Service Innovation Life Cycle in a Manufacturing Ecosystem

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Abstract. Servitization is a grand challenge for all manufacturing companies to extend their business. As main result this paper presents an approach and corresponding research questions on how to integrate servitization in manufacturing businesses by making use of an innovation ecosystem. Companies might benefit from this approach, as it indicates how relevant characteristics to evolve in order to take the next steps in the servitization process and what challenges have to be regarded when it comes to the conditions for service innovations. However, the result of this paper still remains an approach that needs to be applied and validated in industrial practice.

Keywords: Service Innovation, Life Cycle, Manufacturing Ecosystem, Service Science, Service Management, Service Engineering

1 Introduction

Today services are of increasing importance for European economies as a whole. In the European Union the service sector creates about three quarters of the overall Gross Domestic Product (GDP) [1]. Furthermore, it also has high impact on the European labour market, as almost three-quarters of all European jobs are allocated here 91]. Moreover, companies from primary and secondary sectors, and especially manufacturing companies, are struggling as well to become more service-oriented, in order to find new business and industrial models to meet users' expectations and customers requirements[2]. Traditional product-centric sectors, with the aim to put customers and users at the centre of their business models, are therefore evolving into service centric sectors and are embracing and adopting deep transformation processes in order to meet the new challenges: this evolutionary process is often referred to as the servitization process for non-tertiary sectors [3]. However, the servitization process is not just a change in the business model: it involves all the aspects of the enterprise, which therefore needs methodological and technical support concerning an integrated development and management of service offerings [3,4,5].

The objective of this paper is to present a general approach for manufacturing companies that want to take the chance of servitization by making use of business

ecosystem. The focus is directed to the relevant research questions rather than to a finalized methodology.

The paper is structured in following sections:

- Trends in Services in Manufacturing Companies,
- Servitization as a Transition from Products to Services,
- Servitization as part of Innovation Cycle,
- Approach for a Model Driven Service Architecture.

2 Trends in Services in Manufacturing Companies

The changing general conditions for manufacturing companies and the increasing significance of services are leading to an increased dynamic of the service business. Manufacturing firms are increasingly beginning to understand the often-neglected service departments as a core function of the company and to invest in new strategies and concepts [6, 7, 8].

Customising of services

The complexity of many material goods increases the requirements, which customers make upon manufacturing companies. Customers particularly expect services such as an intensive consulting, proposal and planning. Furthermore, customers need special software packages and offers of training courses for their staff, which exceed the so far usual measure. Precautionary maintenance, service hotline and tele-services are further components, which secure the availability of expensive machines and systems.

Bundling of products and services

The exchangeability of material goods and the growing number of necessary services increase the costs for the selection, the creation and the operation of an individual problem solution to be paid by the customers. Therefore, customers demand reinforced intelligence-laced packages from material goods and services in order to keep the coordination costs as low and transparent as possible. This trend is identified by keywords such as system business, solution providing and general contractorship.

Leadership of services

New management approaches for example Total Cost of Ownership have awakened the thought with industrial customers of whether it is not economically cheaper to secure the use of the machine (“pay per unit”) instead of purchasing a machine. Leasing models, withdrawal and modernisation services or the complete operation of production plants by the manufacture with or for customers are the answers to such demands. In this case, the material goods are part of the service. The ratio of material goods and services is reversed.

Development of new services
New forms of the division of labour in the value-added chain between suppliers, manufacturers and customers delay service packages at preliminary levels of the value-added chain. As a result, manufacturers take on operators' tasks, suppliers' retailers. Without new services, this form of division of labour cannot be realised. Consequently, tool manufacturers, for example, take on the tool management for their customers or suppliers become R&D partners. In studies a high growth potential is attested especially to tele-services, engineering and financing [10].

3 Servitization as a Transition from Products to Services

Especially within the industrial sector, services have increased their importance, from an internal point of view as well as from the customers' perception. The demand for high customization and the globally growing competition has led to the circumstance that satisfying customer needs by only providing tangible products in no longer possible for manufacturing companies [10]. A set of physical goods and services is needed to raise the value the customers receive. The focus has to be put on the understanding of the customers' problems. A suitable solution should be created. Therefore services are added to the mere physical products in order to solve the customers' problems.

Services hereby can be provided by manufacturing companies themselves (which offer the tangible product) or by a third party, for instance specialized service providers. The service component of such solution bundles can be incorporated in the price of the physical good or invoiced separately. Furthermore it has to be closely connected to a tangible product, but it does not necessarily need to be provided together with it (with regard to place and time).

