose expertise is constrained by a traditional business background; internalisation is possible for new venture SMEs (introducing advanced services since inception), whose only business commitment is the provision of advanced services. Thus, the commitment of the manufacturer with product-centric customers, partners and overall traditional business constrains the capture of value in advanced services, as inadequate decisions can quickly lead to resource dilution (Zhou et al., 2020). Such evidence demonstrates the advantageous position of new ventures to specialise in high-value and specialised activities in comparison to product-centric manufacturers, issue that has received scant attention in the extant literature.

Based on the experiences of B2B and B2C SMEs, the findings of this study evidence the contingency on type of customers of the manufacturer's development of problem-solving activities requiring customer contact. Established literature has pointed to the need for specific service skills, different than those deployed in traditional manufacturing, to serve the customer through advanced services. Oliva and Kallenberg (2003) point to the creation of a separate service-centric organisation to address the sales, monitoring and servicing of the product-service offering. Similarly, Alghisi and Saccani (2015) argue that manufacturers should invest in developing the skills required to keep tight control over the service delivery and to establish close customer relationships.

This study, in contrast, suggests that SMEs already count with the softer skills and service capabilities required in advanced services (Ulaga and Reinartz, 2011, Smith et al., 2014). Instead, the findings of this study identified that industrial business customers are generally more reticent to adopt advanced services in comparison to the openness of individual consumers. Such evidence is consistent with Forkmann et al. (2017), who highlighted that the service capabilities of the customer are overall more important than those of the manufacturer. This study has shown how individual customers take the initiative towards the offering (i.e. early adopters) while industrial customers are characterised by inertia and a cost-driven mindset. Thus, B2C manufacturers are more likely to enjoy an advantage targeting and implementing advanced services over their B2B counterparts.

In conclusion, taking into account the subjective nature of value in advanced services has allowed to expand the knowledge on the contingencies in advanced services, highlighting how manufacturers' ability to capture value is contingent upon the organisation's size, business background and type of customers. Beyond identifying the interplay between key resources, activities and partnerships in the value capture process, this study demonstrates that their configuration is contingent upon the specific characteristics of the manufacturer. These insights complement current knowledge on B2B manufacturers and confirm the need for further research to take into account consumer markets (Cenamor et al., 2017, Rapaccini, 2015), while open the path for the advanced services literature to further investigate the competitiveness of new ventures.

## 7.3 The collaborative nature of value in advanced services

The present study focused on the manufacturer's extended embedded context, particularly adopting the ego-network perspective. By answering *RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?*, this study has filled the gap in knowledge regarding the impact and wide variety of interdependent actors that have a role in the manufacturer's success in advanced services. Consequently, the findings of RQ3 allow to expand current knowledge regarding the collaborative nature of value in advanced services. Specifically, this study shows how the ego-network structure is as relevant as its composition as both influence the partner's ability to support the manufacturer. The findings also identify specific key partnerships expanding the knowledge in collaboration in advanced services beyond the manufacturer's supply chain and industry.

Taking the ego-network perspective has allowed to expand current knowledge on the impact of the extended embedded context in manufacturers' success in advanced services. Prior research has mainly focused on dyadic and triadic collaboration, which has prompted the direction of research towards the customers and the immediate supply chain members working with the manufacturer (e.g. dyadic role ambiguities (Sjödin et al., 2016); upstream service supply chain (Finne and Holmström, 2013)). By adopting an ego-network perspective, the present study has been able to expand current knowledge providing new insights on how and which partners impact manufacturers' value capture process in advanced services.

The analysis of the ego-network composition characteristics complements established literature on the importance of relational rather than transactional interactions in advanced services. In particular, the findings of this study highlighted how the relational intensity underpinning the manufacturer's relationships with end users and established traditional partners drive their adaptation and multiplexity of roles in the ego-network. The present study substantiate the common assumption that trust and collaboration must underpin the manufacturer's relationship

with customers (Sjödin et al., 2016, Smith et al., 2014, Raja et al., 2013) and suppliers (Bastl et al., 2012, Karatzas et al., 2017, Kohtamäki et al., 2013) in advanced services.

Additionally, the findings of this study suggest that relational intensity not only decreases opportunistic behaviours and information asymmetries between the parties (Kohtamäki et al., 2013), but it also represents an opportunity to avoid resource dilution. The manufacturer's shift of investment from product to more uncertain service innovations may dilute its resources and damage its performance in the long-term (Zhou et al., 2020). This study argues that the multiplexity of roles in the ego-network allows manufacturers to reduce their need for investment leveraging on already available resources instead. Thus, this study demonstrates the importance of relational interactions beyond the value co-creation process (Sjödin et al., 2016, Smith et al., 2014), and into their role in the manufacturer's value capture process.

The analysis of the ego-network structure characteristics advances prior knowledge by introducing actor's position in the analysis of collaboration in advanced services. Even though structural characteristics have been previously discussed (i.e. bridge position (Bastl et al., 2012); structural hole (Finne and Holmström, 2013)), the literature is yet to directly address the impact that specific positions may have for the manufacturer's success in advanced services. The present study strengthens the understanding in this matter by demonstrating the impact of the ego-network structure in the manufacturer's value capture process. In particular, the findings of this study suggest that partners' impact is partly determined by their position in the ego-network, in relation to the manufacturer (i.e. brokerage position and cluster), the rest of the ego-network (i.e. structural hole) and the external context (i.e. bridge position).

The structural insights of this study have led to the identification of key partnerships whose potential has been underestimated in the advanced services literature. For instance, whereas financing institutions have been portrayed as economic integrator (Gebauer et al., 2017), this study highlighted how funding bodies' bridge position allows them to also act as a partnership facilitator. Similarly, while the integration of specialised resources is recognised to be the main role of technology partners (Opresnik and Taisch, 2015), this study demonstrated the manufacturer's opportunity to achieve a brokerage position in between cross-industry partnerships and the rest of ego-network. Considering the strategic management of advanced services, such evidence suggests that manufacturers need to be aware of the position of partners within and beyond its immediate supply chain.

