

# Towards Servitization in the Age of Digital Innovation – A Case from Vehicle Industry

Author(s): Asif Akram

Affiliation(s): Halmstad University, Halmstad, Sweden

*Email address (es): asif.akram@hh.se*

**Abstract** The advancement in digital technologies drives industries to change their core businesses which present number of challenges. One of them is transformation of manufacturing industries towards servitization. This paper reports empirical findings from an on-going project related to servitization in the age of digital innovation. The research study is in the context of the vehicle industry and concerns e-maintenance services based on remote diagnostics technologies. It explores the servitization of vehicle industry in the age of digital innovation. Such innovations embark challenges to innovation environment. A study in this regard has been conducted and it revealed the challenges related to the design, organizational strategy and organizational transformation.

**Keywords:** servitization, product-service systems, vehicle industry, digital artifact, remote diagnostics system, digital innovation, digitalization

## 1 Introduction

Information and communication technologies (ICT) are enabling manufacturing firms to the development as well as advancement of services within different products-based industries. This allows them to expand their business by providing services in addition to their core businesses. Broadly speaking, this movement of including service as value-added activity to manufacturing companies is referred as Servitization (Almeida et al, 2008). However, this trend bring challenges to existing business and innovation environment.

A strongly related phenomenon to servitization is Product Service Systems (PSS). It was defined by Goedkpop et al. (2007) as “a combination of products and services capable together of meeting user needs”. Baines et al. (2007) state that “the concept of PSS is a special case of servitization that values the performance or utilization of products instead of their properties and obtain differentiation through the integration of products and services that provide use value for the customer”. This definition is more close to digital innovation logic by Yoo et al. (2010) in information systems. Another related phenomenon to servitization includes service science (Chesbrough and Spohrer, 2006).

The previous research on servitization has taken in account of products or service based logic in changing economy (Baines et al., 2008). However, the research on servitization mainly

interplays between product-based and service-based logic while the use of digital technologies play a key role. Recently, IS research community is taking a keen interest in knowing what a 'digital technology implanted service' really means in relation to traditional notions about service innovation (see e.g. Barrett et al., 2010; Yoo et al. 2010a). Banies et al. (2008) have argued that despite of many similarities and cross over between these two communities of researcher, there are few explicit links. This is demonstrated by lack of cross-referencing between the two communities. Hence, I treat the servitization topic similarly to my review on PSS published in Banies et al. (2007).

In line with the research, this paper asks the question: What are the challenges associated with servitization in age of digital innovation?

The paper proceeds as follows: First, In I ground my rationale of servitization (or product-service systems) and digital innovation in related literature section. In this case, it is related to the introduction of services based on remote diagnostics system. The following section gives a background to the research approach and methodology while contextualizing the empirical situation. Thereafter, I provide empirical finding from the systematic analysis of empirical material. A discussion about its implication in IS followed by conclusion and future work closes the article.

## **2 Related Literature**

This section provides a review of the literature on digital innovation, and servitization and a view to show that both exhibits similar principles. The will provide a basis to exhibit the possibility of studying the servitization in the presence of digital innovation.

### **2.1 Servitization**

The term 'Servitization' is coined by Vandermerwe and Rada in 1988. They defined Servitization as "market packages or 'bundles' of customer-focused combinations of goods, services, support, self-service and knowledge". Since then, many researchers have defined the servitizations (see Verstrepen and van Den Berg, 1999; Robinson et al., 2002; Desmet et al., 2003; Lewis et al., 2004; Ward and Graves, 2005; and Ren and Gregory, 2007). An overall understanding in defining the term include that it the innovation of an organizational capabilities and processes to shift from product sale to product and service sale.

The literature on servitization covers a wide range of topics. It includes topics such as defining servitization, classification of servitization, modes of servitization, and challenges facing manufacturing companies both on cultural and corporate level (Baines et al., 2008; Banies et al., 2008). Both, Almeida et al., (2008) and Banies et al., (2008) provide an extensive literature review on servitization over the last four decades. For example, Almeida et al., (2008) has provide a literature review that identified servitization, provided classification of servitization and finally, suggested a preliminary staged conceptual model. Similarly, Banies et al., (2008) provides an extensive review of the body of literature encompassing the efforts to define servitization, its evolution, key features, drivers, challenges, industries and previous work done to overcome challenges. This body of literature covers all kind of literature where manufacturing products have attempted to exercise the adoption of servitization.

