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► **To cite this version:**

Oksana Polova, Catherine Thomas. How to perform collaborative servitization innovation projects: the role of servitization maturity. *Industrial Marketing Management*, 2020, 90, pp.231-251. halshs-02924913

**HAL Id: halshs-02924913**

**<https://shs.hal.science/halshs-02924913v1>**

Submitted on 22 Aug 2022

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## **How to perform collaborative servitization innovation projects: the role of Servitization Maturity**

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# **How to perform collaborative servitization innovation projects: the role of Servitization Maturity**

## **Abstract**

Although current literature indicates that openness and collaboration are crucial for success in an innovative servitization solution within interorganisational servitization projects, research is limited compared to that on product and technology innovation projects. Moreover, this emerging servitization literature is limited to the traditional lead-firm perspective within larger consortiums. To help redress the balance, our research studied six collaborative servitization projects in mobile information and communication technologies (mICT) to explore why some open innovation efforts succeed in simultaneous service and product innovation with a market application of innovative solution, while others do not. The study provides empirical evidence that only a small number of projects resulted in an effective servitization innovation solution. This conclusion emphasises the complexity of creating service innovation in the mICT sector. By comparing better performing servitization projects with those that were less successful suggests that higher performance, in terms of novel service development, requires more than mere strong intention, adequate leadership and change management competencies. Rather, it also requires real servitization maturity in terms of a shared servitization framework and market-oriented innovation.

## **Key words:**

Servitization, service innovation, collaborative innovation projects, mICT

## **1. Introduction.**

Collaborative servitization innovation projects are cooperative initiatives to design and implement solutions that involve concurrent innovation of both the technology and service components. To be successful they require a good understanding of what drives servitization outcomes (Davies et al., 2006; Fliess and Lexutt, 2017) such as an efficient combination of service knowledge (Storey et al., 2016), capabilities and resources (Fliess and Lexutt, 2017) and management of the value co-creation process (Perks et al., 2017; Laczko et al., 2019). Success demands overcoming the challenges of collaboration with a large number of external partners in order to access, exchange and combine specific service knowledge, capabilities and resources (Fliess and Lexutt, 2017) which demands cultural and organisational shifts within the lead firm (Gebauer and Fleisch, 2007; Kowalkowski et al., 2017a) supplier and customer organisations (Roerich et al., 2019), and all partners involved (Martinez et al., 2019). Yet simultaneous innovation of the tangible and intangible components of the servitization solution (Gebauer, 2011) requires close collaboration between all partners involved (Marilungo et al., 2016) to create valuable market knowledge, even from the early development stages, in order to anticipate and capture market opportunities (Saul and Gebauer, 2018). But reaching close collaboration is difficult even within a dyadic co-innovation partnership with customers (Roerich et al., 2019); a partnership that should be maintained throughout the whole process of service value co-creation (Aarikka-Stenroos and Jaakkola, 2012) and which requires trust and a holistic commitment (Kowalkowski, 2011; Ojasalo et al., 2015; Fliess and Lexutt 2017; Roerich et al., 2019). Furthermore, an effective innovative servitization strategy (Gebauer et al., 2010;—Kowalkowski et al., 2013) requires a shared understanding of potential market value, which, in its turn, implies clarity in communicating value of each participant in the repartition of roles, and in the repartition of captured value (Perks et al., 2017).

Despite recognition that servitization process is collaborative and innovative by nature, and the need for extensive and close collaboration for value co-creation determined by a collaborative effort (Perks et al., 2017), major research insights on collaborative servitization are mainly at the lead firm project level (Kowalkowski et al., 2013; Kowalkowski et al., 2017b; Perks et al., 2017) and do not address the problems of open innovation collaboration in interorganisational projects. The current state of servitization literature is focused either on the seller or on the customer perspective, providing few answers on the multi-actor collaborative processes in developing novel servitization solutions (Story et al., 2016; Raddats et al., 2019; Roehrich et al., 2019). Thus there is a distinct gap in studies on interorganisational collaboration beyond the traditional lead firm perspective within larger consortiums (Roehrich et al., 2019) that exhibit the full spectrum of issues relating to collaborating partners and the special characteristics of actors' interaction in a given context of ICT (Fliess and Lexutt, 2017).

To fill this gap, this research analyses larger consortiums undertaking collaborative servitization innovation. More specifically, this study is designed to provide answers as to why some mICT collaborative servitization innovation projects (mCIP's) succeed in the design and market-applicability of innovative solutions while others not. This research compared six mICT servitization innovation projects within the French Centre of Competence of Secured Communication Solutions (Pole SCS), which is characterised by a particular open innovation dynamic around mICT. The objective of this paper is to generate an emergent model, grounded in a data structure, capturing the interviewees' views of mICT servitization in abstract theoretic terminology, and articulating the core concepts related to it. The research contributes to the development of theoretical knowledge by introducing the novel concept of "*servitization maturity*". From a practical perspective, this study provides deeper insights into the implementation for managerial practices and local policies, required to foster collaborative innovation in servitization projects.

The article is organised as follows: we review the research on both service innovation and collaborative innovation projects, then turn to a comparative case study of six collaborative servitization projects in mICT; projects that attempted to co-create both a new service and a new technology simultaneously. Finally, our findings are discussed and implications for future research are explored.

## **2. Literature review**

To better understand collaborative innovation in servitization projects we explore two related research streams: the specificity of innovation in servitization and the challenges of collaborative innovation in servitization project.

### **2.1. Innovation in servitization project**

#### **2.1.1. From services to servitization**

Service is becoming a major source of revenue, even for product companies (Chesbrough, 2011). With a shift from a goods-dominant logic as an output of internal processes to the service practice of a service-dominant logic as value co-creation with customers (Vargo and Lusch, 2004), service is a core of the new logic in doing business requiring specific capabilities (Ojasalo et al., 2015). However, despite the specific characteristics of services and the role of service innovation, most companies do not have R&D operations dedicated to their own service offering (Chesbrough, 2011).

In addition, studies show that the boundaries between services and products are becoming blurred, with products taking on the characteristics of services through

“servitization”, while services are taking on the characteristics of products via widespread use of ICT in services (Barret et al., 2008). In other words, there is a shift towards the “servitization” of products and the “productization” of services (Baines et al., 2007) with servitization enhancing product identity whose material component constitutes an integral part of the service system (Morelli, 2003). However, we lack an understanding of the management process used in creating a servitization solution from both an empirical (Fliess and Lexutt, 2017; Kowalkowski et al., 2017a) and a theoretical perspective (Johnstone et al., 2014; Kowalkowski et al., 2017a), especially concerning the business models for value creation via service provision (Neely et al., 2011; Gebauer, 2011).

Importantly, servitization implies innovation solutions, comprising the development of novel combinations of its tangible (product/technology) and intangible (service) components (Weisner et al, 2013). Despite increased attention within the literature on service development, knowledge is lacking on what comprises successful management in creating complex innovative solutions (Kowalkowski et al., 2017a).

The case of mICT servitization solutions, where product and service are inextricably linked, is particularly interesting as mICT helps shift perspectives on services and products to the blurred boundaries between them (Broussolle, 2016)<sup>1</sup>. mICT, recognised for its for their core role in technical feasibility, structuring and value creation of service offering (Lusch and Nambisan, 2015; Orlikowski and Scott, 2014; Baines et al., 2017), clarifies that servitization is an integral part of service provision (Martinez et al., 2019). Hence, a better understanding of mICT capabilities on service innovation and service use experience is needed (Lusch and Nambisan, 2015). Despite recent concerns about “smart servitization” as high technology advancements<sup>2</sup> in the design and delivery of smart service offerings in business-to-business industrial networks (Kamp and Parry, 2017) - the empirically-supported explanations for success or failure of the offerings remain elusive (Fliess and Lexutt, 2017; Kowalkowski et al., 2017a). Thus, not only is mICT servitization integral to service innovation, but it also reflects the inextricable link between products and services – a core objective in analysing the servitization innovation processes. According to Fliess and Lexutt (2017) further studies are needed to identify the which processes more likely to lead to ICT servitization success.

### **2.1.2. Servitization: a collaborative manner to innovate**

Scholars show that service-dominant logic (Vargo and Lusch, 2004) implies a shift towards co-design, holistic engagement, user-centred empathy and agile service implementation (Ojasalo et al., 2015), implying a reframing towards closeness in collaboration with client. Scholars indirectly outline a need for openness in order to effectively collaborate with a large number of external partners (Wiesner et al., 2013), all from very different fields of knowledge (Salonen and Jaakkola, 2015), to access, exchange and combine specific service knowledge, capabilities and resources (Fliess and Lexutt, 2017). Servitization implies innovating solutions in a collaborative manner (Weisner et al, 2013), an integrating practice seen to more and more involve customer, supplier, and key actors, yet little is known of how such a dynamic and collaborative approach impacts the development of novel servitization solutions within open innovation dynamics.

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<sup>1</sup> Indeed, “On the one hand, they loosen the proximity relationship that linked consumers and providers, since several services can be provided from a distant place. On the other hand, several goods can be dematerialised and instantly provided to the consumer using download, conferring them the look of services, i.e. a combination of intangibility and customer-provider direct link” (Broussolle, 2016, p.8)

<sup>2</sup> Like mICT, industry 4.0, advanced manufacturing technologies, machine-to-machine communication, Internet of Things etc.

However, studies on open service innovation are rare (Mina et al., 2014) calling for further studies of service innovation, including on collaboration between customers and actors (Snyder et al., 2016). The process of open service innovation remains even less explored comparing to product and technology innovations (Chesbrough, 2011; Mina et al., 2014). This is even more valid for servitization. All of which raises the question of how knowledge exchange and combination (Nahapiet and Ghoshal, 1998) is performed in order to enhance innovation within projects.

## **2.2. Challenges of collaborative innovation servitization projects**

### **2.2.1. The key factors to perform collaborative innovation projects**

The literature, mainly on collaborative technology innovation projects, already identified two key success factors: structural antecedents and effective forms of governance. Structural antecedents encompasses the role of: *complementary technologies* in alliances (Ahuja, 2000; Stuart, 2000; Hagedoorn and Wang, 2012) and collaborative R&D projects (Berchicci, 2013); *trust* in alliances (Uzzi, 1996), interorganisational projects (Maurer, 2010), dyadic customer-provider partnership (Kowalkowski, 2011), and interorganisational or internetwork cooperative contexts (Lascaux, 2019); *prior experience* in collaboration and *engagement of already known partners* in R&D alliances (Anand and Khanna, 2000) and collaborative R&D projects (Spanos et al, 2015, Belderbos et al 2017).

Studies on the success of collaborative technology innovation projects outline a need for efficient forms of governance (Davis and Eisenhardt, 2011; Pitsis et al., 2014; Samset and Volden, 2016; ul Musawir et al., 2017; Wu, et al., 2017; Haq et al, 2019). This literature addresses many of project efficiency issues including: design, types, and role of governance mechanisms. For example, Davis and Eisenhardt (2011) outlined the crucial role of rotating leadership in successful knowledge combination. However, contemporary research on governance of interorganisational innovation projects remains ambiguous (Wu, et al., 2017), while the confusion of scholars concerning weak effectiveness and the poor outcome of projects persists (Haq et al., 2019). Even fewer answers are provided when considering the mechanisms that enable realisation of successful collaborative innovation servitization projects.

Finally, the studies on ecosystem as structure outlined two key points. Firstly, Adner (2017) outlined the alignment structure required to render cooperation of a multilateral set of partners efficient. Also, the scholar highlights a need for the identification of the focal value proposition. According to Andler (2017) the value proposition is the foundation of the ecosystem and creates the boundary of the relevant ecosystem. In his ecosystem approach it is the focal firm that plays a key role in the identification and sharing of the focal value proposition. However, in contrast to the ecosystem, within a collaborative servitization innovation project, the role of the project leader is much less important than the role of the ecosystem leader.

### **2.2.2. The specificity of collaborative innovation servitization projects**

Collaborative servitization innovation projects may be defined as a cooperative initiative to create, and implement, innovative solutions with simultaneous innovation of technology and service components. Though the servitization process is collaborative and innovative by nature, research into collaborative servitization innovation projects remains limited, the majority of studies being dedicated to the innovation initiatives and projects carried within a firm (Kowalkowski et al., 2017b), and do not address open innovation collaboration in interorganisational projects. Few recent studies address the issue of collaborative innovation but do so only from the perspective of a centric leading firm. This

dominant centric-firm approach does not reflect the full spectrum of complexity present in open collaborative servitization dynamics. Nevertheless, this leader-centric literature allowed to outline three key challenges of servitization innovation: 1) the vast scope of partners, 2) close collaboration, and 3) value creation and repartition.

### **Vast scope of partners**

The current literature shows the challenges of collaboration in developing servitization solutions related to a vast scope of partners - an extended collaboration of multiple partners comprising large network of partners, customers, suppliers, intermediaries, etc. Indeed, the special nature of service knowledge has an impact on both the development and the delivery of advanced services within added-value servitization solutions, and requires the development of specific (Neely et al., 2011) diverse (Kowalkowski et al., 2013) and complementary capabilities (Matthyssens and Vandenbempt, 2008), which are a unique and complex combination of interrelated capabilities of all the core partners involved in servitization initiatives (Story et al., 2016).

Thus, servitization scholars highlight the challenges in the collaboration arrangements between manufacturers and other development partners (including service providers, customers, and network organisation) in order to achieve complex servitization solutions (Wiesner et al., 2013). But, collaborative innovation of servitization solution inevitably requires much more than a partnering culture between customer and supplier organisations (Ng et al. 2011) or adaptation within supplier and customer organisations themselves (Roehrich et al., 2019), but a creation a collaborative environment (Marilungo et al., 2016) based on a new mindset with holistic change encompassing all partners involved (Martinez et al., 2019).

### **Close collaboration**

Moreover, servitization literature on innovative solution development suggests that the combination of knowledge between the partners should be realised within close collaboration, reflected in widely applied concepts such as: “co-creation”, “co-design” and “co-innovation”. In contrast to a traditional manufacturer’s servitization, the challenge of simultaneous innovation of the product and service business models (Gebauer, 2011) of an innovative servitization solution is combined with uncertainty of the novel value creation since both service, and its supporting technology/product, does not even exist yet. This implies the need for close collaboration to create valuable market knowledge, even from the early development stages, in order to anticipate, capture and balance market opportunities of standardisation versus customisation (Saul and Gebauer, 2018) offered by user-specific needs and contexts (Ojasalo et al., 2015).