Whereas previous research discussed the importance of suppliers and intermediaries (Rabetino et al., 2017, Baines and Lightfoot, 2014), this study suggests that restricting the focus to the supply chain members can negatively impact the manufacturer's performance in advanced services. Instead, the manufacturer should continuously evaluate established and new partners' positions

to avoid the appearance of opportunistic behaviours and minimise value slippage in the ego-network. In particular, the introduction of advanced services imply a change in the manufacturer's needs and goals, which has actors competing to maintain their position in the network (Story et al., 2017). Thus, the literature should take into the manufacturer's ego-network composition and structure characteristics and achieve a comprehensive understanding of manufacturers' establishment and termination of partnerships to further develop the strategic knowledge of advanced services.

In conclusion, the ego-network perspective adopted in this study is in consonance with Vargo and Lusch (2008a), who claim that value creation takes place within and through networks at various levels of aggregation. The present study has demonstrated how the impact of partners needs to be analysed through the aggregation of levels of analysis. In other words, manufacturers' value capture process cannot be understood within a dyadic or triadic level of analysis. Instead, it requires a perspective that accounts for the complexity of the manufacturer's extended embedded context, where value created at one level of analysis may be captured at another (Lepak et al., 2007). This study has demonstrated the effectiveness of the ego-network perspective to achieve an understanding of the complex reality behind the impact of partners in the manufacturer's extended embedded context.

## 7.4 Summary

This chapter has grounded the study is the literature, discussing the findings with established literature and theoretical perspectives. The chapter is divided into three main sections that comprise the discussion of the findings of each research question addressing the research gaps of the study. The discussion expanded the knowledge regarding the dynamic, subjective and collaborative nature of value in advanced services, particularly in S-D logic, servitization, contingency and collaboration in advanced services.

First, the discussion addressed the dynamic nature of value in advanced services. By focusing on the introduction of advanced services in the market, this study bridged the gap of knowledge between already experienced manufacturers and those still striving to become competitive advanced services providers. The discussion of RQ1 findings advanced knowledge under the S-D logic, showing how value in advanced services builds up as manufacturers' and customers' needs are satisfied over time advancing S-D logic. The findings were also linked to the transformation view of servitization literature, identifying the product-service validation as a turning point for progression. The section concluded by arguing that the manufacturer's ability to progress in advanced services is contingent upon the achievement of a turning point that mitigates the level of risk and uncertainty as perceived by the manufacturer.

The subjective nature of value in advanced services followed. By focusing on the value capture process, this study bridged the gap in knowledge between the actions leading to value for the customer and those leading to value for the manufacturer. The discussion of RQ2 findings demonstrated the inability to apply the extant advanced services literature based on MNCs' experiences to the provision of advanced services of SMEs. Based on the experiences of B2B and B2C product-centric and new venture SMEs, the value capture process was found to be contingent on the organisation's size, business background and type of customers. The section concluded confirming the need for further research on B2C organisations and opening the path to further investigate new ventures in advanced services.

Lastly, the discussion concluded addressing the collaborative nature of value in advanced services. By focusing on the manufacturer's extended embedded context, this study bridged the gap between less complex scenarios and the wider embedded context in which manufacturers compete in advanced services. The discussion of RQ3 findings expanded the knowledge about collaboration in advanced services. The discussion demonstrated how partners' position is as relevant as its roles and interactions in the ego-network to support the manufacturer. The section concluded highlighting the effectiveness of the ego-network perspective to achieve an understanding of the complex reality behind the impact of partners in the manufacturer's extended embedded context.

# CHAPTER 8. CONCLUSION

The conclusion chapter closes the thesis and highlights the impact of the present study for both theory and practice. The chapter provides an overview of the study and summary of key findings. It follows with this study's contributions to theory and implications for practice. The study's limitations are recognised and opportunities for future research are identified accordingly. A section providing concluding remarks finishes the chapter.

## 8.1 Overview of the study and summary of key findings

This study concerned the research territory comprising the analysis of advanced services in the manufacturing industry. In particular, the literature on value in advanced services and the value architecture construct from business model literature formed the basis of the framework that set the conceptual boundaries to understand the success of manufacturers exploiting the potential of advanced services in the market.

The review of the literature argued that much can be learned by acknowledging the dynamic, subjective and collaborative nature of value in advanced services. Accordingly, three research gaps were identified referring to the early stages of advanced services provision, the value capture process and the extended embedded context and three research questions were established:

- RQ1. Which forms of value emerge for a manufacturer introducing advanced services in the market?
- RQ2. Which collaborative actions does the manufacturer take in order to capture these forms of value?
- RQ3. How does the nature of the relationships with its partners impact the manufacturer's development of these actions?

The purpose of this study was to explore how the nature of the relationship between the manufacturer introducing advanced services in the market and its partners impacts the manufacturer's value capture process. In fulfilling this purpose, the study introduced SNA in advanced services research, adopting the ego-network perspective to set the appropriate boundaries to the unit of analysis as well as to guide the data collection process. The study offered important insights as a result of the empirical analysis and the discussion shows how findings further expanded current knowledge with regards to S-D logic, servitization, contingency and collaboration in advanced services.

By answering the first research question, this study bridged the gap of knowledge between already experienced manufacturers and those still striving to become competitive advanced services providers. The findings revealed that strategic value outcomes in the form of uncertainty reduction

and first mover positions, knowledge value outcomes in the form of increased market intelligence, and economic value outcomes in the form of increased market share and reduced costs emerged at the introduction stage of advanced services provision.

Moving to the second one, this study bridged the gap in knowledge between the actions leading to value for the customer and those leading to value for the manufacturer. The findings pointed that in order to capture such value outcomes, manufacturers take on production activities in the form of manufacturing, testing and certifying advanced services, problem-solving activities in the form of data management and targeting the offering to customers, and platform activities in the form of implementation within members operations.

For the last research question, this study bridged the gap between less complex scenarios and the wider embedded context in which manufacturers compete in advanced services. Findings highlighted academia, cross-industry organisations, MNCs, funding bodies, higher-level organisms, established traditional partners and end users as the key partnerships supporting the manufacturer's capture of value during the introduction of advanced services in the market. The analysis identified their role and position with regards to the ego-network structure and composition as the determinants of partners' impact in the manufacturer's value capture process.