In this paper, I will focus on the challenges faced by organization in the course of the adoption of servitization strategy as mentioned by Baines et al., (2008). Although, numbers of researchers have addressed different kinds of challenges, Banies et al., (2008) have categorized these challenges into three distinct categories both from cultural and corporate

perspective. A broad of category of these challenges include service design, organizational strategy, and organizational transformation. According to the authors, the underlying assumption of service design challenges arouse from the thinking that design of services is significantly different from design of products. This difference may lead to marginal risk that may out-weight the benefits of potential profit. A second challenge is associated with the services-oriented strategy which requires organizations to adopt necessary organizational structure and process. This also requires a need for a customer-oriented strategy as well as value services. The third challenge is related to the organizational transformation which underpins the assumption that service culture is different from product culture. Such assumption has also been acknowledged in other service science literature (e.g. Vargo and Lusch, 2004; 2008). However, this challenge requires a shift of corporate mindset to take on service logic is necessary. Moreover, it requires changes to long standing practice and attitude. This may lead to internal resistance to change where underlying logic is not understood or something more challenging and is termed as ‘service paradox’ by Gebauer and Fridli (2005). A summary of literature related to both cultural and corporate challenges are shown in the table below:

<i>Type</i>	<i>Challenges in adoption of servitization</i>
Design	Design of services is different from design of products. The managerial risk may out-weight the potential benefits.
Organizational Strategy	Need to adopt necessary organizational structure, and strategy that support customer alliance.
Organizational Transformation	Need for service culture which is different from product culture; Creating service-oriented environment and finding right people; Internal resistance to change where new logic is not understood; Thinking people as main assets; Service paradox in manufacturing company related to organizational and cultural hurdles; More complex customer needs and demands

Table 1: A summary of challenges in adoption of servitization (Banies et al., 2008)

## 2.2 Digitalization and Digital Innovation

Digital innovation is defined as “the carrying out of new combinations of digital and physical components to produce novel products” (Yoo et al., 2010). Yoo (2010) in his earlier work showed that digitization (i.e. encoding of analog information into digital information) is an important stimulus of digital innovation. An example of digitization is embedding digital technology such as remote diagnostics systems in vehicles. Furthermore, the digitization, in turn, makes physical products programmable, addressable, sensible, communicable, memorable, traceable, and associable (Yoo, 2010). This digitalization of non-digital artifacts has undergone evolutionary waves (Yoo et al., 2010b). The focus of such innovation is based on product innovation and is different from existing IT innovation which is mostly concerned with process innovation (Swanson, 1994).

The services enabled by digitalization are called digital services (Yoo et al., 2010c) and innovation in services is called digital service innovation. Driven by advanced development of

digital technology digital services differ from conventional services and inherit properties from digitalized products as well as from services, hence possessing the hybrid nature (Yoo, 2010; Yoo et al., 2010a). Drawing on this point, it is necessary to pipeline the underlying properties and concepts' discussion regarding digital innovation in order to study digital service innovation.

Yoo et al. (2010a; b) have identified three waves of digitalization in case of AEC and camera evolution. According to them, the first wave of digitalization includes simply the technical digitization of analog contents and service into digital format. The associated digital technology provides the same function as non-digital counterparts, with some additions and intelligence advantaging the reduction in cost. The distinct feature of second wave is the separation of digital devices, networks, services, and contents that were tightly coupled. This provides the shift in traditional boundaries across product categories and industries. In the final wave of digitalization, there is possibility to use mesh-up services that can be further re-combined creating incessant stream of new innovation possibilities for products, services, technologies etc. as can be seen in Google digital earth service. As digitalization continues, digital products are being equipped with increasingly diverse set of capabilities.