Servitization scholars within networking theory (Gebauer et al., 2013; Kowalkowski et al., 2013; Weigel and Hadwich, 2018) and the service-dominant logic approach (Lusch et al., 2010; Ford, 2011) consider networking as a useful tool for collaboration enabling the sharing of experiences, know-how, skills and technology. Studies identified the role of different types of service networks and their corresponding dynamic and operational capabilities (Gebauer et al., 2013), as well as the role of a set of factors on the success of service networks throughout servitization: including the roles of the: process of partner selection, partner manager in charge of network coordination, partners communication, service level agreements, customer orientation, professional competence on innovation performance, customer satisfaction, and durability of partnership (Weigel and Hadwich, 2018).

Close collaboration implies, first of all, a closeness with customers (Kowalkowski, 2011) throughout the whole process of service value co-creation

(Aarikka-Stenroos and Jaakkola, 2012). Establishing close collaboration in supplier-customer co-innovating partnerships requires trust and commitment (Kowalkowski, 2011; Fliess and Lexutt 2017; Roehrich et al., 2019), user empathy, holistic engagement and agility of service implementation (Ojasalo et al., 2015). But, reaching such close collaboration remains complex even within dyadic co-innovating partnership, as it takes enormous time, effort and agility to design and manage such close supplier-customer interaction (Roehrich et al., 2019). Moreover, in the contexts of collaborative innovation of servitization solutions, the complexity of collaborative interaction between the partners from different knowledge fields leaves no place to a sole leader guiding the entire development process (Salonen and Jaakkola, 2015). This implies the need for alternation and realignment (Saul and Gebauer, 2018) - shared leadership, appropriate agility of strategic directions and change management (Kowalkowski et al. 2012; Kowalkowski et al. 2017a; Roehrich et al., 2019) in realising an innovative collaborative servitization solution.

### **Value creation and repartition.**

The particularity of service knowledge, and the intangible nature of service itself, raise concerns about how to share value between a large number of partners; leading to difficulties in combining knowledge and partners motivation. Indeed, successful value co-creation between a large number of partners (Salonen and Jaakkola, 2015), within innovative collaborative servitization projects, requires strategic envisioning and realignment in the sensing and seizing of market opportunities (Saul and Gebauer, 2018) based on a shared understanding of potential market value (Perks et al., 2017).

Also, there are a number of important concerns from collaborative servitization experience in creating novel value within the firm-networking servitization studies, for example: interorganisational network orchestration, and value constellations in networks. As sets of connected exchange relationships, both value constellations and value platforms, imply that collaboration is initiated by a central network leader (big firm or SMEs) who deliberately unites and orchestrates the core actors around novel value creation (Kowalkowski et al., 2013; Perks et al., 2017). These core actors are independent but intentionally interrelated to bring into being a specific servitization strategy, which in its turn may imply innovation (Gebauer et al., 2010; Kowalkowski et al., 2013). At the same time, the leader trusts and depends upon these actors in achieving the outcome of value co-creation (Perks et al., 2017). The success of value co-creation is determined by the collaborative actions of the all partners involved, and it implies the critical importance of clarity in the repartition of roles in which actors collaboratively co-create value, as well as in the repartition of value captured among them (Perks et al., 2017). More specifically, it indicates the core role of sharing early ideas between partners about the potential value creation opportunities offered by collaboration with the lead-firm, identification of possible value misalignments, and the establishment of a shared understanding of each partners' needs and perceptions their own value (Perks et al., 2017).

But, the anticipation of potential value is already challenged by the difficulties of combining, sharing, and managing the service knowledge (Storey et al., 2016). Moreover, leader' strong focus on technology or product, and own centricity in assessment of capabilities and resources of its partners and knowledge retention may harm the communication of complexity and intangibility of value related to service innovation objectives; and prevent the establishment of a clear and shared understanding of how the value of a novel service is delivered (Perks et al., 2017). Such obstructed envisioning of the value of collaboration may block innovation from



the very early stages of value creation, even before any combination service knowledge occurs (Perks et al., 2017). These insights resonate with studies that position a focal value proposition at the core of the ecosystem in order to align the positions and activities of different partners. An ecosystem logic implies the need for structure alignment among partners within the same ecosystem in terms of their perspectives on the value proposition to ensure common value creation (Adner, 2017) and is of particular relevance in the collaborative servitization innovation context. However, as demonstrated above, it is extremely challenging to anticipate and define the value proposition within servitization innovation projects.

In summary, several gaps were identified in understanding collaborative servitization innovation projects. Firstly, current research outlines the challenges of a project with a large number and scope of partners, but it does not provide insights into how to manage close collaboration without a leading firm. Although some servitization studies reflect some interorganisational aspects of servitization, they address only the issues at focal firm level and its own internal organisational issues in realising servitization (Kowalkowski et al., 2013). By adopting the perspective of the central actor, most service infusion (Kowalkowski et al., 2013), network orchestration studies (Perks et al., 2017), and service networks (Gebauer et al. 2013; Weigel and Hadwich, 2018) neglect the involvement of SMEs and lack a broader stakeholder perspective. Moreover, while servitization literature is centred either on the seller or the customer perspective, there are few answers on the process of interorganisational collaboration in innovating servitization solutions within a project over time (Raddats et al., 2019; Roehrich et al., 2019). In the same way, a broader understanding of value co-creation (Vargo and Lusch, 2004), implying dynamic collaboration in value creation between a firm and its customers around value propositions (Vargo and Lusch, 2008), requires further clarification within network settings (Kowalkowski, 2011). Studies on successful management of service networks in servitization settings remain rare (Weigel and Hadwich, 2018). Thus, there is a distinct gap in studies on interorganisational collaboration within larger consortiums (Roehrich et al., 2019) that exhibit the full spectrum of issues relating to collaborating partners and the special characteristics of actors' interaction in a given context of ICT (Fliess and Lexutt, 2017). In response to these needs for further studies within larger consortiums, this research explores interorganisational collaboration within servitization innovation projects in mICT.

## **Methodology**

This research is conducted within the specific context of French Pole of Competitiveness<sup>3</sup>. More specifically we selected servitization collaborative innovative projects that were originated within the Secured Communicating Solutions Pole (Pole SCS). Specialised in ICT, Pole SCS was formed in 2005 in the Provence-Alpes-Côte-d'Azur region and encompasses the Marseille, Rousset and Gemenos and Sophia Antipolis technology clusters. Not only is the context of Pole SCS rich in sources of external knowledge in ICT and mICT, but it also promotes and supports collaborative projects between diverse actors, including big and small organisations, universities, private laboratories and other entities, thus allowing to explore mICT servitization collaborative innovative projects within open innovation dynamics.<sup>4</sup>

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<sup>3</sup> Being reinforced by European policies oriented on the strategic development of high-tech clusters, new industrial policies of Centres of Competitiveness in France were implemented to support strategically important specialisation and to settle clear objectives of reinforcement of specific geographic places within France via academic-industrial collaboration for not only technological and scientific purposes within CIP's, but also with the aim to achieve an impact on market.

<sup>4</sup> Secured Communicating Solutions Centre (Pole SCS) allows to explore mICT servitization collaborative innovative projects within open innovation dynamics as it is specialising in ICT and mICT. Also, it was labelled by the government as a "global pole of competitiveness".

From a critical realist prospective (Bhaskar, 1978), this study is designed to provide the answer on the question why some mICT servitization collaborative innovation projects (mCIP's) succeed while others not. Therefore, this study employs intensive research methods – the explanatory comparative case study method as defined by (Avenier and Thomas, 2015). This method represents a conceptual advantage as abductive comparative case study allows elucidation of the detailed contingency of contextual conditions under which assumed generative mechanisms interact, regroup and act (Bhaskar, 1978) explaining why these servitization mCIP's are resulting in a service development or not, depending on the specific context of each projects.

### **Selection of cases: from 23 to 14 cases**

We selected the most pertinent CIP's of Pole SCS around mICT servitization. As a starting point, we collected extensive data about CIP's originating within Pole SCS. We were able to reunite the information about 419 CIP's, referenced by Pole SCS, over a seven-year time period of innovative activities, referenced by Pole SCS, over a seven-year time period of innovative activities.<sup>5</sup> From this base we selected mCIP's with formally declared the objective of service development and with the availability of funds. Thus, we obtained 23 servitization mCIP's from which 14 agreed to participate in our research.

### **Data collection: 14 cases**

In total, we conducted 43 interviews with the participants of these 14 projects. The interviews represent 46 hours and eight minutes of recordings; some 528 pages. The interviewing process was based on semi-structured interviews with open-ended questions (Annex1). This way we intended to avoid influencing the interviewee and so obtain the most appropriate information about the phenomena. From a critical realist perspective, searching for explanations of differences in results, our interview guide was elaborated in a way to attract the attention of interviewees on the events through the entire process of the project from its initiation and initial objectives to the final results. In this way we aimed to gather information from the project actors through their description of events. Most importantly, we included questions relating to the motivation of the project actors to increase our chances of gathering the information about the reasons for a successful or failed servitization innovation.

Importantly, only six of the 14 projects had, at the beginning of the project, a real intention to develop a servitization solution. To guarantee the comparison, all projects had the same characteristics in terms of composition of partnership, antecedents and contextual condition of Pole SCS. More detailed data on the characteristics of projects is presented in Annex 3 and 4. Consequently, the in-depth analysis of the phenomena of mICT servitization within mCIP's is based on 16 interviews with the participants of six projects' These specific interviews represents 21 hours and eight minutes of recordings, or 229 pages of text (Annex 2).

### **Data analysis of six cases**

The analysis of data is based on the DREI<sup>6</sup> process of Bhaskar (1998) adapted by Wynn and Williams (2012). Consequently, the analysis of collected data is organised in the following phases: Describing the significant features of the events;

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The context of Pole SCS is rich in sources of external knowledge in ICT and mICT and supports the development of applicative collaborative projects between diverse actors, including big and small actors, universities, and private laboratories and other entities.

<sup>5</sup> Pole SCS provides an access to its projects' database for a seven-year time period.

<sup>6</sup> DREI process: Describing the significant features of the events; Retroducing of possible causes – i.e. generative mechanisms and structures; Ensuring that proposed mechanisms have strong causal and explanatory power; and Identifying the generative mechanisms at work activated by contexts.

Retroduction of possible causes – i.e. generative mechanisms and structures; and Identifying the generative mechanisms at work with strong causal and explanatory power and activated by contexts via comparison of cases.

The first phase is dedicated to the description of projects in terms of their characteristics, and especially their results, in order to gather together projects with really similar characteristics. The description of significant features of servitization mCIP's included: type of project actors and their relation to Pole SCS; servitization objective; and the results in terms of servitization solution obtained through the projects' realisation.

Thus, within the first stage we described all six mCIP's and identified two different types within them: *two successful servitization mCIP's* and *four failed servitization mCIP's*. Therefore, the second phase, more explicative, is dedicated to the identification of generative mechanisms, and structures, as well as their mode of activation that explain the results of the projects in terms of servitization innovation for each type of servitization mCIP's. Our explicative phase is based on the abstractive process of open coding (Strauss and Corbin, 1998) adapted by Gioia et al. (2012) that allows to identify the structures, the contexts that allowed to activate the generative mechanisms responsible for the results in terms of knowledge creation for each types of mCIP's in the specific case of mICT servitization. We thus build a data structure for each type of project, by reuniting the codes of 1<sup>st</sup> and 2<sup>nd</sup> order together with aggregate dimensions of 2<sup>nd</sup> order data structures for the two types of mCIP's are developed (Figure1 and 2) and completed by data tables.<sup>7</sup>

Finally, we compare the results of analysis obtained within each of two types of servitization mCIP's to improve our understanding of the role of the contexts and the structures in the activation of generative mechanisms that produce the observable.

## **Findings**

The findings are organised in two sections: the findings regarding the 1<sup>st</sup> and 2<sup>nd</sup> types of servitization innovation and resumed with a third comparative section.

### **Type 1. Successful servitization innovation**

Both projects of the 1<sup>st</sup> type were initiated and structured with similar antecedent conditions and ended with commercialised servitization solutions.<sup>8</sup> The solutions were specific to the needs of the industrial laundry and public transport companies, as final users, and comprised technological innovation of products as well as an improvement in existing services provided by the clients. Thus, both projects resulted in successful servitization innovation in terms of both material and service components.

### **Retroduction and identification of generative mechanisms of the 1<sup>st</sup> type**

Our data structure for this type of projects is presented in Figure1 (Annex 5), based on which we develop our reasoning regarding this specific type of realisation of mICT servitization.<sup>9</sup>

The 1<sup>st</sup> types of servitization mCIP's were initiated within a specific set of contextual conditions: “Market-oriented mICT Innovation”, “Shared servitization framework” and “Conditions for collaborative efficiency”.

### **Market-oriented mICT Innovation**

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<sup>7</sup> Full data tables are available upon the request of reviewers.

<sup>8</sup> Figure1 and 2 are presented in Annex 5 and 6. More specific description of common characteristics of structural antecedents and the results is presented in Annex3.

<sup>9</sup> The Data structure is completed by a Data Table (Annex7).

Initially, the 1<sup>st</sup> type of servitization mCIP's had the strong orientation on market in realising mICT innovation. It was a distinctive and mutual engagement to realise innovation, combined with shared understanding of the necessity to gain competitive advantage via project solution as a reaction to a strong competitive pressure to innovate in mICT environment. To distinguish themselves the projects' actors "*tried to push a kind of a new solution on the market. Because today the market is widely covered by SERENEX from XP*" (PFast/I4\_indust).

### **Shared servitization framework**

Both projects were characterised by early development of an exact and common servitization objective "True servitization objective elaborated and fully shared". For example, actors of the projects of the 1<sup>st</sup> type "*were in the project because they shared the same idea as us: how to improve the performance of LCD and the security of RFID in transportation market*". "*So, everybody is concerned in getting the project success*" (PFast/I3\_smeLead). The common objective was reinforced by clear and formalised "business model understanding" "*There is a real market, because there is a great problematic to tag the clothes*" (PText/I3\_acad) and business model "*...formalised from the beginning of the project*" (PFast/I3\_smeLead).