Through the discussion, this study was grounded in the advanced services literature. Regarding the dynamic nature of value, this study advanced the knowledge under the S-D logic, showing how value in advanced services builds up as manufacturers' and customers' needs are satisfied over time. This study also expanded the transformation view of servitization literature, identifying the product-service validation as an external turning point for progression at the introduction stage of advanced services provision. Regarding the subjective nature of value, this study showed how the value capture process is contingent on the organisation's size, business background and type of customers. Regarding the collaborative nature of value, this study highlighted the relevance of specific actors beyond the supply chain and showed how the ego-network structure is as relevant as its composition as both influence the partner's ability to support the manufacturer.

This study has important contributions to theory that enhance the knowledge and understanding of advanced services, as well as implications for management practice. Contributions to theory and implications for practice are presented in the following sections.

## 8.2 Contributions to theory

This section explains in detail the contributions to theory of this study. First, the study contributes to the emerging advanced services theory in the multi-actor context through the ego-network perspective. Second, the study contributes to the knowledge on the manufacturer's progression, identifying Big Data as the first layer of value when introducing advanced services in the market.

Third, the study bridges the fields of strategic management and SNA contributing to theory by identifying the potential of cross collaboration for the manufacturer's effective execution of innovation in advanced services. Lastly, the study connects research on new ventures with the advanced services literature, expanding the knowledge on network quality and how it can impact the manufacturer's competitiveness in advanced services.

### 8.2.1 Advancing research in the multi-actor context: the ego-network perspective

The present study contributes to the emerging theory in the multi-actor context by introducing the ego-network perspective from SNA into the advanced services literature. Researchers have indicated the urge of adopting a multi-actor perspective (Raddats et al., 2017, Story et al., 2017), but most studies continue to limit the analysis to the dyadic manufacturer-customer relationship (Reim et al., 2018, Ambroise et al., 2018). This study specifically addressed manufacturers' extended embedded context through the ego-network perspective, establishing the ground to build an integrative multi-actor body of knowledge in advanced services.

Advanced services literature has mostly developed research in the context of dyadic, triadic and supply chain relationships, leaving manufacturers' interactions beyond upstream and downstream partnerships widely unexplored. The dyadic context, characterised by the analysis of manufacturer-customer relationships, constitutes most of the advanced services literature (Macdonald et al., 2011, Ulaga and Reinartz, 2011). Such knowledge has in turn expanded and evolved through the inclusion of intermediaries with the analysis of triadic relationships (Finne and Holmström, 2013, Karatzas et al., 2017). The inclusion of service supply chain members currently completes the body of knowledge in the multi-actor context (Alghisi and Saccani, 2015, Story et al., 2017). However, Lusch et al. (2010) argue that supply chains are only a part of the nested interdependent context in which organisations are embedded.

The present study contributes to theory by asserting the ego-network as the integrative perspective to set the boundaries to the extended embedded context and expand the understanding of advanced services in the multi-actor context. This study shows how the ego-network perspective provides an efficient method to delimit the boundaries of the analysis as well as effective tools to elicit information on the structure and composition of the manufacturer's relationships beyond its supply chain. This contribution to theory provides new avenues to advance current research, including all relevant actors in the analysis while maintaining the focus on a particular actor of interest. In particular, it allows to address the latest calls for future research in the advanced services literature (Zhou et al., 2020, Sjödin et al., 2020), enabling a richer understanding of the interdependencies driving success and failure in the extended embedded context.

This study breaks a new ground in the advanced services literature, demonstrating how a validated perspective from SNA can help to unveil the potential of an underexplored area of knowledge in

advanced services. The current lack of a multi-actor perspective that considers the inclusion of actors beyond explicit supplier and customer relationships constrains the opportunities of the advanced services literature to explore promising research avenues beyond the manufacturer's supply chain. Thus, the adoption of the ego-network perspective contributes to the advanced services literature setting the boundaries for further research to elaborate on more comprehensive frameworks as well as to develop further theoretical contributions that take into account the complexity of the extended embedded context.

### 8.2.2 Big Data: first layer of value in the manufacturer's progression

The present study contributes to the literature on manufacturers' progression towards the success in the exploitation of advanced services in the market by focusing on the early stages of provision, particularly the introduction of advanced services in the market. Several attempts have been made to identify the stages underlying the journeys of product-service providers (Martinez et al., 2017, Lütjen et al., 2017), but the extant literature is yet to further understand the content of such stages. This study specifically addressed the configuration of key resources, activities and partnerships driving the capture of value at the introduction stage of advanced services provision, expanding the knowledge on the manufacturer's progression by identifying Big Data as the first layer of value. Big Data is characterised by its high volume, velocity and variety (McAfee et al., 2012), comprising the data emerging from customers' usage experiences and the product-service performance.

Established literature has shown how product-centric manufacturers tend to gradually expand their offerings introducing additional services characterised by higher complexity and risks as they progress over the stages in the product-service provision (Martinez et al., 2017, Lütjen et al., 2017). Longitudinal studies have further confirmed the linear transition of traditional MNCs from base to more advanced solutions (Cui et al., 2019, Rajala et al., 2019) as well as advanced the knowledge on specific stages and forces influencing the progression (Baines et al., 2020). But, even though an evolutionary journey, researchers agree that there is not a single path to success as the content of each stage is unique to the manufacturer and it can change according to internal and external circumstances (Baines et al., 2020, Martinez et al., 2017).

The present study contributes to theory by identifying the crucial role of Big Data for the manufacturer's progression from trial and error to growth at the introduction stage of advanced services provision. The intangibility of value in advanced services requires manufacturers to constantly provide ongoing reassurance to customers (Baines and Lightfoot, 2014). The present study shows how customers' usage experiences data represents the physical evidence (i.e. success stories) of the viability of the offering in the market, allowing manufacturers to reduce the uncertainty associated with the intangibility of advanced services. Benchmarking is considered a

necessary initial step to deal with the lack of expertise in services (Mathieu, 2001). The present study shows how the product-service performance data is required to set benchmarks, allowing manufacturers to increase their market intelligence and confidence in the advanced services provision.

