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Positioning of Spare Part Contracts in the Servitisation Process

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Abstract

In today's competitive market, servitisation as a relatively new term in academia and industry is finding its place to offer services within selling products, as after sale products and sometimes offering services instead of products. Different types of servitisation have been introduced during the last two decades, where each implementation has its own demands and effects on the revenue and efficiency of companies in different sectors. The aim of this paper is to address and position spare part contracts as a form of servitisation in industries and look at its demands and features. For this paper, literatures relating to servitisation and its different types have been studied with keywords such as: servitisation, spare part contracts and support contracts, then positioning the spare part contracts in servitisation concept has been studied and tried to show the difference between service supply chain and product supply chain. Gaps in the literature have been identified such as the financial benefits of spare part contracts as a part of servitisation concept, supply chain of different spare part contracts, and clarifying the detailed differences between of spare part contracts with other servitisation forms such contract for availability, and contracts for capability from the supply chain point of view, revenues and responsibilities of involved partners.

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1. Introduction

Servitisation as an innovation for companies helps them to move on from being manufacturing and product oriented to service oriented. However, for being service oriented industry does not mean production line and manufacturing facilities should be ignored or omitted. It can be an integration of productions and services. Servitisation originated in the 1980s in the states. Most contributions in this concept have been from academics and some practitioners from operations, production, services, business management and marketing fields. Servitisation is being driven by ever more complex customer requirements and a need to maintain competitiveness. There are various types of servitisation examples in the literature for different sectors such as: aerospace, transportation, and machine tools. These types of contracts maintain revenue streams and improve profitability,

particularly in high value manufacturing sectors. Delivering service contracts is more complex than solely manufacturing products as it requires diverse range of approaches to product-service design and organizational strategy. There are not lots of significant works which can be help practitioner, and this is the basis of research challenge of this field. The first and second sections of this paper present an introduction to servitisation, its features and drivers, while the last section positions the spare part contracts in the servitisation concept.

2. Literature gap

Some gaps have been identified in the literature on this topic. There are various types of servitisation which are currently in use. However, spare parts contracts have not been addressed a majority of the literature. It is the goal of this paper is to position the spare part contracts in the servitisation

concept. However, there are others aspects which must be addressed: the financial benefits of spare part contracts as a part of servitisation process is a field which has not been studied yet. There are some differences among support contracts in servitisation process from different angles. Contracts for availability and contracts for capability are the main support contracts which have received significant attention in the literature. The differences between spare part contracts for availability and capability from different angles require further study.

3. Servitisation

Servitisation is a term which was first used in Vandermerwe and Rada [1]. The term is widely recognised as the process of creating value by adding services to products [2]. The literature in the field shows that there is growing interest from academia, industry and government in the business concept[3]. The definition of servitisation has changed significantly since it was introduced. Table 1 shows this evolution from 1988 to 2013.

Table 1. Different definition for servitisation during time

Author	Definition of servitisation
[1]	“Market packages or ‘bundles’ of customer-focussed combinations of goods, services, support, self-service and knowledge”
[4]	“The emergence of product-based services which blur the distinction between manufacturing and traditional service sector activities”
[5]	“Adding extra service components to core products”
[6]	“An integrated bundle of both goods and services”
[7]	“Any strategy that seeks to change the way in which a product functionality is delivered to its markets”
[8]	“Increasing the range of services offered by a manufacturer”
[9]	“A change process wherein manufacturing companies embrace service orientation and/or develop more and better services with the aim to satisfy customer’s needs, achieve competitive advantages and enhance firm performance”
[10]	“A trend in which manufacturing firms adopt more and more service components in their offerings”

3.1. Features

Manufacturing companies have traditionally sold products solely without any integrated services. However, in recent decades, managers recognized the necessity of providing services in the context of marketing strategies [10;12] in order to drive competition. The initial idea was focused on delivering physical goods and services were only an add-on to products [12]. The provision of services has now turned into a deliberate and explicit strategy with services becoming the main differentiating factor in totally integrated products and service offering[14]. Recently, the value proposition often includes services as fundamental value-added activities [1;12] and reduces the product to be just a part of the offering [13].