What is more, from the very beginning the 1<sup>st</sup> type mCIP's had a highly specific orientation on particular users "Customisation Priority - Targeting specific user". A specific user was identified and this guided the particular direction for further development of customised servitization: *So they (the client – laundry rent company) had specific expectations about the functions of the final solution*" (PText/I3\_acad). It was thanks to direct access to a user that was known, integrated and actively participating that the outcomes of servitization were clear from the very beginning.

Thus, "Market-oriented mICT Innovation" combined with "Shared servitization framework" reflect a strong degree of the maturity of servitization innovation. Most importantly, it allowed partners to clearly anticipate of the potential value creation of servitization innovation within a collaborative effort.

### **Conditions for collaborative efficiency**

The 1<sup>st</sup> type of servitization mCIP's reunited favourable conditions for true collaborative efficiency of shared camaraderie and risk sharing, respectfully named as "Brain vs. Geographical proximity" and "Established trust between the partners". Not only the partners knew each other, but they were involved in projects because of their competencies: "*You work with people that you like, that you share ideas. Like I have an idea, my partner shares it as well, is competent and we make good things together. So, it is not a geographical proximity, it is brain proximity, the proximity of heart*" (PText/I2\_smeLead). What is more, such prioritising of competencies in structuring of the project was realised based on the clear understanding of the necessity of trustful spirit within a collaboration that reflects strong motivation in collaboration: "*I think it is extremely important to know each other before. Because we can share the ideas and be sure that everybody is concerned by the project.*" (PFast/I3\_smeLead).

These "Conditions for collaborative efficiency" and "Servitization maturity" constitute contextual conditions that allow to activate two key mechanisms, clear "anticipation of servitization innovation value" and strong "motivation to collaborate in servitization innovation", that in their turn allow to develop an efficient structure.

### **Efficient structure: Independency- Interdependency Equilibrium**

The 1<sup>st</sup> type of servitization mCIP's settled a particular balance between self-governance and interrelated connections between the partners. It was based on "Clear task repartition without internal competition" with "Global architect and a coordinator who had global view of technology and problems".

First of all, in both projects we observed a good repartition of tasks between the actors involved that were complementary and non-competing within their core expertise. Initially projects leader "*were very careful that in one given domain there is only one player, only one partner*" (PText/I2\_smeLead), This excluded internal completion as "*everyone know that he worked in a single task, and with a very specific constrains*" (PText/I3\_acad).

What is more, the overall leadership of the collaboration was characterised by critical role of "Global architect and a coordinator who had global view of technology and problems". The leader confirms: "*On the overall architecture level we were the only one to have the top view*". "*We were the only one in that system architecture. The other partners were just there full of confidence, very defined, very specific in their competencies, all of them, specific and were very successful*" (PText/I2\_smeLead). Both projects had strong leader (SME) where participants "*interact directly (with the leader) because the project leader has the skills to understand every problematic.*" (PText/I3\_acad) and had global view of technology and problems.

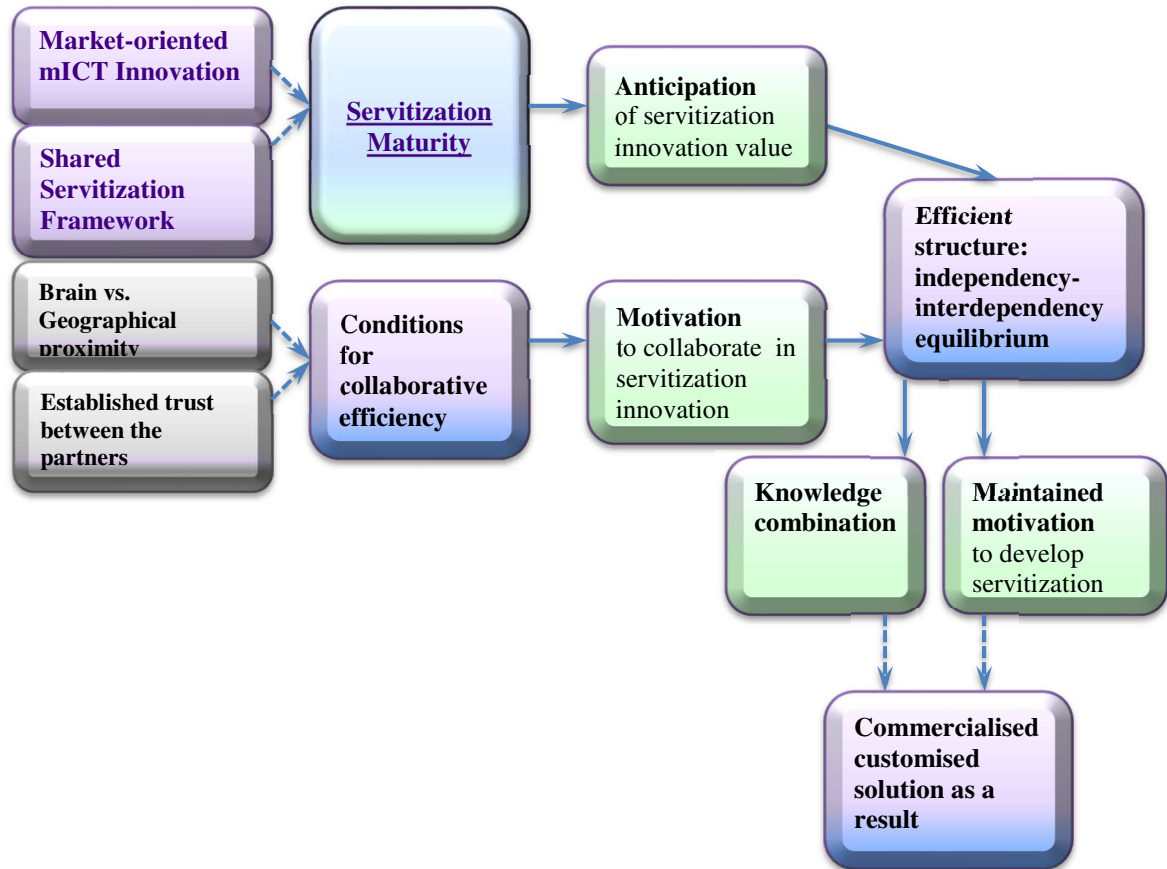
### **Commercialised customised solution as a result**

Consequently, this efficient structure was critical for achieving desired results. 1<sup>st</sup> type mCIP's were realised up to the "Commercialised final solution, specific to users". Firstly, efficient structure fostered "knowledge combination" by the active involvement of specific user in the refinement of product to fit specific user's needs. Indeed, the successful development of the "*... solution with specific functions which are dedicated to transport ticketing*" (PFast/I4\_indust) would not have been possible without an active user involvement in knowledge combination while developing customised solution. "*So, the user was the one to build the overall application specification. It was the one to buy it and to use it. So, it means within our system, once they defined what they (users) wanted...different industrial partners got to technical specification. And they were supported by academic labs, to help to develop the whole thing*" (PText/I2\_smeLead).

Secondly, efficient structure "maintained motivation to develop servitization" established by collaborative efficiency up to the "commercialised customised solution as a result": "*...it was more easy to get at the end something which can be sold: that we can put on the market and sell. But this was the main objective of that project*" (PFast/I4\_indust). "*The target is that they will be on the market. And they will be on the market*"(PFast/I3\_smeLead). "*...we have started already the promotion*" (PFast/I4\_indust).

The resumed representation of collaborative servitization innovation dynamics of the 1<sup>st</sup> type of servitization mCIP's is presented in the Figure 3.

**Figure 3 General dynamics within the 1<sup>st</sup> type of servitization mCIP's**



**Type 2. Failed servitization innovation**

All four projects of the 2<sup>nd</sup> type were initiated and structured with similar antecedent conditions and ended with non-commercialised servitization solutions.<sup>10</sup> The solutions were incomplete by being specific only to the use application field (mobile publicity, tsunami alerts, smart building, water industry), but not to the needs of real companies. So, service components were defined in terms of feasibility of application in the long-term. While in terms of the material component, projects resulted in technological innovation of product technology, including the development of an advanced prototype far from commercialisation. Thus, all four projects resulted in failed servitization innovation in terms of both the material and service components.

**Retrodution and identification of generative mechanisms of the 2<sup>nd</sup> type**

The data structure for the 2<sup>nd</sup> type of projects is presented in Figure2 (Annex6), based on which we develop our reasoning regarding this specific type of realisation of mICT servitization.<sup>11</sup>

The 2<sup>nd</sup> types of servitization mCIP's were initiated within next contextual conditions: “Technology- versus Market-oriented mICT Innovation”, “Unshared servitization framework” and “Conditions when collaboration is likely to be less effective”.

**Technology- versus Market-oriented mICT Innovation**

The 2<sup>nd</sup> type of servitization mCIP's had strong orientation on applied research in realising mICT innovation. The participants became engaged in collaborative

<sup>10</sup> More specific description of the results is presented in Annex4.

<sup>11</sup> The Data Structure is complemented by the Data Table for the 2<sup>nd</sup> type of projects (Annex8).

innovation with a potential of raising complementary financial gains from future applications. Largely centred on science and technology, the participants saw an application potential for their technology. *“Our main objective was to foster this activity and try to demonstrate by using this kind of project that it is possible to do alert via satellites.”*(PRatc/I2\_industLead). As a reaction to highly evolving and troubled mICT market where *“...you have a mobile ICT market that is increasing. Lot of events. But the players there are fragile”* (PRatc/I3\_acad) the participants of the mCIP’s of the 2<sup>nd</sup> type realise the necessity to apply their technology to existing needs *“To be more familiar with this kind of technology, and this kind of technology users.”* (PCont/I1\_sme).

### **Unshared servitization framework**

Another distinction of the 2<sup>nd</sup> type of mCIP’s was related to weak servitization framework where *“Servitization objective elaborated but not fully shared”* combined with *“Business model misunderstanding: unclear market positioning”*. The leaders of four projects have generalist vision of market and its needs, having *“a global vision of needs”* (PMpub/I1\_acad).

Also, this vague servitization objective was not mutually shared among all the actors: and lacked the clarity in market positioning: *“there were several different entities, ... and each has a different objective...And sometimes it is not always fully in line with what we want to do in the project.”* (PRatc/I2\_industLead). As the benefits of servitization were not clear to all project actors, the business model was also misunderstood, while its importance and the lack of consideration to its elaboration was recognised after the project was finished: *“... it was not done by the Marketing, by the Strategy (departments); it was done only by one person here that’s why it’s small...I’d prefer to have people also from the Strategy or Marketing”* (PSmart/I1\_indust Lead).

What is more, 2<sup>nd</sup> type mCIP’s initially had *“no customisation priority”* that represented a non-customised servitization approach, specific to an identified field of application but not to the actual needs of final users. Here, the main problem laid in difficulty to anticipate final outcomes of servitization due to unclear service definition and counting on experimentation in real-life conditions within several use scenarios. *“User context was considered during all the project. Because at the beginning we tried to define the final user needs and tasks, the environment, the kind of tools and so on. And at the end we tested several times... to check the usability of new products, new devices and new services.”* (PCont/I1\_sme). Such experimentation is too far from specific expectations of the actual use of servitization solution.

Thus, *“Technology- versus Market-oriented mICT Innovation”* combined with *“Unshared servitization framework”* reflect a low degree of the maturity of servitization innovation. Most importantly, this immaturity did not allowed partners to clearly anticipate of the potential value creation of servitization innovation within a collaborative effort.

### **Conditions when collaboration is likely to be less effective**

The 2<sup>nd</sup> type of servitization mCIP’s accumulated a number of weaknesses that created unfavourable conditions for collaboration. One of them was related to *“Geographical vs. Brain proximity”*. Without clear idea of final service user, the partnerships were constructed around a set of competencies required for the realisation of project. At first place the partners from prior experiences were chosen according to *“feeling”* proximity, while the unknown partners were picked with the respect to existing requirement of Pole SCS in geographical location and partner type. This way some of the participants were not in the project scope and unable to

establish any collaborative relation. *“We were there just because they were needing academic partner, not because they were willing to do real things with us...what we were doing was interesting to no one. And so that was it – we were just left on ourselves...”* (PSmart/I2\_acad). Another disadvantage lay in “Partially established trust between the partners”. A collaboration spirit was shared only between some of participants that knew each other in advance, resulting in a limited trust: *“And then, after...what was there: the relationship based on trust between them (leader) and (big industrial)”* (PMpub/I1\_acad). But *“We didn't really live these (sharing of risks, mutual assistance) that much through the project itself”* (PMpub/I1\_acad).

Combined with “servitization immaturity” these “Conditions when collaboration is likely to be less effective” activate two critical mechanisms, “challenging anticipation of servitization innovation value” and “weak motivation to collaborate in servitization innovation”, that in their turn caused the development of an inefficient structure.

### **Inefficient structure: Independency- Interdependency Disequilibrium**

There was the misbalance between self-governance and interrelated connections between the partners of the 2<sup>nd</sup> type of servitization mCIP's. Though the projects were characterised by quite good repartition of tasks between the complementary actors and independent teams, but it was combined with some degree of internal competition that was sometimes challenging for the collective effort. *“There was some competition with big industrial partners, because in fact they thought (Leader) was like...competitor...they were a bit afraid to be there, the relationship was a little bit strange.”* (PSmart/I1\_industLead). What is more, the leaders were not playing the role of global architects: *“It is difficult to talk about an architect in this context.”* (PSmart/I2\_acad). The overall leadership was more realised through the coordination and synchronisation of the collaboration, where industrial partners had more global vision of technology and supported the lead in an informal way. *“Well, normally it was for leader to do that, but actually it was for big industrial group to do it somehow.”* (PMpub/I1\_acad).