This contribution to theory demonstrates how Big Data is required to satisfy the mitigation needs of inexperienced providers (trial and error), until they reach the level of confidence that allows them to progress into the satisfaction of expansion goals (growth). Whereas prior research has pointed to Big Data as a source of competitive advantage at mature stages (i.e. generating profit selling data to third parties (Rymaszewska et al., 2017); upgrading the offering (Opresnik and Taisch, 2015)), this study signals Big Data as the first layer of value before the product and the service. In other words, value does not arise from the offering itself but from the data generated by it. In this light, the present study argues that data management skills are not only useful to capture the economic value of the exploitation of the offering in the market (Ulaga and Reinartz, 2011), but rather constitute a determinant of the organisational readiness to compete through advanced services.

### 8.2.3 Network structure and innovation: the strategic logic of cross collaboration

The present study contributes to the literature on the strategic management of advanced services by shifting the focus from large manufacturers to SMEs. Researchers have highlighted the need to keep control over the sources of competitive advantage in order to strategically lock-in the value of advanced services (Vendrell-Herrero et al., 2017, Alghisi and Saccani, 2015), but not all manufacturers have the same capacity to manage advanced services. This study specifically addressed the value capture process from the perspective of SMEs, expanding the knowledge on manufacturers' strategic management of advanced services.

Advanced services require capabilities, knowledge and skills that differ from those deployed in traditional manufacturing processes (Ulaga and Reinartz, 2011, Smith et al., 2014). One side of the literature has shown how manufacturers' internalisation of advanced services' core competences protects their competitiveness allowing to safeguard the emerging competitive advantages (Baines and Lightfoot, 2014). Other studies, in turn, have pointed to the adaptation of suppliers and intermediaries to the advanced services' requirements (Bastl et al., 2012). Manufacturers' collaboration with a tightly integrated supply chain has also been shown to allow to prevent external value slippage while reducing opportunistic behaviours between partnerships (Rabetino et al., 2017, Bigdeli et al., 2018).

The present study contributes to theory by identifying the strategic logic of cross collaboration based on the specific position of partners in the manufacturer's ego-network. Cross collaboration refers to partnerships with actors beyond the supply chain, whose lack of connection with the rest

of the network (structural holes) place the manufacturer in an advantageous position (brokerage) to safeguard the confidentiality and value of innovative advanced services projects. This study shows the potential of cross collaboration to ensure the capture of value from innovative projects. Specifically, this study points to cross collaboration as the strategic choice for manufacturers whose lower capacity impedes internal specialisation and whose supply chain members lack the specialised knowledge to be able to adapt to the innovativeness of the product-service offering.

Beyond exploring the roles of partners in manufacturers' value capture process, this study is of theoretical importance because it bridges the field of strategic management with SNA to explain manufacturers' effective execution of innovation in advanced services. This contribution to theory extends recent discussions which already hinted the strategic relevance of cross collaborations with academia and complementary cross-industry organisations (Lutjen et al., 2019, Tronvoll et al., 2020, Visnjic et al., 2018), adding that not only matters the type of partner but also its position in the network. The strategic relevance of cross collaboration expands the latest knowledge on the relationship between the network's structure and the manufacturer's performance and progression in advanced services (Zhou et al., 2020, Baines et al., 2020). In particular, this study demonstrates the positive effects of the presence of structural holes in manufacturers' ego-networks for the capture of value from innovative projects.

### 8.2.4 Network quality and competitiveness: clusters of higher-level organisms

The present study contributes to theory on network quality in advanced services based on the experiences of new ventures. The advanced services literature has noticed how customers' *value-in-use* is influenced by the network quality of the manufacturer (Macdonald et al., 2011), but little is known about how such quality can be improved beyond the supply chain. This study included both product-centric and new venture SMEs' experiences, expanding the understanding of how network quality impacts competitiveness at the introduction stage of advanced services provision.

Established literature on new ventures already highlighted the crucial role of network quality in the market entry and survival rate of SMEs, showing how specific institutional and organisational linkages improve the legitimacy and access to resources of the organisation at foundation (Baum and Oliver, 1991, Baum and Oliver, 1992, Baum et al., 2000). Even though the connections to relevant institutions have a positive effect in manufacturers' servitization (Turunen and Finne, 2014), the extant advanced services literature has adopted a narrower view to manufacturers' embeddedness. In particular, network quality is considered as the manufacturer's ability to access and make use of other suppliers, intermediaries and competitors in the provision of advanced services to customers (Macdonald et al., 2011, Raja et al., 2013, Macdonald et al., 2016). The perceived network quality influences the likelihood of the customer to choose the manufacturer over alternative providers (Raja et al., 2013).

The present study contributes to theory by identifying the manufacturer's embeddedness in clusters as a particular factor that can improve its network quality, and therefore its competitiveness, at the introduction stage of advanced services provision. Specifically, this study highlights the role of clusters of higher-level organisms that are aligned with the values and culture of the manufacturer (e.g. governmental institutions, CE and sustainability organisms, business associations, innovation hubs). Such clusters of like-minded actors provide manufacturers with a safe space to further connect with organisations that are already aligned with their service culture or innovative product-service offering in a predominantly product-centric industry. The findings of this study also highlight how the power and influence of higher-level organisms creates a sense of trust in potential customers, increasing their perception of the manufacturer's network quality over competing alternatives outside the cluster.

This contribution to theory connects research on new ventures with the advanced services literature, expanding the knowledge on network quality and how it can impact manufacturer's competitiveness in advanced services. Clusters of higher-level organisms represent an opportunity to secure innovations with the support of governance and regulatory forces (Lutjen et al., 2019). The findings of this study demonstrated how the embeddedness of new ventures in such clusters since inception facilitated the implementation of advanced services, while the lack of such embeddedness led product-centric manufacturers to deal with a higher degree of reticence. This contrast provides the advanced services literature with an additional lens to analyse and understand manufacturers' success and failure in advanced services. In particular, auditing processes should not only evaluate the service capabilities of business partners (Macdonald et al., 2016, Forkmann et al., 2017), but also evaluate the effect of clusters on manufacturers' competitiveness in advanced services.

