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Many industrial Virtual Organisations (VOs) operate in manufacturing industry. Their business focus has been on investment product deliveries to industrial customers. Now the needs of their customers are changing. Besides a single delivery, their customers are increasingly interested in the lifecycle services related to their investments. It seems that in many cases, the ability to commit to the lifecycle services is becoming a prerequisite for getting the contract for the investment product delivery. This sets challenges for companies, who make these deliveries as VOs. A VO is a temporary collaboration for a specific task, but lifecycle services require long term commitment. This paper discusses and analyses the ongoing business focus shift from transaction and delivery centric towards lifecycle business centric in the context of industrial manufacturing VOs. The paper identifies challenges that this shift in focus set for VOs. It also analyses some prevailing approaches for VOs to provide lifecycle services. Still, many questions remain open, and thus this paper can be seen as setting some questions for the future research in the area of VOs and industrial lifecycle service business.

1. INTRODUCTION

Companies in manufacturing industry are facing hardening competition in their traditional line of business because the physical products that they manufacture have become commodities. The customers of the commodities are price sensitive and commodities can typically be produced effectively by challengers from the low labor cost countries. Simultaneously, the customers are starting to look at the lifecycle costs of their investments and the cost of a single transaction is in many cases becoming less important. In practice, this means that instead of a one-off delivery only, the customers are interested also in the services related to the delivery and to the operation (and also other lifecycle phases) of the investment [2] [10]. Previously, the lifecycle services were managed by the operator, but for the time being, operators do not necessarily consider e.g. maintenance as their core competence anymore. Especially this applies to capital-intensive, long lifetime investments, like plants or systems in these plants. The need for lifecycle services opens up new business opportunities [5] because services are often knowledge intensive and hard to copy. Thus, the lifecycle services may be considered as one way to respond to the price competition from low labor cost countries.

Large investments in industry have typically been one-off projects, which however contain several systems and machines that are produced by some subcontractor networks repetitively. Virtual Organisations (VOs) are considered as one way to organize in this kind of business effectively. The VOs are dynamic (can

be re-configured within one order), configured for a specific order, existing for the duration of one order only, and adherent to a specific life-cycle [3]. The changing business environment, with the emerging needs for lifecycle services set, however, challenges for the VOs in manufacturing industry. These VOs typically deliver long lifetime capital investments (like plants) or large systems to these. How a VO that delivers an investment product can offer lifecycle services in a similar way as a large company that self takes care of e.g. design, manufacturing and installation tasks, and the respective services during the different lifecycle phases of the investment? Regarding studies on services, which support products or their use, Mathieu [13] points out that the empirical studies on advanced product services are not too common and they take the customer rather than supplier viewpoint.

2. OBJECTIVES AND SCOPE

The main objective of this paper is to identify and analyze the challenges of business focus shift from manufacturing-oriented towards lifecycle service -oriented. The focus is on manufacturing industry VOs (supplier viewpoint) that have traditionally produced one-off investment products for their customers, but now their customers are indicating that they would like to purchase lifecycle services besides the investment. This paper also presents some potential ways how to respond to the challenge, but mainly it brings questions into discussion and for future research.

3. BUSINESS FOCUS SHIFT

3.1 Traditional business focus of manufacturing industry VOs

On the general level, it is defined that the added value that a VO produces is not restricted to physical products. For instance, an often used definition of VOs by Kürümlüoğlu et al. [12] is as follows: “VO is a temporary consortium of partners from different organizations established to fulfill a *value adding task*, for example a *product* or *service* to a customer.” This definition however, implies that the value add comes from a single product or service (“a product or service..”). It must be noticed that the definition does not explicitly restrict to a single product or service only, but it is just the impression that the reader of the definition easily gets. Regarding the existing VOs in manufacturing industry this seems to hold also true in practice. As these VOs themselves put it often, they do “joint delivery projects”, which often are single endeavors to fulfill customer’s quite exact need – either a physical product or a service. The services may relate to a physical product delivery, e.g. process consultation, engineering, installation & startup, training services or they may be so called after-sales services, e.g. spare parts, repair, or upgrade projects [7]. The point is that the prevailing *modus operandi* is to consider these as single tasks. After the delivery (of the physical product or service), the VO has come to its dissolution, and the companies have moved to subsequent VOs (or to the VBE where they wait for the next VO and develop their preparedness).