### **Non-commercialised prototype as a result**

Subsequently, inefficient structure influenced the results of the projects of the 2<sup>nd</sup> type. From one side, inefficient structure resulted in “challenging knowledge combination” by unclear idea of user's needs within a given application field and conflicting interests. Partners in the 2<sup>nd</sup> type of mCIP's faced difficulties in sharing knowledge necessary for service development. *“... at a certain point we had a problem in getting information from Leader...there was information and data that they had a difficulty to... share.”* (PMpub/I1\_acad). Though on separate building blocks of the servitization solution partners were able to combine the knowledge, they did not have the combinatory capacity for the global solution: *“... globally in the project – there was no really trusting synergy. But on components, on up-stream or on down-stream components – yes, there was synergy.”* (PRatc/I2\_industLead). Also, an inefficient structure did not allow to maintain the initial motivation in the development of servitization innovation causing “shifting motivation in servitization development to technology”. Weak motivation in outcomes in terms of servitization remained uncertain, while the motivation in technology development was and remained clear from the very beginning *“I'm not sure about the specific market aspects that were addressed. Because the academics, SME, and big companies ...were concentrated on technology, technology and technology.”* (PCont/I1\_sme).

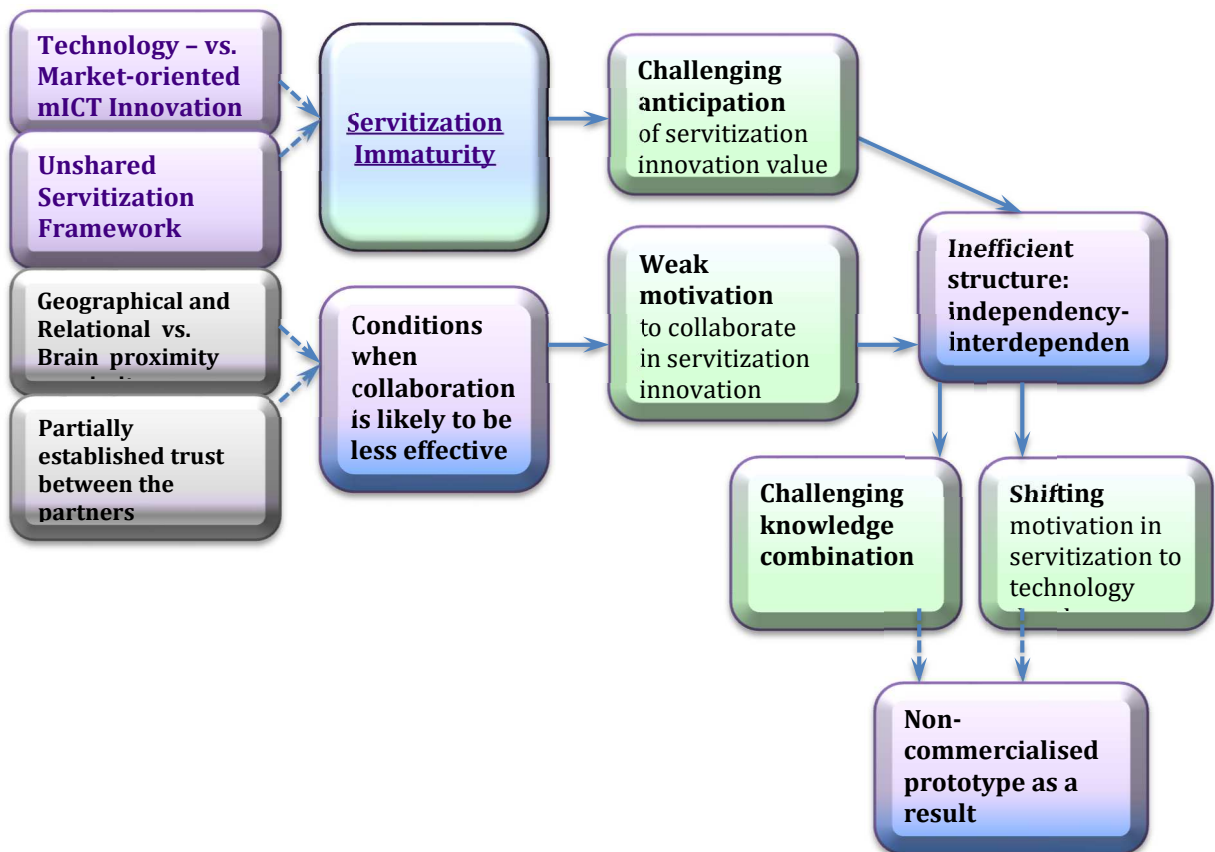
Consequently, the 2<sup>nd</sup> type projects resulted in “non-commercialised prototype specific to use application field”. *“We delivered some prototypes...There was proof of*



concepts, of techniques supporting the services...But not the demonstration of the full service.” (PRatc/I3\_acad). So, the lack of active participation of final user resulted in developments that are not adapted to real use: “But, typically the mobile worker did not want such equipment – too sophisticated.” (PCont/I2\_acadLead). Thus, the projects remained technology and R&D-oriented and developed “non-commercialised prototype as a result” with uncompleted service component far from reaching the market: “So, again maybe it remains too much research projects with interesting things as in many research projects but without all concretisation in the real life with real service with real money” (PRatc/I2\_industLead).

The resume of general dynamics of collaborative servitization innovation of the 2<sup>nd</sup> type of servitization mCIP’s presented in Figure 4.

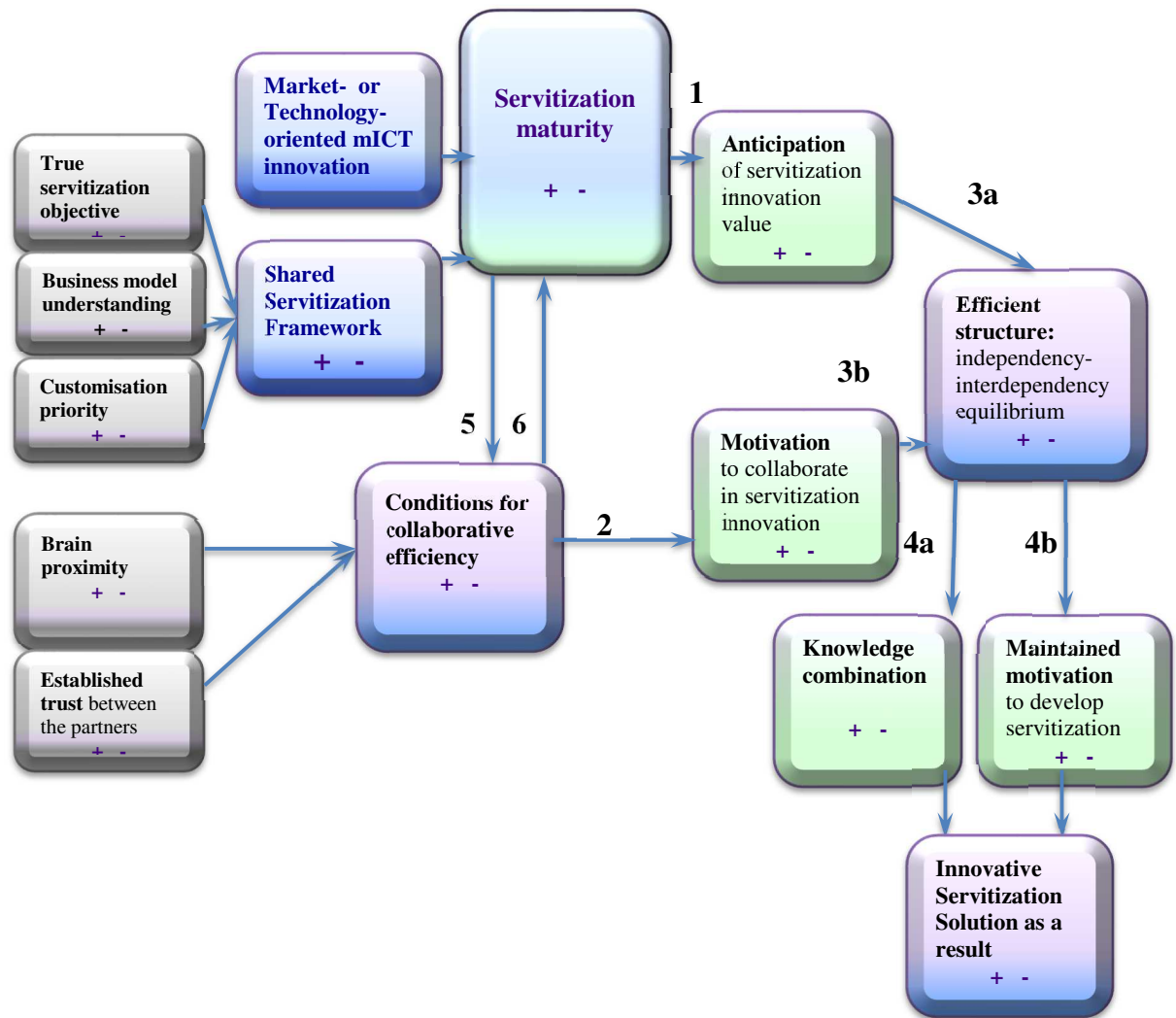
**Figure 4 General dynamics within the 2<sup>nd</sup> type of servitization mCIP’s**



**Synthesis of analysis: the comparison of two types servitization mCIP’s**

The retroduction and identification of generative mechanisms of the two types of servitization mCIP’s allowed us to develop an emergent model of servitization framework (Figure 5). The results of the study show two key elements of context: *servitization maturity* and *conditions for collaborative efficiency*, and how these activate the generative mechanisms responsible for the outcomes of collaborative servitization innovation. More specifically, it is *market-oriented mICT innovation* and a *shared servitization framework* that constitute servitization maturity and results in a clear anticipation of the value of servitization innovation (1). In its turn, the choice of trustful partners, based on their competencies, creates the conditions for efficient collaboration and favours a strong motivation to collaborate (2).

**Figure 5 Emergent model of mICT servitization framework**



Moreover, when the anticipation of servitization innovation value and the motivation to collaborate in servitization innovation are activated, they both result in the establishment of an efficient structure within servitization mCIP's (3a; 3b). And here it is the degree of established structure efficiency that influences the results of collaboration (4a; 4b). Not only does an efficient structure allow to establish agility and flexibility in service innovation processes between complementary and non-competing partners (supported by a global architect), but also results in successful knowledge combination via active involvement of customer in value co-creation processes and the continuity of market-oriented motivation in servitization innovation. While an inefficient structure often suffers from a disequilibrium of interest between partners that challenges knowledge combination and only reinforces their initial engagement in the development of the technology, while at the same time diminishes the market-centred objectives. Thus, the degree of structure efficiency activates the generative mechanisms of fostered versus challenging knowledge combination and maintained versus shifted motivation in servitization and thus influences the final results of a collaborative effort. Also, the degree of servitization maturity favours real service collaboration, making it more and more efficient (5). Simultaneously, collaboration efficiency improves servitization maturity as the capacity to develop services in terms of customisation, business model understanding

and shared servitization objective; while collaboration inefficiency does not allow the accumulation of maturity competencies (6).

Thus, the comparison of two types of mCIP's shows two distinctive approaches to the development and management of these projects that activates key mechanisms of servitization innovation with different levels of efficiency. The mechanisms responsible for the outcomes of servitization mCIP's are: *anticipation of servitization innovation value*, *maintenance of the motivation to collaborate in servitization innovation*, and *knowledge combination*. What is more, apart from the conditions for collaborative efficiency, *servitization maturity* is another key element of context which influences structure efficiency and is required for successful outcomes of servitization innovation.

### **Discussion and conclusions**

This study provides deeper insights into processes of servitization within coupled-based open innovation dynamics (Chesbrough, 2011; Mina et al., 2014) both empirically (Fliess and Lexutt, 2017; Kowalkowski et al., 2017a) and theoretically (Johnstone et al., 2014; Kowalkowski et al., 2017a). More specifically, by choosing to study the development of novel solutions within collaborative innovation servitization projects in mICT within French Pole SCS, this paper explores the novel multi-actor configuration of collaborative processes (Story et al, 2016; Raddats et al. 2019; Roehrich et al., 2019) to answer the call for studies on interorganisational collaboration within larger consortiums (Roehrich et al., 2019) in the context of ICT (Fliess and Lexutt, 2017).

First, our major contribution consists in introducing a novel critical element of context for collaborative efficiency - the concept of "*servitization maturity*" - a new antecedent of innovation that contributes to a better understanding of the factors responsible for servitization success (Davies et al., 2006; Fliess and Lexutt, 2017). Indeed, both types of servitization mCIP's were launched with similar antecedents of partners' diversity, membership in Pole SCS, and a prior working relationship between them, but, nevertheless, the projects developed different collaborative efficiencies. Thus, comparing to the prior understanding of the importance of conditions for successful innovation in terms of trust (Uzzi, 1996; Maurer, 2010; Kowalkowski, 2011; Lascaux, 2019), prior collaborative experience, engagement of already known partners (Anand and Khanna, 2000, Spanos et al, 2015, Belderbos et al 2017), and efficient forms of governance (Davis and Eisenhardt, 2011; Pitsis et al., 2014; Samset and Volden, 2016; ul Musawir et al., 2017; Wu et al., 2017; Haq et al, 2019), servitization maturity suggests a *shared servitization framework* established from the very beginning and a *market-centred servitization engagement* maintained through the whole period of the project's realisation as complementary critical contextual conditions mobilised by partners, to co-develop a servitization solution effectively. While Adler (2017) recognised the importance of identification of focal value proposition to ensure that partner cooperation is efficient, our results go further, in the servitization context, to show that the role of servitization maturity enables the building of a focal value proposition and, thus, an efficient project cooperation. It is precisely this shared value proposition that will allow to create the conditions for the alignment of the roles and the activities of the actors for the value proposition to materialise

What is more, we provide an enriched view on shared servitization logic comparing to prior studies on servitization. Servitization scholars outlined the need for a shared sense of potential market value (Kowalkowski, 2011; Perks et al., 2017) and the importance of such new holistic mindset (Martinez et al., 2019) for

combining, sharing and managing the service knowledge (Storey et al., 2016) resources and capabilities (Fliess and Lexutt, 2017) without providing a clear understanding of how it can be established. Our findings provide a more detailed view on the shared servitization framework composed of *a true servitization objective clearly elaborated, and fully shared, business model understanding with clear market positioning, and customisation priority*. Also, this shared servitization framework and market-oriented innovation both constitute servitization maturity, which fosters the capacity to anticipate the project's value creation. Clear anticipation of servitization value creation allows to initiate an efficient structuring of collaboration in terms of clear repartition of tasks.