## 8.3 Implications for practice

The present study also pose important implications for practice. This section describes how this study hopes to enlighten the path for managers in similar circumstances as well as to increase the participation from governmental institutions and influencing organisms in the legitimation of advanced services in the market.

### 8.3.1 Supporting SMEs' value capture process at the early stages of advanced services

The focus of this study on the introduction of advanced services in the market provides managers with an insight into one of the most uncertain stages of provision. The goals and priorities at the early stages of advanced services widely differ from those at maturity (Baines et al., 2020). From a strategic point of view, this study supports unexperienced managers to take a more informed decision regarding the uncertain scenario that precedes the achievement of long-term sustained

competitive advantages. In particular, this study aims to evoke action from managers to evaluate and implement the necessary changes in its extended embedded context.

This study encourages managers from traditionally product-centric industries to identify and connect with clusters of like-minded organisms early on in their journey. In particular, joining relevant international organisms or regional innovation hubs can facilitate the introduction of the offering in a like-minded environment, fostering partnerships with organisations and potential customers beyond its product-centric industry. Additionally, this study highlighted the relevance of partners' multiplexity of roles as way to reduce the resource dilution driven by the introduction of advanced services. Thus, managers should assess which relationships can be leveraged to support both product-centric and advanced services offerings, especially at an early stage when economic returns are not envisaged.

By acknowledging the value capture process of SMEs, the present study provides managers with unique insights regarding the needs and sources of support that adhere to the specific needs of smaller organisations. An audit of the ego-network structure and composition can be used as a tool to assess the alignment and competitiveness of current and potential partnerships. Managers should find it particularly useful to leverage on academia and cross-industry organisations given its non-commercial and non-competitive nature. By maintaining such partnerships in the form of *silos* within their networks (structural holes), managers can benefit from the exclusive control of specific advanced services projects while collaborating with specialised partners. In particular, managers could leverage on the synergies with Universities by jointly applying for research and innovation grants. Managers could also identify complementarities by attending cross-industry trade fairs beyond its field of expertise.

Internally, this study urges managers to place data management skills at the forefront of their capability development prior to the introduction of advanced services in the market. This study has shown the crucial role of Big Data for the mitigation of needs and progress towards expansion goals. Thus, managers need to ensure the adequate collection and interpretation of data in order to strategically inform their decision-making towards a growth phase. Failing to learn from pilots and absorb customers' feedback represents a direct threat to SMEs' progress (Dmitrijeva et al., 2019). The introduction of the offering arises as an opportunity to strengthen the relationship with early adopters, building the trust and legitimacy that sets the bases for further collaboration and innovation (Tronvoll et al., 2020). This study advises managers to also carefully select the participants for the pilots, assessing not only short-term criteria but their long-term potential.

### 8.3.2 Legitimating advanced services: collaboration and awareness sessions

The present study evidenced how the lower capacity of SMEs and the innovativeness of advanced services challenge targeting and implementing advanced services in the market. The findings of

this study suggest that SMEs will highly benefit from an increase in the current support and involvement of governmental institutions and other influencing organisms of regional or international coverage (e.g. CE and sustainability organisms, business associations, innovation hubs). Collaboration and awareness sessions coordinated by such powerful actors could help legitimate advanced services in the market, increasing the understanding about the potential opportunities for growth available across sectors of interest.

This study has shown how SMEs, especially of product-centric background, rely on funded projects to materialise advanced services in collaboration with specialised partners (e.g. research centres, software developers). Collaboration sessions could enhance SMEs' service innovativeness facilitating the identification of complementarities and synergies. The aim of these sessions would be to encourage participation from a variety of sectors of interest and to promote SMEs' dissemination of specific advanced services projects to discuss opportunities for collaboration beyond their business circles. An organisation's obsolete assumptions about potential partnerships can translate into missed opportunities for value capture reducing its competitive advantage in the market (Cambra-Fierro et al., 2011). Thus, such sessions represent an effective tool to strengthen SMEs' competitiveness in advanced services.

This study has shown how SMEs, especially those whose product-service offering is based on innovative technologies, benefit from their embeddedness in like-minded clusters to implement advanced services in the market. Awareness sessions could enhance SMEs' potential to lead the transformation of the manufacturing industry. The aim of these sessions would be to provide a space where SMEs can present success stories and promote the adoption of advanced services as the path to a more resilient economy against economic and environmental crisis. Advanced services require a transformation of the product-centric mindset and behaviour that has traditionally led the success of the industry, which can spur the market's postponement and rejection (Kleijnen et al., 2009). Thus, such sessions represent an effective tool to educate customers and organisations on how to effectively exploit the potential of advanced services.

## 8.4 Limitations of the study and opportunities for future research

Although the study offers several contributions, its limitations must also be recognised. This section presents the limitations of the study and aims to inspire future research to continue exploring and expanding the knowledge in advanced services. The limitations identified refer to the theoretical background, the design, sample and focus of the research. Avenues for further research are highlighted after each limitation.

### 8.4.1 Theoretical background: opportunity to adopt institutional theory

The value architecture construct from business model literature was used to build the framework that explains the success of manufacturers in advanced services. It is important to acknowledge that such framework did not take into account how external uncontrollable variables may also influence manufacturers' ability to capture the emerging value from advanced services. Specific bureaucratic, legal and financial constrains characterise a business environment (Hashi, 2001, Hay and Kamshad, 1994, Tsatsou et al., 2010), which can represent a burden for manufacturers' development of activities and integration of resources. During the development of the study it was observed that particular decisions were limited by the business environment. For instance, Case G highlighted the administrative burden of legally being considered a leasing organisation, being unable to fit the parameters of a manufacturer to adhere to specific tax schemes.

Future studies could adopt institutional theory (Scott, 1987) to advance the investigation and achieve an understanding of how the business environment moderates the capture of value in advanced services. From a managerial perspective, the transition from product-centric to advanced services providers can also affect the regulations applying to the new service operations (Turunen and Finne, 2014), and it is critical to understand how such changes may affect their competitiveness in the market.