Yoo et al., (2010a) have described three key design features of a digital technology that differentiate it from earlier technologies as: the re-programmability that relates to the ability of devices to be re-programmable enable separation of semiotic functional logic of device from physical embodiment; the homogenization of data which refers to the binary representation of data and together with emergence of new media separate the content from medium; and the self-reliance nature of digital technology means it requires the use of digital technology.

The advantage of using digitalized artifacts include new dimensions to service relationship as embedded sensors can become eye and ear of remote service provider (Yoo et al., 2010a; Barret et al., 20010) who can access real-time data and in turn can provide seamless services to customers.

### **3 Research Methodology**

This paper reports on a study within a vehicle industry that is aiming to move towards servitization. It forms a part of an on-going research project in collaboration with companies involved in the vehicle industry and academic community. The project aims at implementing innovative remote maintenance and diagnostics services based on state of the art remote monitoring and diagnostics technology. From research perspective, we are interested in studying system in real-time settings while companies are interested in deploying them in their business. The organization of such collaboration can work a share space where research efforts and practical initiatives can blend in fruitful ways (Mathiassen, 2002).

The study is conducted as an interpretative study (Walsham, 1993; Klein and Myers, 1999) at the companies. The rationale behind selecting the site includes availability of multiple resources, cooperation opportunity, and possibility of purposeful sampling (Yin, 1989; Peppard, 2001). Our study is based on exploring opportunities and challenges related to remote diagnostics systems in the digital innovation process.

To serve the purpose, several activities have been performed in order to generate data by involving different stakeholders called 'participants'. The activities include interviews, workshops, project meetings and observations and e-mail correspondences. Following paragraphs show the details about the activities:

The exploratory study started with the service development meeting with the purpose to plan, find and create refined project document. Each of the meeting lasted between 1-2 hours and they served as the basis for preparing workshops. Meeting notes and summary documents provided the participants' expectations and are coupled with other documents.

In addition to initial planning meetings and interviews, monthly meetings (each of which was 3 hours in length) were held. These were generic in nature and discussed project issues which occurred across the disciplines such as technical, service development and business. Cross-disciplinary inputs about opportunities and challenges were collected using notes and meeting minutes.

Even though, the interviews are rich sources of interpretations, they should be supplemented with other sources (Klein and Myers, 1999). The initial development meetings were followed by conducting semi-structured and open ended interviews with the purpose to get rich information. The interview study was inspired by the work of (Myers and Newman, 2007; Schultze and Avital, 2011) and supplemented them with number of activities listed above.

Workshops were conducted as half-day activities and included interviewing and drawing value networks with the business area representatives. The purpose of these activities was to understand the existing structure and character of the value networks from customers' perspective. The main focal point about exploring opportunities and challenges were considered during this activity. The interviews were recorded and later transcribed to interpret data. These were one of the major sources of information where value networks were drawn with the particular business areas representatives to find out existing status and potentials remote e-maintenance. The project meetings, monthly meetings and available documents provided the basis to run these workshops. These available documents include weekly reports about project, field notes, and company documents.

<i>Activities</i>	<i>No</i>	<i>Participants</i>
Interviews	4	<ul style="list-style-type: none"> <li>• Business Area Representatives</li> <li>• Maintenance Manager</li> <li>• Service Developers</li> <li>• Informatics Researchers</li> </ul>
Project meetings (Biweekly and on-demand)	26	<ul style="list-style-type: none"> <li>• Service Developers</li> <li>• Project Manager</li> <li>• Technical Researcher</li> <li>• Informatics Researchers</li> </ul>
Workshops	3	<ul style="list-style-type: none"> <li>• Service Developers</li> <li>• Business Area Representative</li> <li>• Informatics Researchers</li> </ul>
Monthly Project Meetings	8	<ul style="list-style-type: none"> <li>• Service Developers</li> <li>• Project Manager</li> <li>• Informatics Researchers</li> <li>• Technical Developers</li> <li>• Technical Researchers</li> </ul>
Documents (Meeting notes, weekly Project reports, mail correspondence)		<ul style="list-style-type: none"> <li>• Service Developers</li> <li>• Project Manager</li> <li>• Technical Researcher</li> <li>• Informatics Researchers</li> </ul>