In addition, the servitization literature highlighted the problem of knowledge integration (Storey et al., 2016) between the partners from diverse knowledge fields (Aarikka-Stenroos and Jaakkola, 2012) that lies behind the servitization logic. In this regard, our study highlights that the simultaneous innovation of technology and novel service development, within servitization mCIP's, increases the complexity and multi-dimensionality of the service innovation processes. Actually, the integration of partners, and their competencies from different knowledge fields, is so complex that without servitization maturity the project actors are unable to establish the necessary integrative mechanisms for effective knowledge integration. So, the realisation of an effective innovative servitization strategy requires maturity of the idea of the service component of the servitization solution. It must be mature enough to allow a clear anticipation, and shared understanding, of potential market value creation. It is servitization maturity which, together with the conditions for collaborative efficiency, result in an efficient structure that reinforces the initial engagement and collaboration efficiency in combining knowledge from different fields as well as service knowledge.

Secondly, the study enriches the current knowledge on contextual conditions regarding the role of antecedents of innovation in terms of the role of trust (Uzzi, 1996; Maurer, 2010; Lascaux, 2019) beyond dyadic servitization settings (Kowalkowski, 2011). Presented in the form of conditions for collaborative efficiency, we provide a more refined view of the role of trust in multi-actor servitization, as an antecedent condition of innovation, by showing the positive impact of trusting partnership unless it was initially based on the privileged competencies of potential partners, rather than merely on prior knowledge of them. These findings are in line with insights on the complex combination of complementary and interrelated capabilities (Matthyssens and Vandenbempt, 2008; Storey et al., 2016) that outline the core role of their development within external relationships (Matthyssens and Vandenbempt, 2008) through a mix of internal and external capabilities (Kowalkowski et al., 2011). Here, our findings outline that choosing partners according to their competencies is fundamental for an efficient combination of knowledge and capabilities. Also, competencies and trust are foundational conditions for collaborative efficiency as they allow the creation of true collaborative environment. Such collaborative efficiency within the 1st type of mCIP's fostered the motivation in collaboration around servitization in terms of willingness to share critical knowledge and overcoming the problem of strong focus on technology. On the contrary, within the 2nd type of mCIP's the initial focus on technology was only reinforced, resulting in knowledge retention and preventing the innovation of any servitization solution to be achieved.

Thirdly, our empirical results show successful servitization initiatives (Davies et al., 2006; Fliess and Lexutt, 2017), in terms of the benefits of customisation, support the literature on the need for close collaboration with customers in value co-creation in product innovation (Sawhney et al., 2005), service innovation (Carroll and Helfert, 2015; Ojasalo et al., 2015) and servitization (Kowalkowski, 2011; Aarikka-Stenroos and Jaakkola, 2012; Fliess and Lexutt, 2017; Roehrich et al., 2019). The findings provide

evidence of effective servitization outcomes following active involvement, and a continuous interaction of customers, throughout the whole process of service value co-creation (Aarikka-Stenroos and Jaakkola, 2012) within the 1st type of mCIP's that resulted in a successful customer-centric solution, compared to the failed servitization outcomes of the 2nd type, where potential customers remained passive observers and merely providers of an application field for a future service. Our research shows that the projects that do not customise their development fail to innovate the service component of the servitization solution. Thus, regarding the existing ambiguity of choices between standardisation and customisation (Chesbrough, 2012; Green, et al., 2017; Saul and Gebauer, 2018), a customisation approach appears to be more efficient in realising servitization projects in the mICT context. Here the concept of servitization maturity shines more light on the activation of anticipation as a mechanism for assessing the novel business value of servitization solution (Perks et al. 2017) and seizing market opportunities (Saul and Gebauer, 2018), within open innovation dynamics (Carroll and Helfert, 2015) that allowed an efficient combination of service specific knowledge (Storey et al., 2016; Fliess and Lexutt 2017) for the desired outcomes of servitization (Fliess and Lexutt 2017) and eventual commercialisation (Davies et al., 2006).

Fourthly, the study contributes to a better understanding of the problems of collaboration by showing the core role of an efficient structure. The servitization literature outlined that when there is a lead-firm that guides the development of servitization solution, the increased complexity of collaborative servitization requires a collaborative or holistic engagement with development partners and customers in the implementation of a servitization innovation solution (Wiesner et al., 2013; Ojasalo et al., 2015; Fliess and Lexutt 2017; Roehrich et al., 2019), or combined with shared leadership, appropriate agility of strategic directions and change management (Kowalkowski et al. 2012; Kowalkowski et al. 2017a; Roehrich et al., 2019). Our research shows that, under conditions when there is no sole leader guiding the entire development process between the partners from different knowledge fields, it also necessitates an efficient structure characterised by a *project architect* with a global vision of the technology and of the possible problems, and by establishing a *dependency-interdependency equilibrium*. Such structural efficiency not only allows efficient knowledge integration, but also enables the continuity of motivation in the collaborative development of innovative servitization solution.

Finally, from a practical prospective, the study shows that, in reaction to opportunities and requirements of local innovation policies, numerous projects might emerge each with formally declared a servitization objective, and a real engagement in service development. However, such initiation of policies is not sufficient to generate value unless oriented towards servitization maturity. To be efficient, these policies should be focused on the support of project actors in both accessing and developing specific market knowledge and competencies related to the development of service maturity as well as a shared servitization framework and a market-oriented engagement.

### **Limitations and directions for further research**

As all qualitative studies, our research has limits related to its specific context. The concept of servitization maturity within collaborative servitization innovation dynamics would benefit from further research in other contexts than mICT. These early research findings call for new studies, qualitative and quantitative, to improve the understanding of servitization maturity within innovative interorganisational servitization collaboration. Also, more studies are required to elucidate the concept of customisation within interorganisational servitization innovation projects.

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## Annex1

### Interview grid - the list of questions

<p><b>1. ORGANISATION AL LEVEL– current activity, mICT, innovations</b></p> <p><b>Organisation’s current activity</b></p> <ul style="list-style-type: none"> <li>▪ Precise your position and functions within the organisation?</li> <li>▪ Briefly present the activity of the organisation and its core directions?</li> </ul>
<p><b>Organisation’s mICT</b></p> <ul style="list-style-type: none"> <li>➤ What is the current interest in mICT of your organisation? <ul style="list-style-type: none"> <li>▪ Where would you situate the activity of your company in a mICT-related value chain or in several mICT-related value chains? Are they mainly local or global?</li> </ul> </li> </ul>
<p><b>Organisation’s innovations</b></p> <ul style="list-style-type: none"> <li>➤ In general, what are your current innovative activities and plans? <ul style="list-style-type: none"> <li>▪ What is your idea of open/collaborative innovation?</li> <li>▪ Is the sharing of the internal technological elaborations is desirable?</li> </ul> </li> </ul>
<p><b>2. CLUSTER LEVEL– cluster environment, mICT, innovative climate</b></p> <p><b>Cluster business environment</b></p> <ul style="list-style-type: none"> <li>➤ In general how would you describe your insertion in the high-tech mICT cluster?</li> <li>➤ How, in your belief, knowledge and expertise are transmitted within the cluster in general?</li> <li>➤ What, in your believe, is or should be done on cluster level to foster the interaction?</li> </ul>
<p><b>Cluster innovative environment</b></p> <ul style="list-style-type: none"> <li>➤ How would you characterise the mICT innovative climate of Sophia Antipolis in general?</li> <li>➤ In your opinion, is collaborative innovations and knowledge exchange in mICT supported?</li> <li>➤ Do you know the examples of successful mICT collaborative projects in the cluster?</li> <li>➤ Did the cluster itself has any kind of influence on their realisation?</li> </ul>
<p><b>3. PROJECT LEVEL – definition, initiation, implementation and results</b></p> <p><b>Project Definition</b></p> <ul style="list-style-type: none"> <li>➤ Can you provide some more precisions on what this particular mICT project is about?</li> <li>➤ Does the design of this project assume its enrolment up to the final user application, or its enrolment stops somewhere in the middle without reaching the market directly?</li> <li>➤ In the regard to the mICT-related value chains of your organisation, evocated by you above, this particular mICT project is to be deployed within which of them?</li> <li>➤ Was the project designed for the development of a service offer, or it rather comprised a material component, or both?</li> </ul>
<p><b>Project Initiation</b></p> <ul style="list-style-type: none"> <li>➤ How the idea was conceptualised into a potential mICT service offering for further development, and consequently, how the very project was born?</li> <li>➤ What was your motivation to collaborate within this innovation project?</li> <li>➤ Were there any specific difficulties in drafting the future project?</li> </ul>
<p><b>Project Set-up</b></p> <ul style="list-style-type: none"> <li>➤ Generally speaking, how the collaborative project was structured and set-up? <ul style="list-style-type: none"> <li>▪ Who edited the answer on a tender/a call for offers?</li> <li>▪ Was this process centralised or not?</li> </ul> </li> <li>➤ Since when do you practice the involvement of external parties in the development of innovative ideas?</li> <li>➤ How did you found, met and choose your external partners for the further development of the mICT project? <ul style="list-style-type: none"> <li>▪ Why these particular partners had been chosen?</li> <li>▪ Were the issues of trust, sharing of risks and mutual assistance considered?</li> </ul> </li> <li>➤ Were your partners local or external to the cluster? <ul style="list-style-type: none"> <li>▪ If local – was it of any advantage in collaboration? If yes – why? If no – why?</li> <li>▪ If external – was it of any disadvantage? If yes – why? If no – why?</li> </ul> </li> <li>➤ How would you describe a collaborative <b>interaction</b> with your partner and its quality? <ul style="list-style-type: none"> <li>▪ Did the quality of interaction evolved with a time?</li> </ul> </li> </ul>

- If yes, what event/person contributed to its evolution?
- Was the **architecture** of the project mutual and shared among the parties or not?
- ✚ Were there a leading partner playing a role of the architect in project elaboration?
  - Has this partner a particular competency in structuring of this kind of projects?
  - Was the design of this project realised well or not, and why?
- ✚ Whether the definition and **distribution of IP rights** was considered and well understood?
  - Where there any problems in particular related to IP rights distribution?
- ✚ Was the application considered up to the **user context**? If yes:
  - Who coined the idea of the utility of the final offer and its value for a user?
  - At what stage user context was considered?
  - Were there any particular difficulties related to mICT and its implementation?
- ✚ How close actually you have been to reaching the **market**?
  - Was the idea of **business model** somehow formalised or not? If yes:
    - ✓ Whether the idea of user context was formalised into a business model?
    - ✓ Who formalised the business model?
    - ✓ Was there any link between this model and the development of mICT service?
- ✚ What can you say about **the funding** of this project (type of funding, role of the cluster..)?
- ✚ Were there some other particular challenges throughout the project set-up?

### Project Implementation

- ✚ What were the methods and approaches employed towards collaboration on practice?
  - What can you say about the capacity of the parties involved to share the knowledge and to collaborate mutually?
  - Where there any difficulties in particular?
- ✚ Was the implementation of the project based on dealing with a **multitude of technologies** for the development of a final solution? If yes:
  - How did you handle these technological issues outside of your core competence?
- ✚ How the challenges while facing specific difficulties and conflicts have been treated?
  - Were these difficulties rather **technical** by nature, or rather **relational** challenges?
  - Was there a partner-leader in the solving problems?
- ✚ How the realisation of the project was managed?
  - Who was playing the major coordinating role?
  - Were there any crucial stages in project management?
  - Was the participation in the implementation of the project shared among parties or not?
- ✚ Who of the parties involved had a role of the architect in the implementation of the project?
  - Was the realisation of the project successful or not, and why?
  - Had this partner a particular competency in realisation of this kind of projects?
- ✚ Were there some particular difficulties in realising the project?
- ✚ How the **service potential** was explored?
  - Did the initial understanding of the user context for a service evolved throughout the project implementation? If yes:
    - ✓ What were critical moments to its evolution?
  - Were there some other potential application discovered? If yes:
    - ✓ What was the source of these new business opportunities?
  - Where there any specific difficulties related to service dimension of the project?

### Results

- What is the final service offer at the end?
  - Did the designed business model happen to be viable at the end?
    - ✓ If yes, how the total solution was delivered to customers?
    - ✓ If no, do you still have an intention to commercialise the offer and how?
  - What were the specificities or difficulties related to a service development?
  - Have you been/are you satisfied with the results of collaboration?
    - ✓ Was the integration of mICT for novel service development successful?
    - ✓ Was there an active input from all parties involved?
    - ✓ What skills and resources were or should have been engaged in the collaboration?
- If you could start it all from the very beginning, what would you have done differently? Why?