### 8.4.2 Research design: opportunity to develop a longitudinal study

This study has addressed the manufacturer's introduction stage of advanced services provision through a cross-sectional time horizon. Even though this study recognises the dynamic nature of value in advanced services, the research design still portrays a static view addressing a specific stage of provision. Whereas large manufacturers need to be mindful of the time that is required for their organisations to be able to achieve the level of service capabilities needed to progress in the advanced services provision (Baines et al., 2020), most of the SMEs included in this study already operate under a service oriented culture which can increase their speed of progression. Contrary to lengthy longitudinal studies of large manufacturers (Tronvoll et al., 2020, Rajala et al., 2019), SMEs pose an advantage for researchers to achieve a fair understanding of evolution patterns and mechanisms in a shorter period of examination.

Further research could take the form of a longitudinal case study to understand how partnerships evolve over time re-shaping the role of the ego-network in the manufacturer's value capture process. The position of actors influences their power in a network (Story et al., 2017, Bigdeli et al., 2018), whose evolution can challenge manufacturers' capture of value in advanced services over time. A longitudinal research will provide scholars with an insight into the evolution of power forces in the ego-network and how manufacturers can keep control under increasing levels of risks in the long term.

### 8.4.3 Research sample: opportunity to include partners and non-expert informants

The exploratory nature of the multiple-case study has allowed to obtain a breadth of data, being one of the few studies to provide empirical evidence on new ventures and B2C manufacturers, but the number of cases is limited. The identification of cases was challenged by the lack of public information about SMEs' stage of advanced services provision, requiring an initial interaction to be able to confirm their suitability for the study. This issue together with the time constrains of the research constituted a barrier to the inclusion of further cases. The cross-case analysis allowed to reduce the impact of this limitation as both evidence supporting the claims and lack of evidence found against them served as a confirmation of the findings.

Being the focus of this study the manufacturer's value capture process, data about the ego-network was only sourced from informants from the SMEs. Even though an efficient way of eliciting ego-network characteristics (Marsden, 1990), the depicted presence or absence of connections is based solely on the SME's knowledge which might cause concern. The collection of network data through surveys allows researchers to obtain general data about connections in a time effective manner (Borgatti et al., 2009, Burt, 2000). A survey administered to several members of the ego-network could help researchers to develop an enriched structure of the connections and possible unnoticed interdependencies between all the actors involved in advanced services.

Another limitation refers to the lack of a consistent managerial level and number of informants within each SME. The variation in the structure and degree of involvement of employees with regards to advanced services across SMEs, resulted in the impossibility to match the level and number of experts with whom was possible to have an interview. Future research, which is not limited to expert informants, could substantiate the findings of this study.

### 8.4.4 Research focus: opportunity to investigate negative partners and other economic realities

The present study has focused on the impact of partners in terms of their support in the manufacturer's value capture process. However, it has been demonstrated that the lack of negative relationships can be even more important than the presence of supportive ones (Wellman, 1981). The advanced services literature could benefit from research on the multi-actor context that takes into account the manufacturer's relationships with challenging or disruptive actors. Further research could be done to investigate how the absence or presence of negative partners can act as an enabler or barrier in the manufacturer's value capture process.

Lastly, this study is also limited by concentrating on manufacturers from developed economies. The production, supply and delivery processes places the manufacturing industry as one of the main pillars affected by sustainability issues (Garetti and Taisch, 2012). Advanced services allows to consolidate a new consumption and production model based on services, rationalisation of

material use and dynamic design and usage upgrades (Pialot et al., 2017, Tukker, 2004). The contingency of this study on a specific economic context limits the understanding of the environmental value of advanced services for manufacturers at a global scale.

Further research could apply the research to developing and emerging economies to enhance the transferability of the results. The 2030 Agenda for Sustainable Development counts with 17 Sustainable Development Goals (SDGs) committed to eradicate poverty and achieve sustainable development by 2030 world-wide (European Commission, 2019). Taking into account diverse economic realities under different levels of development poses an opportunity to demonstrate the global value of advanced services for the manufacturing industry to achieve such targets.

## 8.5 Concluding remarks

The present study has achieved an understanding of the impact of the extended embedded context in the value capture process of SMEs introducing advanced services in the market. Several limitations in relation to the research have been acknowledged yet, the purpose of this study was not for its findings to be generalisable, but to provide an exploration of a topic that has not been previously researched in the advanced services literature. Even though the limitations need to be taken into account when considering the findings, this study provided novel contributions and implications for both academics and practitioners.

The development of this study has shown the interest of SMEs in the potential of advanced services, not only as a source of competitive advantages but as the path towards a necessary change in the manufacturing industry. The innovative approaches of both product-centric and new ventures demonstrate the determination of SMEs to transform the manufacturing industry. However, their needs for support are not being met at the same speed as their willingness to progress.

A systemic approach is required for SMEs to lead the path towards an economically and environmentally resilient industry through the shift from traditional business models to advanced services. The contribution of this study has been made with the hope to encourage the required systemic approach across sectors of interest. In particular, this study aims to evoke action from academia, managers, governmental institutions and influencing organisms to adopt a pro-active collaborative approach to the research, support and legitimation of SMEs' advanced services initiatives.