The circumstances mentioned above lead to the situation, that products are more intensively combined with service components today than in previous decades. In literature this development often is referred to as "servitization of products", a term that has been coined by Vandermerwe and Rada [11] and mainly describes the process of creating customer value by adding services to a tangible product. Oliva and Kallenberg [12] add – discussing the transition from products to services – that servitization also centers on the growing "relative importance of services" in comparison to the tangible goods offered, such as machines. Being just an add-on to a product, services are rather unimportant in the customers' perception in contrast to the tangibles. However, by becoming a valuable component of a product-service bundle that solves customer problems, services are getting relatively more important. Thoben et al. [13] link that growing relative importance of services [12] as a characteristic of servitization processes with the non-tangible value that is created by them. **Errore. L'origine riferimento non è stata trovata.** shows, that during a servitization process the tangible value-share decreases whereas at the same time the non-tangible value-share is increasing.

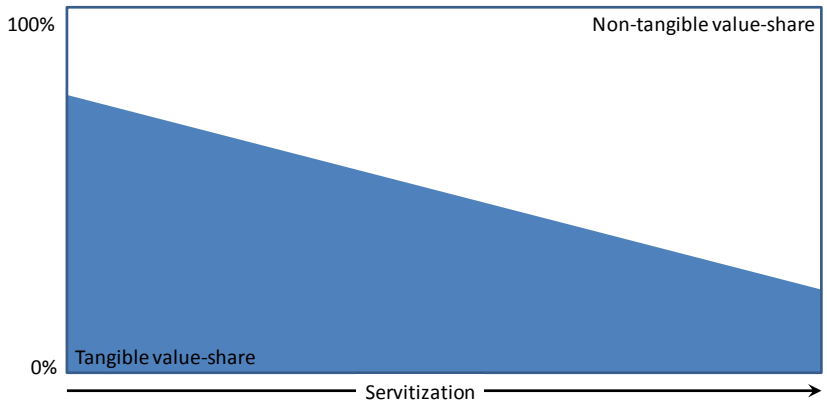

Fig. 1. Increasing the non-tangible Value-Share [13]

Different levels of servitization have been identified, reaching from the traditional manufacturer of tangible products, over the provision of service add-ons to the provision of products as a service. With the concept of extended products, Thoben et al. (2001) provide an appropriate model to connect products, product related services and the needs of the customers, see **Errore. L'origine riferimento non è stata trovata.**.

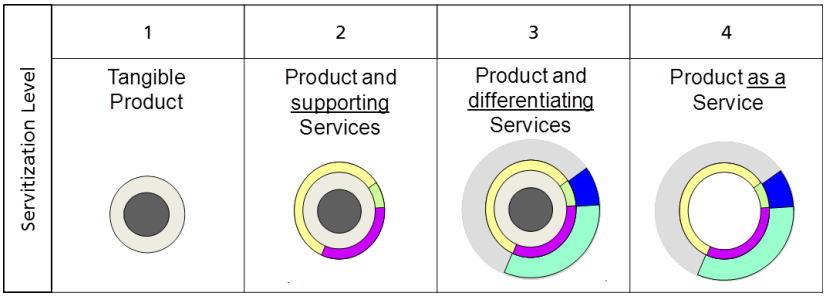

Fig. 2. Extended product concept [14]

Starting with the tangible product (level 1), four levels of servitization can be distinguished. The product and supporting services level (level 2) stands for the simultaneous offering of tangible products with appropriate services. Typical supporting services are for instance financial, repair or maintenance services. Differentiating services (level 3) are services that create a differentiating competitive advantage towards competitors (e.g. by means of configuration or consulting services or individualized full service contracts). In level 4, products even become services, for example with reference to the so called operator model. Here, the physical products remain property of the manufacturing company although it is installed at the customers' site. Revenue streams are generated by operating the machine or plant for the customers, for example according to the amount of units it produces for them.

4 Servitization as part of Innovation Cycle

The approach of this paper is to consider servitizationas an essential part of the service innovation cycle, see **Errore. L'origine riferimento non è stata trovata.**. The Innovation cycle can be describe by three steps:

- Seeking for new ideas and selecting a good one– Service Innovation (left side of the Cycle, first round),
- Development of a service based on the selected idea– Servitization in a company (right side of the Cycle, first round),
- Impacting the Service Innovation network by the new developed service in the market– Innovation Ecosystem (left side of the Cycle, second round).