## Annex2

### The details of the interviewing process regarding six selected mCIP's

No	Actor name	Actor type	Position of interviewee	Time	No of pages
<b>CONTINUUM - Case 2.4.</b>					
1	PCont/I1_sme	SME, geographical proximity	Founder	1H 20min	13
2	PCont/I2_acadLead	<b>Leader/ Academic partner, Pole SCS member</b>	<b>Founder</b>	<b>3H 45min</b>	<b>36</b>
3	PCont/I3_acad	Academic partner, Outsider	Researcher	1H 20min	18
<b>FASTPASS - Case 1.1.</b>					
4	PFast/I1_acad	Academic partner, Pole SCS member	Researcher	40 min	12
5	PFast/I2_acad	Academic partner, Pole SCS member	Researcher	1H 10min	10
6	PFast/I3_smeLead	<b>Leader, SME, Pole SCS member</b>	<b>Founder</b>	<b>48 min</b>	<b>10</b>
7	PFast/I4_indust	Big industrial group, Pole SCS member	Product marketing manager	1H 3min	11
<b>MPUB - Case 2.1.</b>					
8	PMpub/I1_acad	Academic partner, Pole SCS member	Researcher	1H 6min	18
<b>PAC ID TEXTILE - Case 1.2.</b>					
9	PText/I1_acad	Academic partner, Pole SCS member	Researcher	40 min	9
10	PText/I2_smeLead	<b>Leader/SME, Pole SCS member</b>	<b>Founder</b>	<b>37 min</b>	<b>7</b>
11	PText/I3_acad	Academic partner, Pole SCS member	Researcher	46 min	9
<b>RATCOM - Case 2.2.</b>					
12	PRatc/I1_acad	Academic partner, Pole SCS member	R&D manager	47 min	8
13	PRatc/I2_industLead	<b>Leader/Big industrial group, Pole SCS member</b>	<b>Coordinating Engineer</b>	<b>1H 33min</b>	<b>14</b>
14	PRatc/I3_acad	Academic partner, Pole SCS member	Researcher	1H 44min	19
<b>SMART IMMO - Case 2.3.</b>					
15	PSmart/I1_industLead	<b>Leader/ Big group R&amp;D division, geographical proximity</b>	<b>Researcher and project manager</b>	<b>3H 3min</b>	<b>25</b>
16	PSmart/I2_acad	Academic partner, Pole SCS member	Researcher	46min	10
<b>Total</b>				<b>21H 8min</b>	<b>229 pages</b>

## Annex3

### Synthesis of characteristics and results of projects of the 1<sup>st</sup> type

“Successful Servitization mCIP’s” 2 of the 6 projects

Synthesis of characteristics of projects of the 1<sup>st</sup> type

<b>Partnership diversity</b>	<b><u>Project consortium</u></b> Both FASTPASS and PAC ID TEXTILE projects were led by SMEs. Regarding the number of partners, FASTPASS had smaller number of participants – 4 in total, versus 9 actors engaged in PAC ID TEXTILE. <b>Both projects were characterised by the involvement of partners from industry and from research. All projects included SMEs, big industrial and academic type of partners.</b>
<b>Prior relationship</b>	In FASTPASS all participants knew each other and some already collaborated before the initiation of the project. In PAC ID TEXTILE there were two new partners, while the absolute majority of partners new each other. In both projects there was an involvement of a leading client in a collaborative effort. <b>Both projects were composed with the majority of known partners.</b>
<b>Pole SCS membership</b>	<b>Both projects were realised under contextual conditions of Pole SCS.</b>
<b>Synthesis of results of projects of the 1<sup>st</sup> type</b>	
<b>Case 1.1. FASTPASS</b>	
<b>Objective</b>	The development of a faster and safer solution in ticketing and payments related to public transport in a short term with an idea to reach banking and ID sectors afterward.
<b>Servitization results</b>	<b>Improvement of services that already exist via commercialised product</b> The mono-application objective for transactions services in public transport sector resulted in the design of four models of smart cards. Three of them were realised completely and are commercialised, while the fourth one remained a demonstrator.
<b>Case 1.2. PACIDTEXTILE</b>	
<b>Objective</b>	The development of RFID-based inventory solution based on the identification of textile for rental services in industrial laundry.
<b>Servitization results</b>	<b>Improvement of services that already exist via commercialised product</b> The service offer was enriched and is on the market. It is directly linked to the commercialised material component – the chip with an electric circuit and an antenna to be installed into textile, and novel reader equipment for textile rental in industrial laundry.

#### Annex4

#### Synthesis of characteristics and results of projects of the 2<sup>nd</sup> type

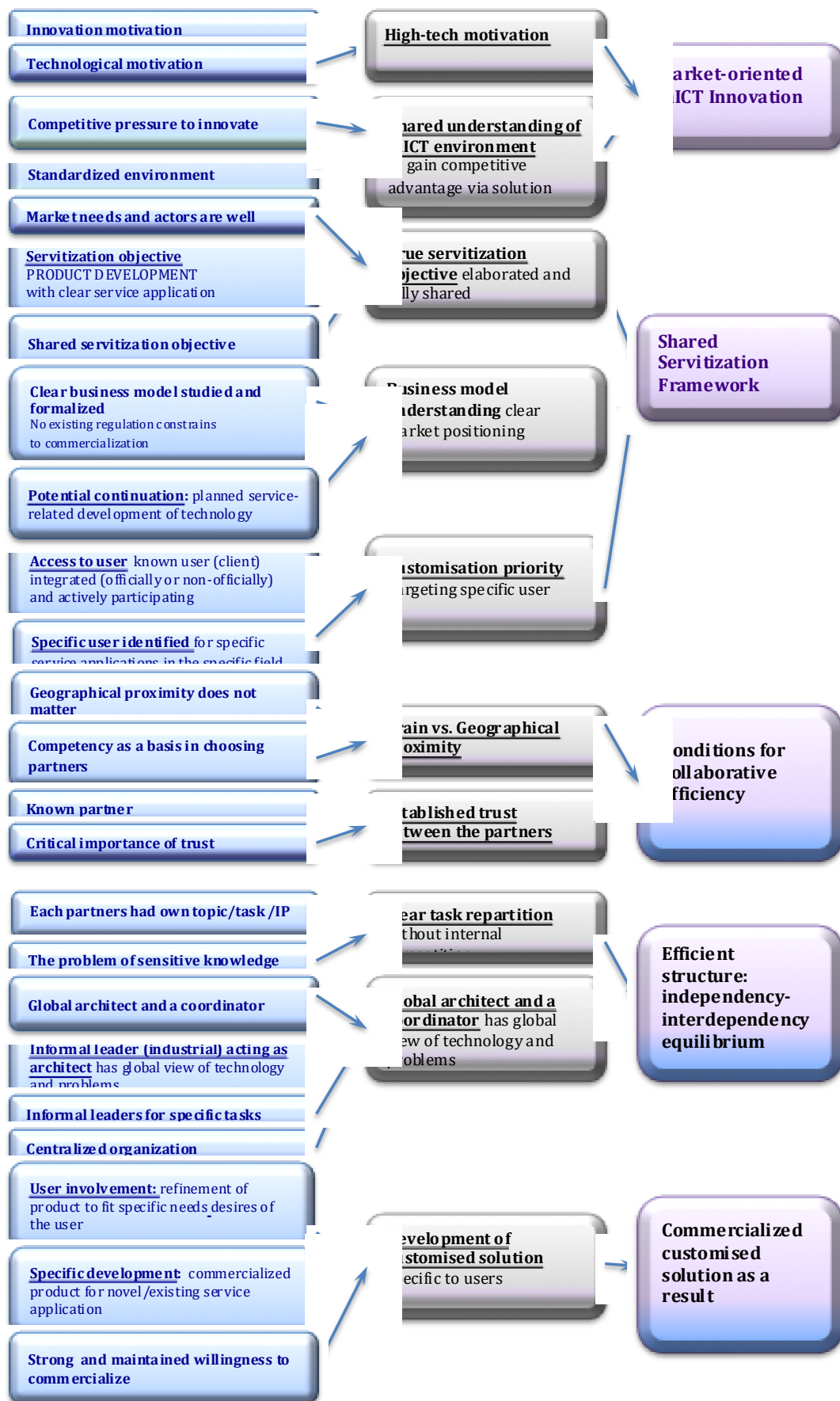
<b>“Failed Servitization mCIP’s”</b>	
<b>4 of the 6 projects</b>	
<b>Synthesis of characteristics of projects of the 2<sup>nd</sup> type</b>	
<b>Partnership diversity</b>	<b><u>Project consortium</u></b> In terms of leadership there was no real homogeneity within the projects of 2 <sup>nd</sup> type. MPUB was led by an SME; RATCOM – by a big industrial group; SMARTIMMO - by a research division of a big industrial group; and CONTINUUM by an academic leader. Regarding the partners, MPUB was composed of the smallest number of 6 official partners, composed of two SMEs, including the leader and business partner, two big industrial groups, and two academic partners. RATCOM had the biggest number of 15 partners: 3 big industrial groups, including the project leader, 6 SMEs, 4 academics, and 2 consultancy organisations.

	<p>SMARTIMMO was the project with 11 partners. It reunited 2 big industrial groups, including the leader, the research division of big telecom operator. It also included 6 SMEs, 2 academic partners and one public partner. CONTINUUM reunited 7 partners: 2 academics, 3 industrial groups and 2 SMEs.</p> <p><b>All four projects were characterised by the involvement of partners from industry and from research. The projects included SMEs, big industrial and academic type of partners.</b></p>
<b>Prior relationship</b>	<p>In MPUB two academic partners and one SME knew each other and already had prior collaboration experience together. One big industrial partner and another SME knew each other as well and were related in term of common business. Less is known about the involvement of the second big industrial.</p> <p>In RATCOM the leader, big industrial, and two academics knew other and had a prior experience in collaboration, while academics knew other. Next 6 or 7 partners were chosen based on working network of industrial leader, and in their turn recommended the rest of the participants. In SMARTIMMO leader composed the partnership 6 partners that were known. Other participants were chosen based on the recommendations of the members of leader's professional network. In CONTINUUM leader reunited partners that were already known, where academics and one SME already collaborated in the past.</p> <p><b>All projects were composed with the majority of known partners.</b></p>
<b>Pole SCS membership</b>	<p><b>The projects of the 2<sup>nd</sup> type were realised under the influence of contextual conditions of Pole SCS due to the considerable membership in Pole SCS, especially on the leadership level.</b></p>
<b>Synthesis of results of projects of the 2<sup>nd</sup> type</b>	
<p><b>Case 2.1. MPUB</b></p> <p><b>Objective</b></p>	<p>The development of mobile marketing solution based on Human-Computer Interaction (HCI) to integrate the publicity into mobile phone usage by offering clients a highly personalised advertisement service on mobile phones, and remuneration for the acceptance of publicity.</p> <p>The project was designed mainly for telecom operators with an idea to get new clients and enlarge their business scope by targeting big publicity contracts.</p> <p>The level of final mobile users was considered via user experimentation</p>
<b>Servitization results</b>	<p><b>-No final service offer but the demonstration of service application that might become a service in the future:</b> partners managed to put in place several scenarios where the publicity could be inserted. The feasibility of application was tested on the field together with big telecom operator</p> <p><b>-Advanced prototype tested in real-life conditions:</b> full-scale validation of the demonstrator. The demonstrator several material components and specific software: an advertising broadcast server, embedded software and a specific component installed in the mobile phone as well as a secured operational environment.</p> <p><b>-No servitization results and no commercialisation</b></p>
<p><b>Case 2.2. RATCOM</b></p> <p><b>Objective</b></p>	<p>The development of tsunami alerts, combined with coastline risk network with both up- and down-link components. The solution would analyse the behaviour of tectonic plaque and would alert the population about coming tsunami via different devices, including highway display panels and mobile phones. The idea was to foster the activity in satellite systems by demonstrating the possibility of tsunami alert via satellites.</p> <p>The project was designed mainly for telecom operator or government to send the alert to population as well as private companies ready to diffuse mass alerts on the basis of remuneration.</p>

<p><b>Servitization results</b></p>	<p><b>- No final service offer but the demonstration of the feasibility of a service application that might become a service in the future:</b>  The project has developed a warning system for tsunami and coastal risks based on two major functional components: <b>an up-link component</b> to deliver, from automatic processing on measurements collected at sea and on land, minimising the false alarm rate; and <b>a down-link component</b> to provide high-performance and reliable means of communication for transmitting the alert in a local network and then in mass distribution based on telecommunication network for professionals.</p> <p><b>-Technological innovation in terms of advanced prototype tested in real-life conditions:</b> validated techniques supporting alarm services with reliable sensors and an alert system to transfer the information at the right time frame. There was a demonstration on the field showing that all technical elements were interoperating and functional. But there were no demonstration of the full service.</p> <p><b>-No servitization results and no commercialisation</b></p>
<p><b>Case 2.3. SMARTIMMO</b></p> <p><b>Objective</b></p>	<p>The development of a complex ecosystem with sensors, machines, distributors, printers, cameras, screens, and computers, the building needs to be seen and managed in its integrity, a sort of a “brain” for any building. It is an idea of a global vision for new smart, communicating and self-regulated buildings.</p> <p>The creation of new service was linked to the development of a Live Box with specific software that will perform as a building “brain” and would also allow an interaction with the building via the usage of mobile phone for companies and to local communities willing to collect and manage the data about the functioning of their buildings.</p>
<p><b>Servitization results</b></p>	<p><b>- No final service offer but the demonstration of the feasibility of a service application that might become a service in the future –</b> prototype of a Live Box and complementing software that proved to be functional.</p> <p><b>-Technological innovation in terms of advanced prototype tested in real-life conditions:</b> the demonstration in terms of feasibility of measurements of temperature, pollution and other tested criteria of environment was realised with the assistance of Mairie of Valbonne in two local schools, primary and nursing one, that were equipped with specific sensors for the 3 months experimentation.</p> <p><b>-No servitization results and no commercialisation</b></p>
<p><b>Case 2.4. CONTINUUM</b></p> <p><b>Objective</b></p>	<p>The development of new ways to interact with the work computing and continual services in water industry.</p> <p>The main idea was to adapt an application in a continuous manner, which would allow worker’s usage of all devices and objects available around and would give him an access to his personal software services, regardless the evolution of available devices.</p>
<p><b>Servitization results</b></p>	<p><b>- No final service offer but the demonstration of the feasibility of a service application that might become a service in the future -</b> a creation of prototypes of hardware specific equipment, including 3D eyeglasses, for mobile ground technicians of water supply field and provided innovative experimental software platform.</p> <p><b>-Technological innovation in terms of advanced prototype tested in real-life conditions -</b> the experimentation of new equipment was realised in mobility situation was held with a participation of ground technicians and specialists in water supply industry validating technological results of the project.</p> <p><b>-No servitization results and no commercialisation</b></p>