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# APPENDICES

## Appendix 1. Sample Interview Questions

| **Introductory questions** |
|---|
| Background information of interviewee:<br>• Name:<br>• Company:<br>• Number of employees:<br>• Years in the business:<br>• Job title: |
| Could you describe in a few words the essence of your business? |
| Who are your main customers/industries? |
| **Ego-network structure and composition** |
| Reflecting on the past 6 months, with which organisations or individuals have you been in direct contact regarding your business activity? |
| Which relationships do you consider crucial for your business? Why? |
| Think about the relationship among these organisations, are they somehow related or totally independent? Explain further. |
| For how long have you been working with each of these organisations? |
| On average, how frequently do you interact with each organisation? Daily, weekly, monthly, less often |
| Think about your relationship with each of these organisations, do you feel equally close to all of them? Why? |
| Which are their roles in your day-to-day business activities? |
| Within the network, what do you value the most of your relationship with "*actor x*"? |
| **Advanced services context** |
| When and why did you decide to introduce advanced services? |
| At which stage of the advanced services journey are you currently on? |
| - Exploring the opportunities |
| - Piloting advanced services with customers (name industries/customers) |
| - Expanding and scaling up advanced services (name industries/customers |
| - Advanced services represent the main source of competitive advantage |
| Who are your main customers/industry regarding advanced services? |
| Regarding that customer/industry:<br>• Which is your product-service offering?<br>• Which is your advanced services value proposition? |
| **Value outcomes** |
| Regarding advanced services, which are your current goals? List up to 3 by priority and explain motivation. |
| Which activities do you consider crucial for the accomplishment of "*goal x*"? Why? (1) |
| Which resources do you consider crucial for the accomplishment of "*goal x*"? Why? (2) |
| Which organisations do you consider crucial for the accomplishment of "*goal x*"? Why? (3) |
| **(1) Value capture - activities** |

Regarding the crucial "*activity x*" you mentioned before, have you encountered any difficulty to develop it over the past six months? Explain.

How does it affect the accomplishment of "*goal x*"?

What did you do to overcome that difficulty?/What do you think it needs to be done to overcome that difficulty?

***→ Repeat with each activity mentioned***

**(2) Value capture - resources**

Regarding the crucial "*resource x*" you mentioned before, have you encountered any difficulty to access or use it over the past six months? Explain

How does it affect the accomplishment of "*goal x*"?

What did you do to overcome that difficulty?/What do you think it needs to be done to overcome that difficulty?

***→ Repeat with each resource mentioned***

**(3) Value capture - partnerships**

Regarding the crucial "*organisation x*" you mentioned before, what do you currently expect from the relationship regarding "*goal x*"?

Do you consider your interactions with "*organisation x*" have met your expectations over the past six months? Explain further.

Regarding your relationship with "*organisation x*", have you encountered any difficulty during your interactions over the past six months? Explain further.

What did you do to overcome that difficulty?/What do you think it needs to be done to overcome that difficulty?

***→ Repeat with each partnership mentioned***

## Appendix 2. Qualitative multiple case studies: number of informants

| ABS Category | Journal | Author, Year | Title | Advanced Services | SMEs | Value Process | Purpose | Data Collection Sources | Unit of Analysis | Cases | Informants |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Industrial Marketing Management | Story et al., 2017 | Capabilities for advanced services: A multi-actor perspective | ✓ | | Creation | Exploratory | Interviews & Documents | Manufacturer, customer or intermediate | 19 | **24** |
| 3 | Production Planning & Control | Alghisi & Saccani, 2015 | Internal and external alignment in the servitization journey – overcoming the challenges | ✓ | | Delivery | Descriptive | Interviews | Advanced services organisations | 5 | **9-2-2-1-1** |
| 4* | Journal of Marketing | Ulaga & Reinartz, 2011 | Hybrid Offerings: How Manufacturing Firms Combine Goods and Services Successfully | ✓ | | Capture | Exploratory | Interviews | Medium-sized manufacturers to Fortune 500 organisations | 22 | **22** |
| 3 | Industrial Marketing Management | Coreynen et al., 2017 | Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers | ✓ | ✓ | Creation | Exploratory | Interviews, expert discussions & workshops | Manufacturing SMEs using digital tools for advanced services | 4 | **Total in two rounds: 2-3-2-3** |
| 3 | International Journal of Production Economics | Rymaszewska et al., 2017 | IoT powered servitization of manufacturing – an exploratory case study | ✓ | | Creation | Exploratory | Interviews & Historical data | Large manufacturers with successful IoT processes | 3 | **3** |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Industrial Marketing Management | Kowalkowski et al., 2013 | Any way goes: Identifying value constellations for service infusion in SMEs | | ✓ | Creation | Exploratory | Interviews & Internal documents | Swedish SMEs infusing services | 13 | **25** |
| / | Managing Service Quality: An International Journal | Gebauer et al., 2010 | Service business development in small and medium capital goods manufacturing companies | ✓ | ✓ | N/A | Exploratory | Interviews & Longitudinal action research | Capital manufacturing SMEs | 8 | **8** |
| / | Journal of Cleaner Production | Oliveira et al., 2017 | Framework to overcome barriers in the implementation of cleaner production in small and medium-sized enterprises: Multiple case studies in Brazil | | ✓ | N/A | Exploratory | Interviews & Literature review | Metallurgic Brazilian SMEs | 4 | **4** |
| 3 | International Journal of Production Economics | Jayaram et al., 2014 | Supply chain management capability of small and medium sized family businesses in India: A multiple case study approach | | ✓ | N/A | Exploratory | Interviews & Survey | Indian family SMEs | 6 | **6** |

## Appendix 3. Axial coding: themes, sub-themes, categories and sub-categories

| Themes (literature) | Categories (literature) | Sub-categories (data) | |
|---|---|---|---|
| Value outcomes | Strategic | Uncertainty reduction | |
| | | Strategic position | First mover |
| | | | Power balance |
| | Knowledge | Market intelligence | Benchmark |
| | | | Accuracy |
| | Economic | Cost reduction | |
| | | Market share | |
| | Personal | Referrals | |
| **Sub-themes (data)** | **Categories (data)** | **Sub-Categories (data)** | |
| Source | Advanced services validation in the market | Physical evidence | |
| | | Transformation of transactional customers | |
| | | Uniqueness and alignment | |
| | | Performance data | |
| | | Usage experience data | |
| | Application of advanced services validation outcomes | Circular value network | |
| | | Expansion | |

| Themes (literature) | Categories (literature) | Sub-categories (data) |
|---|---|---|
| Key activities | Problem-solving activity | Data management |
| | | Targeting customers |
| | | Targeting suppliers |
| | Platform activity | Platform implementation |
| | | Platform configuration |
| | Production activity | Upgrading |
| | | Manufacturing |
| | | Testing |
| | | Certifying |
| **Sub-themes (data)** | **Categories (data)** | **Sub-categories (data and literature)** |
| Need for collaboration | Internal need | Intellectual resources: specialised knowledge |
| | | Financial resources: money |
| | | Physical resources: components |
| | | Human resources: workforce |
| | External need | Customers' inertia and cost-driven mindset |
| | | Newness in the industry |
| | | Stakeholders' interests |
| | | Previous failure |
| | | Suppliers' inertia and risk aversion mindset |