Table 2: Summary of activities

Using Ryan and Bernard's (2003) techniques to identify themes, we have conducted a thematic analysis of the collected data. The above table shows the diversity of activities ranging from holding meetings to conducting interviews as well as workshops. The materials for the analysis during these activities include interview transcripts, value networks, field notes and documents. Hence, each of these requires a different kind of interpretation to give sense to data with the overall aim of finding the challenges and opportunities. Out of the available materials, the interviews and workshops served as the main sources of analysis. The interviews were transcribed and interpreted to find themes and sub-themes while the value networks were analysed to add information to the results. A follow-up study of the results through e-mail was made possible to avoid biases and assuring the findings. These results were also supplemented by the analysis of documents such as weekly project reports, meeting notes, and company documents.

On the basis of the data collection and analysis, we proceeded to results and findings. The results and findings in turn provide illustrations about the challenges associated with digital innovation based on remote diagnostics systems within the vehicle industry. The interpretations are guided by the related literature and the advice of Walsham (2006) on relating interpretations to literature. In this ambition, we have done interpretations on the related literature presented earlier. Next section provides the results obtained from the analysis of the data.

## **4 Empirical Findings**

To explore the challenges in the adoption of servitization in digital innovation, this section presents the empirical findings that are related to servitization and challenges. I presented evidence both from service provider and customer perspectives in order to get richer picture of the phenomena.

### **4.1 Servitization**

Servitization in the form of product related maintenance services is one of the obvious phenomena in the vehicle industry and holds history with the origin of the manufacturing of vehicles. Hence, it warrants by giving it necessary attention to understand the current situation in the market. For example, one of the managers responsible for maintenance of the vehicles mentioned his views about customers' needs in such a words that

*“More and more bus operators are asking for full service. They want to concentrate to their transport mission and they want us to provide the bus and all the required maintenance to run the bus. That is the current trend now”*

The above expression shows that the organization is aware of the servitization or product service system (PSS), that is, services related to products. However, his views do not reflect products related to services or hybrid.

Another manager from service providing company realized the servitization in such a manner

*“We are also starting to talk more and more about the life cycle cost of the vehicle out to the customer. Traditionally we say things like ‘we have the best vehicle’, ‘we offer you the best vehicle’, ‘very attractive price’. But that part is the minor part. A customer may spend 2 million for the bus but in 12 years time of the lifecycle the customer spends lot more money such as fuel, drivers etc.”*

This shows the changing trend in organizations about the realization of servitization as an asset to their business.

One manager from one of the manufacturing company clearly mentioned about servitization in the words that

*“We are trying to move from product oriented business to services oriented business”.*

While one of the manufacturing companies who is still dealing their major business in the sale of products showed product-oriented thinking, but remote diagnostics as a step towards servitization and express his views as

*“The main aim of the technology should be to sell products”*

Hence, the views from manufacturing companies reflect a mixed trend or approach towards servitization. The only thing, I can conjecture from here is that the companies see the technology as potential enabler towards servitization.

## **4.2 Challenges related to the adoption of servitization**

While the companies are interested in servitization on one hand, this pose number of challenges on the other hand.

One of the service developer talked about the attitude of the people in manufacturing companies as

*“There are difficulties with rigid attitude to service development and need to be balanced. For example, an attitude not to talk to customers etc. .... ”*

This shows the internal resistance to change where the new logic of services is not well understood.

A manager responsible for maintenance who earlier mentioned about servitization mentioned the number of challenges related to core competency development for marketing by saying

*“We really try to educate our salesmen to tell the customers about spending for the higher quality to save money in the long run”.*

One of the business area representatives from a manufacturing company put forward the strategy challenge

*“... The most important challenge is to understand that you are not just selling a part of vehicle, you are selling value to the customer and you need to rethink regarding your business model...”*

This thinking reflects the issues related to value service in the adoption of servitization.