There are different types of servitisation varying from products with services as an “add-on”, to services with tangible goods as an “add-on”, and provided through a customer centric strategy to deliver the desired outcomes for

the customer [15], which is shown in Fig1.

3.2. Drivers of servitisation

Commonly, Literatures introduce three main factors for persuading a servitisation strategy; first, financial; second, strategic (competitive advantage) and finally marketing[11;12;15;16]. In the literatures main drivers from the financial point of view are profit margin and stability of income [10;11]. According to wise [11] industries manufacturing goods with high engineering technology, such as the aerospace, rail and automotive industries, service revenues can be estimated at one or two orders of magnitude greater than new product sale alone.

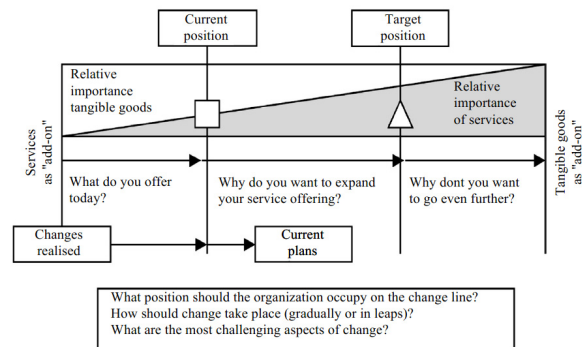


Figure 1. “The Product – Service Continuum” [18]

Emphasis is given by different studies that increasing the life cycle of high value components and products helps to push the most significant revenues downstream towards in-service support[8]. Also some advantages can be achieved in competitive markets through services, as they are often less visible and more labour dependent, services are more difficult to imitate [11;12], making them more attractive and therefore more sustainable revenue sources.

The servicing aspect is well known to influence the purchasing decision and assessing its importance has been a lasting tradition in the marketing literature. This can be seen especially in B2B or industrial markets where customers are described as increasingly demanding for industrial services [1;14;15;17]. Drivers for these demands are the pressures to create more flexible firms, narrower definitions of core competences and higher technological complexity; often leading to increasing pressures to outsource services [6;18].

3.3. Industrial examples of servitisation

There are some literatures which shows the successful adoption of servitisation in some companies [10;14;19]. The examples presented in Table 2 are companies that want to use their downstream services opportunities, which can be divided into different four categories[11]: embedded services, which allow traditional downstream services to be built into the product (e.g. Honeywell’s AIMS for in-flight monitoring of

engine systems); comprehensive services, such as those offered by GE around its product markets (e.g. GE capital's financing activities); integrated solutions where companies look beyond their traditional product base to assess the overall needs of customers (e.g. Nokia's move to network-infrastructure solutions); and distribution control as used by Coca-Cola to acquire prime shelf space in its high-volume low-margin supermarket segment.

Table 2. Industrials examples of servitisation

Organisation	Description	Source
Alstom	Maintenance, upgrade and operation of trains and signalling systems	[20]
ABB	Turnkey solutions in power generation	[19]
Ericsson	Turnkey solutions to design, build and operate mobile phone networks	[20]
Nokia	Nokia's network-infrastructure solutions, providing network equipment and service to carriers	[10]
Thales	Pilot training and simulator-building management	[20]
Rolls-Royce	"Power by the Hour" guaranteed flying hours for aero engines	[21]
Xerox	Document management services. Guaranteed fixed price per copy	[22]
WS Atkins	system integration services and outsourcing solutions	[20]

3.4. Challenges in adoption of servitisation

There are some important cultural and corporate challenges for adopting servitisation [1;10;14;18]. The challenges can be categorized into integrated product – service design, organizational strategy, and organizational transformation. Designing of services is significantly varies from simple design of products, as their natures are different and services are more complex [1;14;16;18].

Different types of risk and uncertainty needs to be considered in the design process [20]. As Baines [15] mentioned, "the marginal risk incurred might outweigh the benefits of increased profit potential. Finally, focus on communication strategies that clearly describe the value proposition to the customer need to be considered in the design of service provision". Companies that decide to shift from being only manufacturing oriented to become a service oriented one need to adopt their services strategy with organizational structures and processes [11;14;16].