| | | |
|---|---|---|
| | | Platform members' lack of alignment |
| | | Competition |

| Themes (literature) | Categories (literature) | Sub-categories (data) |
|---|---|---|
| Key partnerships | Integration | Integration of specialised knowledge |
| | | Integration of public funds |
| | | Integration of private funds |
| | | Integration of specialised components |
| | Risk reduction | Provision of credibility/confidence |
| | | Provision of transparency |
| | | Provision of influence |
| | | Provision of training |
| | | Provision of access to customers |
| | | Provision of barriers of entry |
| | Efficiency | Adaptation to advanced services |
| | | Development of low-value activities |
| | | Access over investment |
| **Sub-themes (data)** | **Categories (data)** | **Sub-categories (data)** |
| Partners | Academia | Manufacturing group |
| | | Research centre/institution |
| | | University |
| | Cross-industry organisation | Digital MNC |
| | | Automotive organisation |
| | | Motor organisation |
| | | Software provider |
| | | Complementary partnerships |
| | | Technology organisations |
| | Funding body | UK public funding body |
| | | India public funding body |
| | | National R&D centre |
| | | Government scheme grants |
| | | Regional government |
| | | European funding body |
| | Established traditional partner | Tubing supplier |
| | | Public health sector relationships |
| | MNC | Supermarket MNC |
| | | Digital MNC |
| | | Automotive MNC |
| | | Construction MNC |
| | Higher-level organisms | Regional business association |
| | | Chamber of commerce |

| | | |
|---|---|---|
| | | Technological centres |
| | | Sustainable automotive organism |
| | | CE foundation |
| | | International sustainability organisms |
| | | Council |
| | | CE SME support program start-up |
| | | Regional sustainable fashion organisms |
| | | Innovation hub |
| | Platform members | Apparel brands |
| | | Fulfilment centres |
| | End users | Food shoppers |
| | | Early adopters |
| | Outsourcing organisation | - |
| | Parent company | - |
| | Investors | High-tech MNCs |
| | | Round of private funds |

| **Themes (literature)** | **Categories (literature)** | **Sub-categories (data)** |
|---|---|---|
| Ego-network structure | Structural hole | Between a partner and the ego-network |
| | | Between the manufacturer and a partner |
| | Brokerage position | Manufacturer |
| | | Partner |
| | Cluster | Manufacturer's embeddedness |
| | | Partner's embeddedness |
| | Bridge position | To cluster of potential partners |
| | | To cluster of potential customers |
| Ego-network composition | Multiplexity | Adaptation to advanced services |
| | Intensity | Relational |
| | | Transactional |

## Appendix 4. Participant Information Letter

Funded by the Horizon 2020
Framework Programme of
the European Union

**Participant Information Letter**
**VALUE CAPTURE IN ADVANCED SERVICES: AN EGO-NETWORK PERSPECTIVE**

Principal investigator: Patricia Carolina Garcia Martin
Organization: Advanced Services Group, Aston University
Contact e-mail: garciamp@aston.ac.uk

Dear Participant,

You are being cordially invited to participate in a research study. The following letter will provide you with the necessary information about why the research is being done and what it will involve for you to decide whether or not to take part in it. Please read the following information carefully.

The study is framed within the advanced services framework, where manufacturers provide integrated service solutions through product-service offerings. The aim of the study is to analyse how network collaboration can support value capture for manufacturers.

The design of the study consists of a multiple case study, with a focus on manufacturing SMEs at the beginning of their journey towards advanced services. The study will be conducted during the present year, and until achieving the desired amount of SMEs to participate. You have been chosen to participate in this study because you satisfy the requirements above stated.

The data collection will be developed in the form of interviews. An interview will be developed with the SME in order to identify crucial network actors (15 min) and advanced services goals and challenges in the network (45 min).

The study and data collection process have been approved by the University Research Ethics Committee, Aston University. Accordingly, data will be electronically stored under password protected files and retained for a period of ten years after the completion of the study in accordance with the University's policy on Academic Integrity. The outcome of the study will be published in the form of PhD thesis and publicly available from the University electronic premises.

By participating in the study, you will have the opportunity to increase your awareness on advanced services value outcomes within your network, and to identify possible value slippage issues and how to solve them.

Taking part in this study is entirely voluntary. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. Besides, you are always free to withdraw from the study at any time and without giving a reason. All information collected is strictly confidential and anonymous. If you wish to participate, please e-mail the principal investigator, Patricia Garcia, on garciamp@aston.ac.uk and attach a signed copy of the consent form enclosed in this letter.

Please, do not hesitate to contact Patricia Garcia if you have any doubts about your participation. Also, if you have any concerns about the way in which the study is conducted, please feel free to contact the Aston Business School Research Ethics Committee on e.bridges@aston.ac.uk.

Thank you so much for taking the time to read the information and provided and I hope to hear from you soon.

10.04.19

Patricia Carolina Garcia Martin

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This project reflects only the author's view and the Research Executive Agency (REA) and the European Commission are not responsible for any use that may be made of the information it contains.

**Appendix 5. Consent Form**


04.10.17

# Consent form

**Full title of Project:** NETWORK PERSPECTIVE ON VALUE CAPTURE: CHALLENGES AND OPPORTUNITIES FOR MANUFACTURERS IN SERVITIZATION

**Name, position and contact address of Researcher**: Patricia Carolina Garcia Martin, PhD student at the Advanced Services Group, Aston University.

| | **Please tick box** |
|---|---|
| I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. | ☐ |
| I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason. | ☐ |
| I agree to take part in the above study. | ☐ |

| | **Please tick box** | |
|---|---|---|
| | **Yes** | **No** |
| I agree to the interview / focus group / consultation being audio recorded | ☐ | ☐ |
| I agree to the use of anonymised quotes in publications | ☐ | ☐ |

Name of Participant _____ Date _____ Signature _____