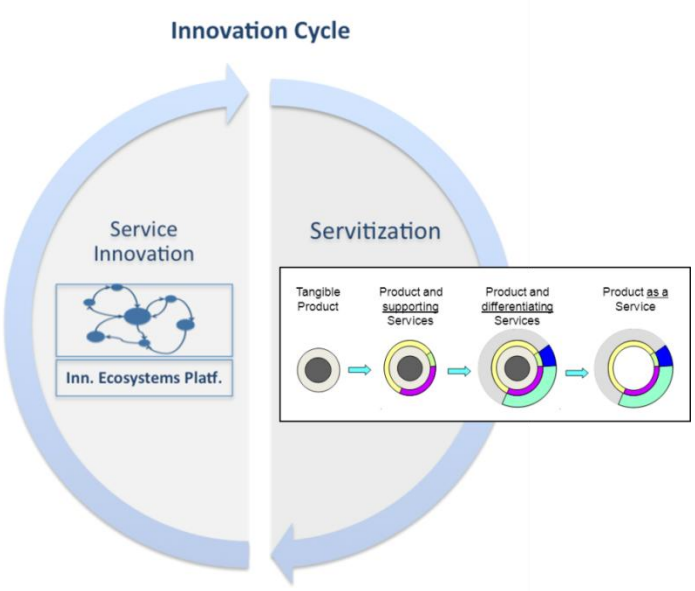

Fig. 3. Innovation Cycle for Services and Levels of Servitization

4.1 Seeking for new ideas and selecting a good one

According to Geoffrey, Granig and Eschenbächer service innovation can be generally differentiated from other types of innovation like product innovation, process innovation or business model innovation [15, 16, 17]. Toivonen and Tuominen [18] offered a pragmatic definition of service innovation: "A service innovation is a new service or such a renewal of an existing service which is put into practice and which provides benefit to the organization that has developed it." It is not just a "clever new idea" but also the development and implementation of a service that is accepted by the customers and so provides revenues as benefits for the service provider. Other definitions or descriptions pronounce that service innovations are not just incremental improve-

ments of existing services offer a “new core benefit or a new delivery benefit that revolutionizes customers’ access to the core benefit” [19].

4.2 Development of a service based on the selected idea

When it comes to manufacturing companies the service innovation cycle touches product aspects as well as service aspects, due to the presumption that the services being innovated are product-related services as focused in this paper. Therefore in the right half of the innovation cycle the interdependence and relation of both, product and service, components has to be regarded with respect to a certain level of servitization as describe in **Errore. L'origine riferimento non è stata trovata.**. In this place it is assumed that service innovation in manufacturing industry will generally trigger servitization processes. The servitization can take place in two ways:

1. Servitization on same level that is already covered. For example: a new innovative product supporting service is added on level 2 of **Errore. L'origine riferimento non è stata trovata.**.
2. Servitization that reaches a new level. For example: the new service is no longer just a supporting addition to the product but requires an adaptation of the physical product so that service and physical product are merged into a new products that differentiates from the existing product.

The second option shows that in servitization processes on level 3 of **Errore. L'origine riferimento non è stata trovata.** is the service innovation is related to the physical product.

4.3 Impacting the Service Innovation network by the new developed service in the market

The approach to make use of an Innovation Ecosystem to foster service innovation is based on the experience that in some cases the innovator come from outside the particular manufacturing or service sector. This was already described more than 20 year ago by von Hippel [20].

A recent definition for an innovation ecosystem is given by the COIN projects [www.coin-ip.eu]: “An innovation ecosystem is a non-hierarchical form of collaboration, in the past mostly founded on a territorial proximity like Smart Regions or Districts but nowadays extending globally worldwide, where big OEMs, SMEs networks, ICT suppliers, universities and research centers, local public authorities, individual consultants, customers and citizens work together for promoting and developing new ideas, new products, new processes, new markets.

The objective is to make use of the very different experience and knowledge background to trigger new innovative ideas and to conduct the servitization process till the sale process of the new extended product. This has to be done in collaborative co-creation processes that require interactions between the partners in the ecosystem [21]. Typical interactions are sharing ideas, coordination, negotiation and solving

conflicts. These interactions are micro-processes that can be considered as “lubrication” for the innovation processes.

5 Summary

In summary, to succeed in nowadays competitive global market, manufacturing companies have to modify their product-focused business model to a more service-oriented one. They need to supply their core products with innovative services to create an attractive bundle. On possibility to do this on a very systematic why is to use the Innovation cycle in combination with the servitization levels to create a new ecosystem. Such an ecosystem provides the necessary fertile ground for service innovations. The collaborative interactions of the partners in the ecosystem is a challenge but also a success factor for innovation. Summarized, the term “servitization” and the corresponding collaborative innovation processes in an ecosystem thus can be understood as an important paradigm shift in manufacturing firms concerning the relative importance of product respectively service business.