Design:

The empirical material on large reflect positive attitude towards design of servitizations. For example, on of the business area representative mentioned that

*“We have successfully designed together with the customers in a project for new a concept on maintenance”.*

This logic of designing with customers was not new in most of the companies. They have deployed it even in their manufacturing business, An example that shows encouraging trend towards include the

*“We have customers involved in our product development and we take their views about what we are going to design, what we are going to provide in the future. So, we try to involve them and we are rather close. We sit together with the customers from time to time and have discussion with them and sometimes doing things together in partnerships.”*

Hence, the companies show most of the challenges in aligning strategy and even more transformational challenges.

## **5 Discussion – Servitization in the Age of Digital Innovation**

The question addressed in this paper is: what are the challenges associated with servitization in the age of digital innovation?

Our findings from the empirical material show that, in overall, the vehicle industry is exhibiting the phenomena of servitization since the start of manufacturing business. However, this servitization is shown in different proportions and express different classifications of the servitization (Baines et al., 2008). The company documents from the vehicle industry shows that it exercises different services such as consulting financing, and integrated solution. These services can be classified on the basis of their range of coverage (Davies et al., 2003). However, servitization associated with the digital technology show mostly maintenance services, that is, product related services, hybrid, and service related products. Such kinds of services are based on the purpose of offerings (Matheiu, 2001) and one can use business model suggested by Mathieu (2001) for transition from manufacturing to services. Kuschel (2009) in his research work addressed the technological, organization and business pre-requisites in this regard. Hence, we can say that the vehicle industry exemplifies a product oriented industry moving towards a servitization of business and therefore provides a valuable setting to investigate the role of IT, and in particular digital innovation, in such development more generally. The knowledge gained is of increasing importance to other product oriented businesses where products become part of ubiquitous computing environments (see e.g. Jonsson, Westergren, & Holmström, 2008).

A conjecture in service classification is that in the age of digital innovation the boundary between product related service and service related product is diffused, hence giving birth to hybrid servitization.

Challenges related to the organizational strategy reveals that servitization in the digital age depicts weak strategy to support customer alliance; lack of necessary organization structure and processes; and concerned related to value services. Hence, changes are required due to servitization include new logic (i.e. hybrid logic of digital artifacts) for company strategy (Wise and Baumgartner, 1999) and interdisciplinary processes which affect especially product, the logistical structure and service operation (Karlsson, 2007). To capture value of this business, a shift from value chain to value network thinking should be incorporated (Akram and Åkesson, 2011). Finally, *in line with the argument that* new aspects for considerations are needed such as: the process of innovation and development of services, the process of production and delivery system, the means of evaluation and the relationship with customers etc. that demand new organizational principles, structures, and processes (Oliva and Kallenberg, 2003).

The challenges related to the transformation depicts that there is internal resistance to change as the new logic is not properly understood. There are also issues with the development of core competency such as in marketing of servitization. Finally, there are some traces of service paradox in manufacturing companies related to organizational and cultural hurdles (Gebauer and Friedli, 2005).

## **6 Concluding Remarks**

We have shown some empirical evidence regarding organizational strategy and transformation. Although, servitization is a way to increase the competitiveness i.e. servitization as adding value to their business (Vandermerwe and Rada, 1988). However, the Competitive advantage doesn't occur solely through service delivery, but in how the services are combined with products to provide high-value solutions (Davies et al., 2003) in digital innovation. The contribution of the paper are of value to the IS researchers involved in servitization or related phenomena in digital innovation. However, the industrial context limits the research and can be further explored in other industries as well. Further research especially servitization with digital artifacts solely can open up new areas of research.