Challenges in defining the organizational strategy is necessary to support the customer allegiance required to deliver a combination of product and services [11]. Adopting a downstream position, such as the provision of installed base services, organizations have to be service oriented and offer services that add value [18]. As Miller [21] pointed out, "organizations provide solutions through product-service combinations and tend to be client-centric and providing customized, desirable client outcomes organized around particular capabilities competences and client requirements". However, some authors identify which service management principles often differ from traditional manufacturing practices attempting to transform a traditional manufacturer to the required organizational strategy for effective servitisation, and how this raises particular challenges[22]. There is often

resistance in some sections of companies for implementing these changes[17]. To be successful in the servicing field, finding the right people and creating a service-oriented environment is the key objective to achieving this aim. The main shift from being manufacturing-oriented to service-oriented is that managers must see their people as the main assets [20]. However, there are significant numbers of cases which are discussed in literatures that despite shifting to become service oriented, they did not get the expected high returns [26;27]. This has been called the "service paradox in manufacturing companies", which has been related to both the organizational and cultural difficulties with servitisation[12].

4. Positioning spare part contracts in servitisation

Traditionally there were three types of support contracts with the UK Ministry of Defense (MOD); repair contracts, spare contracts and a post-design service (PDS). Repair contracts usually are fixed-price for a specific and normally short period of time. It is usually constructed based on previous equipment failure rates and future predicted failure rates for known assets. All repair responsibilities are on the contractor such as spares, repair, manpower and etc. [28;29].

On the other hand, there are traditional spare part contracts, where the MOD is responsible for spare parts and the contractor is responsible for other aspects of repair. It has not been the most efficient type of contract, as the quality of spares has typically been an excuse for failures by the contractor. Finally, PDS is similar to an insurance policy as post-design is a complex, unpredicted and expensive progress [26].

Above mentioned support contracts have their own deficiency to be used solely. However, integration of two or three of above support contracts for equipment or even a platform can lead to conflict and dissolution [26].

The MOD has released a new support matrix which illustrates different types of contracts that is currently in use [27]. Figure 2 shows the Support Option Matrix (SOM)[27]. It must be considered that the contractual access options illustrated are not a roadmap for MOD; it describes support contracting types.

Traditionally, assets were delivered by other industries and organisations to the MOD. However, the MOD was responsible for supporting assets throughout their life cycles. The MOD was required to purchase spares and manage all maintenance and repair activities while industry was typically not involved in the support chain. In new spare inclusive contracts, the MOD contracts out management and all activities related to spares to a third party provider. In this type of contract the MOD can significantly reduce the cost of management and depots [27].

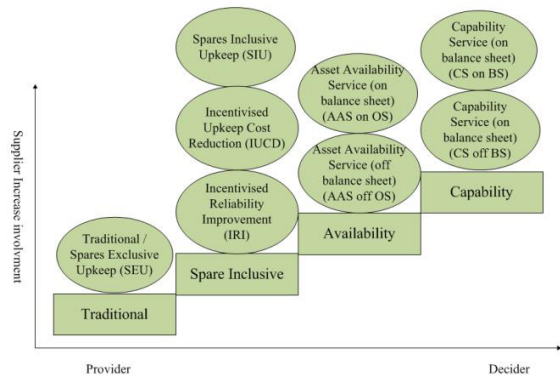


Figure 2 .The MOD contracting access option (MOD, 2007)

Contracting for Availability (CFA) is the next contracting platform that industry is responsible for supporting assets through its life cycle while the MOD owns the asset. The industry is responsible to keep the asset at the contractually agreed performance rate. In the CFA platform, the pre-discussed performance rate is typically based on the availability rate of equipment, sub-system or system and can also be based on availability hours or days.