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References

1. World Trade Organisation (WTO): International Trade Statistics 2008, WTO Publications, Genf, 2008.
2. Freitag, Mike; Husen, Christian van; Müller, Robert: Entwicklung und Management internationaler Dienstleistungen. StudiezumDienstleistungsexportdeutscherUnternehmen, Fraunhofer IRB Verlag, Stuttgart, 2007.
3. Spath, Dieter; Fähnrich, Klaus-Peter; Freitag, Mike; Meyer, Kyrill: Service Engineering internationaler Dienstleistungen, Fraunhofer Verlag, Stuttgart, 2010.
4. Freitag; Mike; Ganz, Walter: InnoScore service. Evaluating innovation for product-related services. In: Service Research&Innovation Institute (Hrsg): Annual SRII global conference (SRII), 2011. March 29, 2011 - April 2, 2011, San Jose, California, USA ; proceedings, IEEE, Piscataway, NJ, 214–221, 2011.
5. Freitag, Mike; Rogowski, Thorsten: Hybride Produkte. Innovationsbewertung für produktbezogene Dienstleistungen. In: Spath, Dieter (Eds.): Mit Ideen zum Erfolg. Technologiemanagement in der Praxis ; [30 Jahre Fraunhofer IAO], Fraunhofer-Verl, Stuttgart, 119–122, 2011.
6. Brax, S.: A manufacturer becoming service provider – challenges and a paradox, in: Managing Service Quality, Vol. 15 (2), pp. 142-155, 2005.
7. Lay, G.; Jung Erceg, P. (Eds.): Produktbegleitende Dienstleistungen, Konzepte und Beispiele erfolgreicher Strategieentwicklung, Springer, Berlin, 2002.

8. Spath, Dieter; Ganz, Walter: Taking the Pulse of Economic Development. Service Trends, Hanser, München, 2011.
9. Rainfurth, C.: Der Einfluss der Organisationsgestaltung produktbegleitender Dienstleistungen auf die Arbeitswelt der Dienstleistungsakteure, Darmstadt, 2003.
10. Johnston, Robert; Clark, Graham: Service operations management: improving service delivery, Financial Times, Prentice Hall, 2008.
11. Vandermerwe, Sandra; Rada, Juan: Servitization of Business: Adding Value by Adding Services, in: European Management Journal, Vol. 6(4), 1988, pp. 314-324, 1988.
12. Oliva, R.; Kallenberg, R.: Managing the transition from products to services, in: International Journal of Service Industry Management, Vol. 14(2), pp. 160-172, 2003.
13. Thoben, Klaus-Dieter; Jagdev, Harinder; Eschenbächer, Jens: Emerging concepts in E-business and Extended Products, in: Gasos, Jorge; Thoben, Klaus-Dieter (Eds.): E-Business Applications. Technologies for Tomorrow's Solutions, Springer, Berlin, 2002.
14. Thoben, Klaus-Dieter; Jagdev, Harinder; Eschenbächer, Jens: Extended Products: Evolving Traditional Product concepts. Proceedings of the 7th International Conference on Concurrent Enterprising: Engineering the Knowledge Economy through Co-operation, 27th-29th June 2001, Bremen, pp. 429-439, 2001.
15. Geoffrey, A.: Darwin und der Dämon‘. Harvard Business Manager, Vol. 26, No. 12, 2004.
16. Granig, P.: Innovationsbewertung: Potentialprognose und -steuerung durch Ertrags- und Risikosimulation. Dissertation, Universität Klagenfurt, Deutscher Universitäts-Verlag, Wiesbaden, 2007.
17. Eschenbächer, Jens: Gestaltung von Innovationsprozessen in Virtuellen Organisationen durch Kooperationsorientierte Netzwerkanalyse. Dissertation, Universität Bremen, Mainz-Verlag, Aachen, 2009.
18. Toivonen, Marja; Tuominen, Tiina: Emergence of innovations in services. The Service Industries Journal, 29:7, pp. 887-902, 2009.
19. Berry, L. L.; Shankar, V.; Turner Parish, J.; Cadwallader, S.; Dotzel, T.: Creating New Markets Through Service Innovation. MIT Sloan Management Review,Vol.47, No. 2., pp. 56 -63, 2006.
20. Hippel, Eric von: The Sources of Innovation. In Boersch, C.; Elschen, R. (Eds.): Das Summa Summarum des Management - Die 25 wichtigsten Werke für Strategie, Führung und Veränderung. Gabler, Wiesbaden, 1988.
21. Westphal, Ingo, Thoben, K.D und Seifert, Marcus: Managing collaboration performance to govern virtual organizations. In Journal of Intelligent Manufacturing, Volume 21, No. 3, pp. 311-320, Springer, 2010.