## References

- Baines, T.S., Lightfoot, H.W., Evans, S., Neely, A., Greenough, R., Peppard, J., Roy, R., Shehab, E., Braganza, A., Tiwari, A., Alcock, J.R., Angus, J.P., Bastl, M., Cousens, A., Irving, P., Johnson, M., Kingston, J., Lockett, H., Martinez, V., Michele, P., Tranfield, D., Walton I.M. and Wilson, H. (2007), "State-of-the-art in product-service systems", IMechE Proc. IMechE Vol. 221 Part B: J. Engineering Manufacture
- Baines, T.S., Lightfoot, H.W., Benedettini O., Kay, J.M. (2008). "The servitization of manufacturing: A review of literature and reflection on future challenges", *Journal of Manufacturing Technology Management*, (20:5), pp.547 – 567
- Barrett, M., Davidson, E., Prabhu, J., Vargo, S.L. (2010). *Service Innovation in the Digital Age. Call for Papers- MIS Quarterly Special Issue on Service Innovation in the Digital Age* (Available at: [http://www.misq.org/skin/frontend/default/misq/pdf/CurrentCalls/SI\\_ServiceInnovation.pdf](http://www.misq.org/skin/frontend/default/misq/pdf/CurrentCalls/SI_ServiceInnovation.pdf))
- Chesborough, H. and Spohrer, J. (2006), "A research manifesto for services science", *Communications of the ACM*, Vol. 49 No. 7, p. 35
- Davies, A. (2004), "Moving base into high-value integrated solutions: a value stream approach", *Industrial and Corporate Change*, Vol. 13 No. 5, pp. 727-56.
- Desmet, S., van Dierdonck, R. and van Looy, B. (2003), "Servitization: or why services management is relevant for manufacturing environments", in van Looy, B., Gemmel, P. and van Dierdonck, R. (Eds), *Services Management: An Integrated Approach*, Pearson Education, Harlow.
- Goedkoop, M., van Halen, C., te Riele, H. and Rommens, P. (1999), "Product service-systems, ecological and economic basics", Report for Dutch Ministries of Environment (VROM) and Economic Affairs (EZ), PRe Consultants, Amersfoort
- Gebauer, H. and Friedli, T. (2005), "Behavioural implications of the transition process from products to services", *Journal of Business & Industrial Marketing*, Vol. 20 No. 2, pp. 70-80
- Robinson, T., Clarke-Hill, C.M. and Clarkson, R. (2002), "Differentiation through service: a perspective from the commodity chemicals sector", *Service Industries Journal*, Vol. 22 No. 3, pp. 149-66.
- Ren, G. and Gregory, M. (2007), "Servitization in manufacturing companies", paper presented at 16th Frontiers in Service Conference, San Francisco, CA.
- Vandermerwe, S. and Rada, J. (1988), "Servitization of business: adding value by adding services", *European Management Journal*, Vol. 6 No. 4.
- Vargo, S.L. and Lusch, R.F. (2004). *Evolving to a New Dominant Logic of Marketing*, *Journal of Marketing*, Vol. 68, pp. 1-17.
- Vargo, S.L. and Lusch R.F. (2008). *Service-dominant logic: continuing the evolution*, *Journal of Academy of Marketing Science*, Vol. 36, No. 1, pp. 1-10
- Verstrepen, S. and van Den Berg, R. (1999), "Servitization in the automotive sector: creating value and competitive advantage through service after sales", *Global Production Management*, Kluwer Publishers, London, pp. 538-45.
- Ward, Y. and Graves, A. (2005), "Through-life management: the provision of integrated customer solutions by aerospace manufacturers", working paper, University of Bath, Bath.

- Yoo, Y., Henfridsson, O. and Lyytinen, K. (2010a). Research Commentary - The new organizing logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, 21(4), 724-735
- Yoo (2010). Computing in everyday life: A Call For Research on Experiential Computing, *MIS Quarterly*, Vol. 34, No. 2, pp. 213-231
- Yoo, Y., Lyytinen K., Boland R., Berente N., Gaskin J., Schutz D., Srinivasan N.: The next wave of digital innovation: Opportunities and challenges. A Report on the research workshop: "Digital challenges in innovation research" (June 8, 2010b). Available at SSRN: <http://ssrn.com/abstract=1622170>
- Yoo, Y., Lyytinen, K., Thummadi V., Weiss A.: Unbounded innovation with digitalization: A case of digital camera (2010c)