**Annex 5**

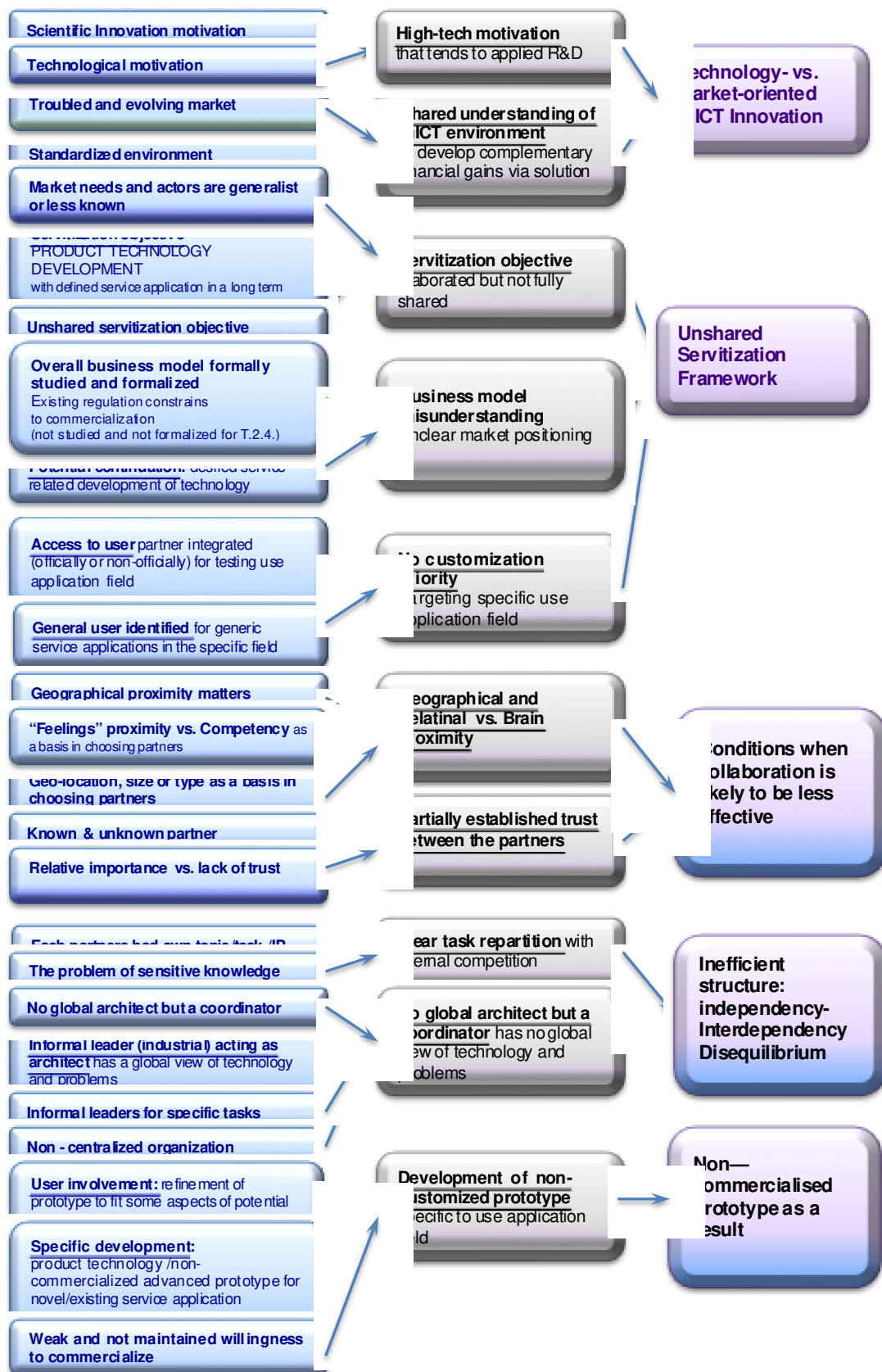
**Figure 1. Data structure of the 1<sup>st</sup> type of Servitization mCIP's**





Annex 6

Figure 2. Data structure of the 2<sup>nd</sup> type of Servitization mCIP's



## Annex7

**Data Table: Selected Quotes for “Type 1 - Successful Servitization mCIP’s”**

<b>Market-oriented mICT Innovation</b>
<b>High-tech motivation</b>
<b>Innovation motivation Case 1.1.</b> “Which technology can serve the 100% of expectations? Non. So we have to innovate. We have to share with mICT, we have to share with new technologies from iPhone or whatever” (PFast/I3_smeLead).
<b>Technological motivation Case 1.1.</b> “Our motivation was to work under the characterisation and to develop new test badges for these systems. And it is very difficult to get the information that is up to date. So this is one of the aspects of our laboratory” (PFast/I2_acad).
<b>Shared understanding of mICT environment to gain competitive advantage via solution</b>
<b>Competitive pressure to innovate Case 1.1.</b> “I think that the starting point was based on specific announcement on competition, and much German competition. We tried to push a kind of a new solution on the market. Because today the market is widely covered by SERENEX from XP” (PFast/I4_indust).
<b>Standardised environment Case 1.2.</b> “And of course we had to consider the issue of standardisation” (PText/I2_smeLead)
<b>Shared Servitization Framework</b>
<b>True servitization objective</b> elaborated and fully shared
<b>Market needs and actors are well known Case 1.1.</b> “And since we are on that market since 1997, it is very easy for us to make such an analyses. We know exactly all the members, and the transporters, so we know exactly what they ask from us. And we have a commitment with them, we know exactly what they want, what they expect. So it was easy for us to build up and to start that project” (PFast/I3_smeLead).
<b>Servitization objective: PRODUCT DEVELOPMENT with clear service application Case 1.2.</b> “Putting RFID to objects and tracing them by itself has no value, ok. You know that the objects are moving from one place to another place. And then you build business intelligence on top of that. And this has a value. The value is the service of our RFID, the service that is generated by our RFID. So, in our particular case at the end of the day it is the service” (PText/I2_smeLead).
<b>Shared servitization objective Case 1.1.</b> “They were in the project because they shared the same idea as us: how to improve the performance of LCD and the security of RFID in transportation market”. “So everybody is concerned in getting the project success, and in getting some finance (PFast/I3_smeLead).
<b>Business model understanding: clear market positioning</b>
<b>Clear business model studied and formalised No existing regulation constrains to commercialisation Case 1.1.</b> (business model was) “...formalised from the beginning of the project” (PFast/I3_smeLead). “it is very important for me for this kind of projects to really define what you want to do – what is the commercial and the legal framework, etc. I knew. Because if the initial target is wage, it is difficult to fit the market” (PFast/I4_indust).
<b>Potential continuation: planned service-related development of technology Case 1.1.</b> “So this is the first step. And the 2 <sup>nd</sup> step which is still under the development, and it is a multiplication card, where in addition to the transports you will have many others: access control, payments, many-many other things that can be embedded within the same card. Students for example. So this is under the development”. (PFast/I4_indust).
<b>Anticipated Customised Servitization</b>
<b>Customisation priority: Targeting specific user</b>
<b>Access to user: known user (client) integrated (officially or non-officially) and actively participating Case 1.2.</b> “The end user was (leader’s) number one customer, a loan textile company”. “The end user was one of the oldest customers” (PText/I2_smeLead).
<b>Specific user identified for specific service applications in the specific field Case 1.1.</b> (the client – transportation company) “who wants to provide tags with payment capability

<p>and great flexibility in terms of utilisation” (PFast/I2_acad). “...we had a lot of discussions with some transport operators and we had a discussion with (client), and then it was a final user interested in the project that we wanted to build up...they’ve (client) said: “Ok, this is a good idea, and if you could do those features on the product then it will help us in order to get this product in our product line” (PFast/I3_smeLead). <b>Case 1.2.</b> “So they (the client – laundry rent company) had specific expectations about the functions of the final solution” (PText/I3_acad).</p>
<p><b>Knowledge combination facilitated by customisation</b></p>
<p><b>Commercialised &amp; customised solution</b> specific to users</p>
<p><b>User Involvement:</b> refinement of product to fit specific needs and desires of the user  <b>Case 1.2.</b> “So the user was the one to build the overall application specification. It was the one to buy it and to use it. So it means within our system, once they defined what they (users) wanted, and once the overall application was set-up, different industrial partners get to technical specification. And they were supported by academic labs, to help to develop the whole thing”(PText/I2_smeLead).</p>
<p><b>Specific development:</b> commercialised product for novel/existing service application  <b>Case 1.1.</b> “..at the end we did the solution with specific functions which are dedicated to transport ticketing”. (PFast/I4_indust).</p>
<p><b>Collaborative efficiency maintaining market orientation</b></p>
<p><b>Brain vs. Geographical proximity</b></p>
<p><b>Geographical proximity does not matter</b> <b>Case 1.2.</b> “... it is not the matter of kilometres here. We can go anywhere in Europe” (PText/I2_smeLead).</p>
<p><b>Competency as a basis in choosing partners</b> <b>Case 1.2.</b> “It is a matter of ...I mean who do you work with? You work with people that you like, that you share ideas. Like I have an idea, my partner shares it as well, is competent, and we make good things together. So it is not a geographical proximity, it is brain proximity, the proximity of heart” (PText/I2_smeLead).</p>
<p><b>Strong and maintained willingness to commercialise</b> <b>Case 1.1.</b> “...it was more easy to get at the end something which can be sold: that we can put on the market and sell. But this was the main objective of that project”(PFast/I4_indust). “The objective is to serve better the market and to be able to fulfil their requirements. So this is the goal (PFast/I3_smeLead). <b>Case 1.2.</b> “There is a real market, because there is a great problematic to tag the clothes mainly” (PText/I3_acad). “And one of the two new ones (partners) is an investment partner that was involved in the commercialisation and is involved right now. And we are having a good business with them” (PText/I2_smeLead).</p>
<p><b>Established trust between the partners</b></p>
<p><b>Known partner</b> <b>Case 1.2.</b> “I knew, in this Consortium we were 6 partners in total, and I already knew 4. So 2 totally new ones. And it was fruitful – the old ones with a new ones” (PText/I2_smeLead)</p>
<p><b>Critical importance of trust</b> <b>Case 1.1.</b> “I think it is extremely important to know each other before. Because we can share the ideas and be sure that everybody is concerned by the project. For me it is quite important to have confidence on that, to be confident in our partners” (PFast/I3_smeLead). <b>Case 1.2.</b> “Trust is a founding principle. If you don't trust the partner – don't bring it!” (PText/I2_smeLead). “...it was more easy to get at the end something which can be sold: that we can put on the market and sell. But this was the main objective of that project” (PFast/I4_indust). The target is that they will be on the market. And they will be on the market” (PFast/I3_smeLead). So for sure we will take some months to push the solution on the market. Because anyhow it will be something new for some transit operators. So for them it is a lot of money, a lot of investments to up-date an existing system, or to select a new one. But we did already, we have started already the promotion (PFast/I4_indust).</p>
<p><b>Efficient Structure: Independency- Interdependency Equilibrium</b></p>
<p><b>Clear task repartition</b> without internal competition</p>

<b>Each partners had own topic/task /IP</b> Case 1.1. <i>“and (everybody is concerned) in getting some results on their own topics. And this is a win-to-win project in that case”</i> (PFast/I3_smeLead). Case 1.2. <i>“we were very careful that in one given domain there is only one player, only one partner”</i> (PText/I2_smeLead). <i>“With the agreement between the partners everyone know that he worked in a single task, and with a very specific constrains”</i> (PText/I3_acad).
<b>The problem of sensitive knowledge:</b> balance between information that can and cannot be shared Case 1.1. <i>“Security, common criteria in all the data sharing. You need to prevent, because if some secrets will go out of the project, or go out of the company, this can destroy the global solution on the market”</i> (PFast/I4_indust).
<b>Global architect and a coordinator</b> has global view of technology and problems
<b>Global architect and a coordinator</b> Case 1.2. <i>“And we interact directly (with the leader) because the project leader has the skills to understand every problematic.”</i> (PText/I3_acad). <i>“On the overall architecture level we were the only one to have the top view. We were the only one in that system architecture. The other partners were just there full of confidence, very defined, very specific in their competencies, all of them, specific and were very successful”</i> (PText/I2_smeLead).
<b>Informal leader (industrial) acting as architect</b> has global view of technology and problems Case 1.1. <i>“I think that both that have these competencies are (the leader) and (core industrial partner)... IP rights, the planning, the manufacturing in the future, etc., the two partners who had the competency were (the leader) and (core industrial partner)”</i> (PFast/I1_acad).
<b>Informal leaders for specific tasks</b> Case 1.1. <i>“Sometimes we have naturally leading people. In antennas, in 4G generation, sometimes in very specific tasks there is a strong cooperation between these. So they found their own leader for that, because official one was not there every time”</i> (PFast/I2_acad).
<b>Centralised organisation</b> Case 1.1. <i>“It was centralised”</i> (PFast/I3_smeLead). <i>“What was the real factor, it was to take the decision and from the management point of view. And then we know exactly where to go, and people have to follow.”</i> (PFast/I4_indust).

## Annex8

### Data Table: Selected Quotes for “Type 2 – Failed Servitization mCIP’s”

<b>Technology- vs. Market-oriented mICT Innovation</b>
<b>High-tech motivation</b> that tends to applied R&D
<b>Scientific Innovation motivation</b> Case 2.2. <i>“Our main objective was to foster this activity and try to demonstrate by using this kind of project that it is possible to do alert via satellites”</i> . (PRatc/I2_industLead). Case 2.3. <i>“And then also you have to think about the research part. And its also R&amp;D so you have to think how to develop.”</i> (PSmart/I1_industLead).
<b>Technological motivation</b> Case 2.1. <i>“And for us it was more innovating around a composition: how to integrate the publicity in the phone usage, how to integrate the publicity in fact in fact. So, it is the composition between the publicity and the ordinary usage”</i> . (PMpub/I1_acad). Case 2.4. <i>“To be more familiar with this kind of technology, and this kind of technology users.”</i> (PCont/I1_sme).
<b>Shared understanding of mICT environment</b> to develop complementary financial gains via solution
<b>Troubled and evolving market</b> Case 2.2. <i>“...you have a mobile ICT market that is increasing. Lot of events. But the players there are fragile.”</i> (PRatc/I3_acad). Case 2.3. <i>“So there are a lot of competitors in that field that it seems that we have to go there, but there is also a lot of debate whether do we have to go to the “Services” or not.”</i> (PSmart/I1_industLead).