The last step is contracting for capability (CFC) which is the most sophisticated contract platform that MOD has relatively lesser experience in and considers potentials in a number of areas. The CFC platform is comprehensive, complex and rarely in use as the supplier is in charge of capability, performance and outputs [29;31]. In addition, there are some critical and notable points for this type of platform such as interpretation of the capability which is different for the supplier and the customer, while security issues are present when involving third parties, etc.

The SOM was designed by the Equipment Support Continuous Improvement Team (ESCIT) in the MOD to simplify the identification of support chain options, Key Performance (KP) and cost drivers. The most notable part of SOM is that it clarifies who is responsible for the cost drivers, either the MOD or private industry[27].

4.1. The asset value proposition

Value proposition is usually offered by the product, there are various parameters for performance which are considered by the users that help them achieve their goals. The following excerpt from an interview which was held by [15] with a Client Account Manager illustrates this point: “For the (equipment operators) satisfaction means an (asset) which produces the best level of performance in whatever circumstance they’re trying to (operate) in”.

4.2. The recovery value proposition

The attributes which constitute the recovery value proposition follow the traditional equipment support model, and would normally be offered as part of repairs, spares or

post-design services contract [15]. The value in this case is in the provider’s and customer’s joint ability to ensure the asset recovers quickly to a usable state. The following excerpt from an interview which was held with an Equipment Programme Manager[15] illustrates this point: “I think (the customer) value the performance of the (asset) when it’s running. They don’t value the service when it’s broken, it’s expensive to them, and it takes too long”.

Table 3. Description of Support Option Matrix adapted from [27].

Support Option	Description
SEU	Industry is contracted for the supply of assets.
SIU	Industry is contracted for the supply of assets along with the maintenance of spares.
IUCR	Industry is contracted for the supply of assets along with the maintenance of spares and is incentivised to reduce the cost of spares.
IRI	Industry is contracted for the supply of assets along with the maintenance of spares and is incentivised to reduce costs by improving the reliability of assets.
AAS on B/S	Industry is contracted to make MOD-owned equipment available at a certain point in the support chain (usually the forward base environment).
AAS off B/S	Industry is contracted to make industry-owned equipment available at a certain point in the support chain (usually the forward base environment).
CS on B/S	Industry is contracted for the delivery of an entire MOD-owned military capability.
CS off B/S	Industry is contracted for the delivery of an entire industry-owned military capability.

4.3. The availability value proposition

This proposition ensures that equipment is available for customer use. For the equipment to be available the proactive maintenance should be considered as well as the customers’ life-time maintenance and the operation of the equipment to ensure about equipment reliability and its performance. This is illustrated in a discussion with an Equipment Manager which was held by [15]: “There are 300 people that work in Services who can be tasked to develop these proactive approaches to keep assets in use. There’s a number of ways you can keep an asset operating longer, you can look at the parts, engineering services assessment, changes to maintenance routines...” In general, the availability value proposition maximises the potential usage of the equipment. The attributes which form this value proposition are often part of an availability contract, where the contract performance is dependent on equipment availability for use, rather than on the performance of activities or tasks [15].

Table 4. “Equipment Configuration Advice for Operational and contextual Capability” [15].

Value Proposition	Attribute
Asset	Equipment Performance
Recovery	Technical Query Resolution Technical Variance Equipment Repair Service
Availability	Equipment Maintenance Service Component Forecasting & Provisioning Through-Life and Obsolescence Forecasting & Planning Recommendations Capability Forecasting & Planning Recommendations Equipment Operating Advice
Outcome	Equipment Configuration Advice for Operational and contextual Capability

4.4. The outcome value proposition

The final value proposition consists of attributes which go beyond availability, to support customers to reach their goals. This is illustrated in the following excerpt from an interview which was held by with an Asset Manager [15]: “you can say: right, the serviceable assets – I could take that assembly, that assembly and that assembly and build an (asset) good for (a certain performance) and send it to (achieve this goal). It probably will get to (the performance level) but not much further. So you can start doing selective builds and selective usage of the assets.”

As Lewis [7] mentioned, “Effective servitisation requires: the co-ordination of manufacturing systems, maintenance systems, and spare parts supply systems, logistics systems, and so on”. It must be considered, whilst the product is provided by an organisation, services and support can be provided by downstream members of their supply network [15]. Furthermore, it has been proposed that supply chain and organisational demands must be integrated together in a similar manner to the product and systems that they provide [7]. Therefore, the effective deployment of a servitisation strategy encompasses and integrates many organisational functions and actors. This makes it an altogether more complicated proposition than simply developing an integrated supply chain strategy, due to the need to support the product over a period with the downstream supply chain delivering a range of products (e.g. spares, upgrades) and services (e.g. training, maintenance).

The main issues in researching servitised supply chains are the differences between product and service supply chains. The whole services supply chain processes can be broken down into:

- Information Flow
- Capacity and Skills Management
- Demand Management
- Customer Relationship Management
- Supplier Relationship Management
- Service Delivery Management
- Cash Flow Management

While the whole productions supply chain management can be broken down as:

- Strategic planning
- Demand planning
- Supply planning
- Procurement management
- Manufacturing management
- Warehousing management
- Order fulfilment management
- Transportation management

The main difference between product and service supply chain is their structure and activities. The product supply chain is more focused on manufacturing products and related field, while the service supply chain is more based on considering the customer’s need and related fields.

5. Conclusion

Servitisation is not the main solution for problems in UK manufactures. It is a concept of significant potential value, which provides some routes to help companies for outranking their value chain. This message is supported by the successes of companies such as Rolls-Royce with its “Total Care” package. Despite of success of Total care package, Rolls-Royce is no longer offering this due to improvements in servitisation and is offering a new package which is called “power by hours” [26].

The concepts discussed are not universally applicable. While it is difficult to imagine that any manufacturer can succeed without offering some services, to be effective and efficient for the manufacturers in delivering the services concept, there are some main challenges and issues to be faced. For instance, to be able to understand how their customers will value their services, the product-service provider will need to be able to configure their products, technologies, operations, and supply chain to support this value offering.

The key findings of this paper are:

- Positioning spare part contracts in servitisation: different types of spare parts contracts have been described and also positioned them the in servitisation process.
- Successful industrial examples of support contracts: various successful examples of servitisation have been identified in different literatures. Each example has been used as a case study in different papers. Also it must be considered that each presented industrial examples in this paper are from different type of servitisation process.
- Different asset value proposition of spare part contracts have been presented in this paper. Each value proposition has been broken down and explained based on findings through literatures.

Studying supply chain of spare part contracts can lead to a better understanding of demands and outcomes of this type of support contract. Future work could involve studying the responsibilities for each contributor in spare part contracts in different sections of a supply chain, and also studying financial efficiency of this type of support contracts.