<p><b>Standardised environment</b> Case 2.1. “...we concentrated on the Android, for instance. We haven’t made the same thing for IOS or for the other phones. So, we simplified things.” (PMpub/I1_acad). Case 2.4. “...to allow that multitude of objects that can be implied in one application and not only one.” (PCont/I2_acadLead).</p>
<p><b>Unshared Servitization Framework</b></p>
<p><b>Servitization objective</b> elaborated but not fully shared</p>
<p><b>Market needs and actors are generalist or less known</b> Case 2.1. “Prim Vision had a global vision of needs” (PMpub/I1_acad). Case 2.2. “And so that is why some industrials like THALES or SFR were involved in the project, because they know that, ok, eventually even if not for tsunami it can be used in another way.” (PRatc/I2_industLead).</p>
<p><b>Servitization objective:</b> PRODUCT TECHNOLOGY DEVELOPMENT with defined service application in a long-term Case 2.1. “But it didn’t disturbed us more than that, because we were not in the product that was supposed to be put into a service straight way.” (PMpub/I1_acad). Case 2.3. “...we wanted to create representative ecosystem with people from the building, user – final users, people from electronics, people from computers and people from network; to be representative and to see all the problems and to implement the solution that everybody validate. That what was important for us.” (PSmart/I1_industLead).</p>
<p><b>Unshared servitization objective</b> Case 2.2. “...there were several different entities, either public or private that were gathered in the project and each has a different objective. So one of the difficulties of this kind of projects is to try to merge all these different objectives and try to do something that makes sense at the end. Because, of course each entity wants to bring forward its specialty, its expertise. And sometimes it is not always fully in line with what we want to do in the project.” (PRatc/I2_industLead). Case 2.3. “...we defined at the beginning the main subject, and after we linked this with some partners. Perhaps, at the beginning we should have defined more precisely what we want to do, so that when we meet partners we say: “We want to do that”. And if they don’t fit exactly or share same objective, then we don’t work together. Because after it is more difficult for some partners to collaborate.” (PSmart/I1_industLead).</p>
<p><b>Business model misunderstanding:</b> unclear market positioning</p>
<p><b>Overall business model formally studied and not formalised</b> Existing regulation constrains to commercialisation Case 2.3. “But it was a really small business model. It means that it was not validated by Orange: it was not done by the Marketing, by the Strategy; it was done only by one person here that’s why it’s small.” (PSmart/I1_indust Lead). “...mICT service depends more on the business model. That is why I prefer to have people also from the Strategy or Marketing to give us some feedback. But it was like that...” (PSmart/I1_indust Lead). Case 2.4. “...the University is not capable – it is not their problem to sell some products or etc.” (PCont/I1_sme).</p>
<p><b>Potential continuation:</b> desired service-related development of technology Case 2.2. “And of course, lets say that the down-stream component of RATCOM, to be perfectly honest, it can be totally disconnected from the tsunamis. I mean the vector for informing the population can be reused for different kinds of emergency. It can be for flows, it can be for fire, and it can be...virtually any kind of disaster. So that was also one of the motivations of the project saying: “Ok, for the up-stream we will focus on submersion and tsunamis. But for the down-stream we can attract the interest of many industrial research centres and we can develop solution that can be reused in different contexts.” (PRatc/I2_industLead). Case 2.4. “...but we thought about our market, the knowledge is OK and use it for other project.” (PCont/I1_sme).</p>
<p><b>Difficulty to anticipate servitization outcome</b></p>
<p><b>No customisation priority</b> Targeting specific use application field</p>

<p><b>Access to user partner integrated</b> (officially or non-officially) for testing and validation of potential use <b>Case 2.1.</b> “...a thing that we’ve done, it was a sub-contracting with (SME). So it is true that they don’t appear in the list of the partners of the project. But we’ve made user experimentation with (SME). They’ve helped us to do an experimentation that we’ve integrated in the results of the project.” (PMpub/I1_acad). <b>Case 2.2.</b> “The final user...we had the global team and the reviewers.” (PRatc/I3_acad). “And I think that this is the notion of having some users as a club of potential clients, monitoring the project.” (PRatc/I3_acad). And so regarding this, globally in the project – there was no really trusting synergy. But on components, on up-stream or on down-stream components – yes, there was synergy.”(PRatc/I2_industLead).</p>
<p><b>General user identified</b> for some service applications in the specific field <b>Case 2.2.</b> “Well, in France a lot of persons are involved in alerting process. It could be Messier/Madame le Préfet, all the Mayors... and they all have a specific role in the chain of the decision of alerting people.” (PRatc/I3_acad). <b>Case 2.4.</b> (Industrial partners in water industry) were in the project as final uses.” (PCont/I1_sme).</p>
<p><b>Non-commercialised prototype</b> specific to use application field</p>
<p><b>User experimentation:</b> refinement of prototype to fit some aspects of potential use <b>Case 2.1.</b> “Regarding a human factor, we’ve made user experimentation (with SME). (PMpub/I1_acad). <b>Case 2.4.</b> “User context was considered during all the project. Because at the beginning we tried to define the final user needs and tasks, the environment, the kind of tools and so on. And at the end we tested several times – we did 5 tests, I think, to check the usability of new products, new devices and new services.”(PCont/I1_sme).</p>
<p><b>Specific development:</b> product technology /non-commercialised advanced prototype for novel/existing service application in a long-term <b>Case 2.2.</b> “...we delivered some prototypes, we did some implementation in the project...There was proof of concepts, of techniques supporting the services....But not the demonstration of the full service.” (PRatc/I3_acad). “So, again maybe it remains too much research projects with interesting things as in many research projects but without all concretisation in the real life with real service with real money.” (PRatc/I2_industLead). <b>Case 2.4.</b> “But, typically the mobile worker did not wanted such equipment – too sophisticated.” (PCont/I2_acadLead).</p>
<p><b>Collaborative inefficiency shifting market orientation to technology development</b></p>
<p><b>Geographical and Relational vs. Brain proximity</b></p>
<p><b>Geographical proximity matters</b> especially in critical project stages: decision-making, integration, prototype refinement, demo. <b>Case 2.1.</b> “Well, (SME) was not local and it is true that sometimes it was difficult to meet. It is true that with (Leader) in Villeneuve Loubet we could see each other more easily. So it is an advantage to be close to each other. Because when you need to meet and to decide quickly, it takes you less time...”(PMpub/I1_acad). <b>Case 2.2.</b> “ It is more convenient if they are closer, but it is not a main drawback if they are not. Ok, yes, sometimes, when you need to send some equipment and you have to ship it, you have to do that and it is a bit more complicated. But it is not an obstacle that is too high. You can overcome this quite easily.” (PRatc/I2_industLead).</p>
<p><b>“Feeling” proximity matters: liking to work together vs. competency as a basis in choosing partners</b> <b>Case 2.1.</b> “ And then, it (project generation and structuring) happened via searching for competencies.”(PMpub/I1_acad). “Yes. We like to work together (with SME).” (PMpub/I1_acad). <b>Case 2.4.</b> “ Each time I’m coming, I’m inviting people, inviting companies to see if we can have some fit in our works”(PCont/I2_acadLead). “The first main idea was: “We want to work together”. Yes, really”. (PCont/I2_acadLead). “...every partner has a good skills in technology.”(PCont/I2_acadLead).</p>
<p><b>Geo-location, size or type as a basis in choosing partners</b> <b>Case 2.3.</b> “There is one more difficulty - was to be in PACA mainly. But it is very difficult to find a good company.” (PSmart /I1_industLead) “...we were there just because they were needing academic partner, not because they were willing to do real things with us. So we were there, and what we were doing was interesting to no one. And so that was it – we were just left on ourselves and ok...”(PSmart/I2_acad). “It was mandatory that company like that</p>

(industrial) was in the project” (PSmart/I1\_industLead). **Case 2.4.** “...we are obliged to find the other partners, like industrials” (PCont/I2\_acadLead).

**Weak and not maintained willingness to commercialise** **Case 2.2.** “...you do the advanced studies, well, you deliver prototype and people they can play with it, but that was not really the people that are in business-oriented companies – they don't care about the prototype.” (PRatc/I3\_acad). “Clearly, this (commercialisation) was one of the drivers from the very beginning trying to do this.” (PRatc/I2\_industLead). “But, again, I'm a bit frustrated that we didn't managed to go the market: selling the system, selling the device, selling the service. This would have been nice.” (PRatc/I2\_industLead). “So that was, from the begging, it was one of the objectives to say: “Ok, it is not only making nice ideas only for tsunami, because you know, ok tsunami may or may not happen in some time, so we have in any way to use this technology, or maybe to sell this technology or do the promotion of this technology in other context”. (PRatc/I2\_industLead). **Case 2.3.** “And we wanted also to sell the solution to facility managers, so we had some interviews, like you today, but with some facility managers. We talk also on the exhibitions in Paris, with several companies with several drafts and with several potential clients.” (PSmart/I1\_indust Lead). “two or three of them (SMEs) were very disappointed at the end that Orange stopped the activity, because they wanted to sell their product from the project. (so it was for NEWSTEO).” (PSmart/I1\_indust Lead). “Research was one of our goals. And, during the project, after the project and before the project also we had some meetings, internal meetings in Orange to convince people from Marketing or from Strategy to go this market, but we didn't succeed. And after R&D can't launch the commercial solution.” (PSmart/I1\_indust Lead). “So for some other projects we are trying to find some transfer activities and to go up to commercialisation and the realisation of prototypes that an industrial partner could use for commercialisation. But this was not our final intention in the SMART IMMO project.” (PSmart/I2\_acad). **Case 2.4.** “But there is no final market, so... this is pity” (PCont/I1\_sme). “In the case of CONTINUUM it was mobile worker called FONTAINIER – for all mobile workers. Because it was to be able to prepare real experiment, so I think market is very far.” (PCont/I2\_acadLead). “It was just a research.” (PCont/I2\_acadLead).

#### **Partially established trust between the partners**

**Known & unknown partner** **Case 2.3.** “Because it takes a lot of time to find the partners. We don't have some help to do that, so it is with “bouche-à-oreille” – the French expression.” (PSmart/I1\_indust Lead). **Case 2.4.** “For the CONTINUUM project we visited one team in Grenoble that we didn't know before. So, we had a seminar in Grenoble to talk with them” (PCont/I2\_acadLead). “...the manager of the school, director of the school was in the field of water industry in fact, and he said to me: “Hey, I know him, I know him... so call them and try to do something with them.” (PCont/I2\_acadLead)

**Relative importance of trust** **Case 2.1.** “We didn't really live these (sharing of risks, mutual assistance) that much through the project itself” (PMpub/I1\_acad). **Case 2.2.** “So it is not necessary to publish everything. And the others don't ask for this neither” (PRatc/I1\_acad). “Then, THALES transmits information via satellites, then information is transmitted with good speed, and good integrity and all that is needed. That is assured by THALES system. So there is no place where they have to give their secret of production, or other secret” (PRatc/I1\_acad). **Case 2.4.** “No, I think for such projects the only risk is to have the partner that do nothing in fact, the partner that doesn't produce anything.” (PCont/I2\_acadLead).

#### **Independency- Interdependency Disequilibrium**

**Clear task repartition** with some internal competition

**Each partners had own topic/task /IP** **Case 2.1.** “...there are always different partners that are bringing particular competencies.” (PMpub/I1\_acad). “And then, there is not that much of exchange – it means that each has its own competency.” (PMpub/I1\_acad). “I think there was a little “blockage” from (big industrial partner), who perhaps was too gourmand.” (PMpub/I1\_acad). **Case 2.3.** “And we tried really to split the work between

*different companies, and different entities. Because this thing is very important, because of IP.” (PSmart/I1\_industLead) “...well most of the partners were making development of their own.” (PSmart/I2\_acad). “There was some competition with big industrial partners, because in fact they thought Orange was like challenger – competitor. We explained to them that we can work together and it would have been better for both... but they were a bit afraid to be there, the relationship was a little bit strange.” (PSmart/I1\_industLead).*

**The problem of sensitive knowledge:** balance between information that can and cannot be shared **Case 2.2.** “The other thing was that sometimes there was some sensitive technology. So they didn’t want to bring too much information and share it with each other. But this is understandable.” (PRatc/I2\_industLead). **Case 2.4.** “Yes, the right balance, because you don’t have to spoil your results, your clients and share your precious knowledge to everyone and also to your competitors of course. But, if you don’t share anything, your knowledge worse anything.” (PCont/I1\_sme).

**No global architect but a coordinator** has no global view of technology and problems

**No global architect but a coordinator** **Case 2.2.** “... if you consider the up-stream component, I was not at all knowledgeable in this field. So I was only coordinating, giving the impulse, but then, after the people they were discussing one with the other the various aspects. All of them (partners) they were interfacing one with another without (leader) being involved, because I was not at the level of knowledge were I could interact with them and say something like: “Oh no, you are not taking a right decision. I’d rather put the sensor here”. I’m not an expert at all in this. So, I was relying on what they said.” (PRatc/I2\_industLead). “And so at the end, yes, the role of the coordinator is to try to find a, lets say a compromise between all the views and something that is acceptable by all the parties.” (PRatc/I2\_industLead). **Case 2.3.** “we were not the leader – just the coordinator of the work- the integrator.” (PSmart/I1\_industLead) “No. An architect, no.” “It is difficult to talk about an architect in this context.” (PSmart/I2\_acad).

**Informal leader (industrial) acting as architect** has global view of technology and problems **Case 2.1.** “Well, normally it was for leader to do that, but actually it was for big industrial group to do it somehow. And so, as a big multinational company, they did it well.” (PMpub/I1\_acad). **Case 2.2.** “So if the coordinator is not willing to go forward and tackle the issue, then of course this is a big problem ☺ for the project. But we were not alone in this.” (PRatc/I2\_industLead).

**Informal leaders for specific tasks** **Case 2.1.** “...when there was a need in arbitrator to give sign that the break is finished, it was ( big industrial partner) who was doing that.” (PMpub/I1\_acad). “Because it was an industrial partner that was the biggest one, with much more influence.” (PMpub/I1\_acad). **Case 2.4.** “In fact, the architecture of the organisation was on administrative leader with a scientific leader for each partner. And, like for every project, the natural leaders that emerged during the meetings.” (PCont/I2\_acadLead).

**Non-centralised organisation** **Case 2.2.** No there was some coordination, but it was not centralised. (PRatc/I2\_industLead). **Case 2.3.** “It’s a coordination, but not really centralised.” (PSmart/I1\_industLead)