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References

- [1] S. Vandermerwe and J. Rada, "Servitization of business: Adding value by adding services," *Eur. Manag. J.*, vol. 6, no. 4, pp. 314–324, Dec. 1988.
- [2] H. Lightfoot, T. Baines, and P. Smart, "The servitization of manufacturing," *Int. J. Oper. Prod. Manag.*, vol. 33, no. 11/12, pp. 1408–1434, 2014.
- [3] P. Hewitt, "The government's manufacturing strategy," Westminster, 2002.
- [4] A. White, M. Stoughton, and L. Feng, "Servicizing : The Quiet Transition to Extended Product Responsibility," 1999.
- [5] J. F. Vandermerwe, Sandra Matthews, William H. Rada, "European Manufacturers Shape Up for Services," *J. Bus. Strategy*, vol. 10, no. 6, pp. 42–46, 1999.
- [6] T. Robinson, C. M. Clarke-Hill, and R. Clarkson, "Differentiation through Service: A Perspective from the Commodity Chemicals Sector," *Serv. Ind. J.*, vol. 22, no. 3, pp. 149–166, 2002.
- [7] N. Lewis, M. Portioli-Staudacher, A. Slack, "Beyond products and services: opportunities and threats in servitization," in *IMS Intl*, 2004.
- [8] A. Graves and Y. Ward, "Through-life management: the provision of total customer solutions in the aerospace industry," Bath, 2005.
- [9] G. Ren and M. Gregory, "Servitization in manufacturing companies," in *16th Frontiers in Service Conferenc*, 2007.
- [10] S. Desmet, R. Van Dierdonck, B. Van Looy, and P. Gemmel, "Servitization: or why services management is relevant for manufacturing environments," *Serv. Manag. - An Integr. Approach*, no. 3, pp. 430–442, 2013.
- [11] P. Wise, Richard Baumgartner, "Go Downstream: The New Profit Imperative in Manufacturing," *Harv. Bus. Rev.*, vol. 77, no. 5, pp. 133–141, 1999.
- [12] H. Gebauer and T. Friedli, "Behavioral implications of the transition process from products to services," *J. Bus. Ind. Mark.*, vol. 20, no. 2, pp. 70–78, 2005.
- [13] H. Gebauer, T. Friedli, and E. Fleisch, "Success factors for achieving high service revenues in manufacturing companies," *Benchmarking An Int. J.*, vol. 13, no. 3, pp. 374–386, 2006.
- [14] L. Smith, R. Maull, and I. C. L. Ng, "Servitization and operations management: a service dominant-logic approach," *Int. J. Oper. Prod. Manag.*, vol. 34, no. 2, pp. 242–269, 2014.
- [15] T. S. Baines, H. W. Lightfoot, O. Benedettini, and J. M. Kay, "The servitization of manufacturing," *J. Manuf. Technol. Manag.*, vol. 20, no. 5, pp. 547–567, 2009.
- [16] H. Gebauer and E. Fleisch, "An investigation of the relationship between behavioral processes, motivation, investments in the service business and service revenue," *Ind. Mark. Manag.*, vol. 36, no. 3, pp. 337–348, Apr. 2007.
- [17] V. Mathieu, "Product services: from a service supporting the product to a service supporting the client," *J. Bus. Ind. Mark.*, vol. 16, no. 1, pp. 39–61, 2001.
- [18] R. Oliva and R. Kallenberg, "Managing the transition from products to services," *Int. J. Serv. Ind. Manag.*, vol. 14, no. 2, pp. 160–172, 2005.
- [19] M. Sawhney, S. Balasubramanian, and V. Krishnan, "Creating Growth through Services.pdf," *MIT Sloan Management Review*, vol. 45, no. 2, pp. 34–44, 2003.
- [20] N. Slack, "Operations strategy: will it ever realize its potential?," *Gestão & Produção*, vol. 12, no. 3, pp. 323–332, 2005.
- [21] D. Miller, Q. Hope, R. Eisenstat, N. Foote, and J. Galbraith, "The problem of solutions: Balancing clients and capabilities," *Bus. Horiz.*, vol. 45, no. 2, pp. 3–12, Mar. 2002.
- [22] I. V. Kastalli and B. Van Looy, "Servitization: Disentangling the impact of service business model innovation on manufacturing firm performance," *J. Oper. Manag.*, vol. 31, no. 4, pp. 169–180, May 2013.
- [23] K. Coyne, "Beyond service fads – meaningful strategies for the real world," *Sloan Manag.*, vol. 30, no. 4, pp. 69–77, 1989.
- [24] A. Neely, "The Servitization of Manufacturing: an Analysis of Global Trends," in *14th European Operations Management Association Conference, Ankara, Turkey.*, 2007, pp. 1–10.
- [25] H. Meier, R. Roy, and G. Seliger, "Industrial Product-Service Systems—IPS2," *CIRP Ann. - Manuf. Technol.*, vol. 59, no. 2, pp. 607–627, Jan. 2010.
- [26] I. Ng, G. Parry, P. J. Wild, D. McFarlane, and P. Tasker, *Complex Engineering Service Systems*. London: Springer, 2011.
- [27] MOD, "CONTRACTOR LOGISTIC SUPPORT," *Def. Logist. Support Chain Man.*, vol. 3, 2007.
- [28] MOD, "CONTRACTING FOR AVAILABILITY (From a Reliability and Maintainability Perspective) Leaflet NO5," *Appl. R&M Man. Def. Syst.*, vol. 1.