Some of the subsequent VOs may have concerned upgrading or reparation of the investment (physical product) that they had previously delivered. Still, even in this case the starting point among the VOs in manufacturing industry has been that the

customer (or the operator of the investment) has separately ordered the upgrade and reparation work for which the VO is created again. This kind of modus operandi seems in practice to fit e.g. Verkko A network, which was studied in Ecolead as one practical example of the existing VBEs in the manufacturing industry. The left end of the figure 1 represents the prevailing modus operandi: parts & machine, and maintenance suppliers.

In the figure, it can be seen that the current VOs concentrate on dealing with the customer purchasing process. They have limited understanding of customer’s operational processes or business. As a consequence from dealing with the purchasing, the deal is often price-sensitive: The customer purchasing wants to buy the cheapest deal. The deal is often a single (project) transaction of a product or a single service, like repair, maintenance task or calibration. After the delivery, the business relationship ends. For the next delivery (either a new product delivery or delivery of service to the previous product) the VO is created again and in many cases the price continues to play a central role when the customer selects who will do the work.

	Part & Machine supplier	Maintenance supplier	Maintenance partner	Performance partner	Value partner
Supplier competencies	Customer's Purchasing	Customer's Operations		Customer's Process	Customer's Business
Content of exchange	Parts, machinery	Single service modules	Service (module) bundles	Tailored services	
Relations towards customer	Distant/ transaction based			Intimate/ joint processes	
Length of relations	Short/ one-off			Long & continuous	
Competitive position	Performance competition (more price sensitive)			Knowledge competition (more solution oriented)	

➔ Risk sharing increases

Figure 1 – Business focus shift from delivery - oriented supplier to lifecycle service - oriented partner. (The figure is based on Kalliokoski et al. [7], Parrinello [15] and Docters [6]).

3.2 Lifecycle service -oriented business focus and its drivers

The trend in industry has been concentrating in core competencies. The same applies to many investment owners and operators who want to do less work with maintenance because they do not consider it as their core business. The systems have also become so complex that even the operators may not have the know-how that is required to maintain the systems properly.

The traditional approach has been buying services as one-off deals, which also fits in the above described traditional business focus of manufacturing industry VOs. The problem, however, is that the single one-off deliveries do not encourage the suppliers to develop solutions that would holistically support the customer. Rather, the one-off deals have led to sub-optimums, where the ordered single service (e.g. maintenance task) is carried out efficiently, but as a whole there could be better and more efficient ways to plan and carry out the services (e.g. the maintenance as whole). The operators and owners are also becoming more and more interested in sharing the risks related to e.g. availability and usability of the investment. This takes the focus of service from supplied product towards maximising customer’s all

the different processes, actions and strategies that are associated with the supplier's product, as discussed by Mathieu [13].

Therefore, the customers have started to demand lifecycle services and related partnership, which are illustrated on the right half of the figure 1. Recently, the lifecycle costs have become even more important criteria for selecting some supplier than the price of the investment product alone. Thus, the investment product customers are increasingly demanding an offer for the whole lifecycle services already when buying the investment in the first place.

Offering lifecycle services sets new requirements to supplier competencies, content of the exchange, customer relations, supplier commitment and to the competitive position of the supplier. The fundamental difference compared to one-off product deliveries is the length of the commitment; after the delivery of the investment product, there are a lot of responsibilities left. All the lifecycle services, which need the same competencies as the delivery of the investment product need to be taken care of. The benefit for the supplier companies is that there is a secured income for the agreement period. After the period, the gained knowledge concerning customer's operative processes and business is of great value to the customer. So, it is probable that the customer is not willing to change service provider too easily. For a company (or a VO) that delivers investment products (like automation systems) there may be several customers who wish to buy lifecycle services alongside the physical product. Thus, there are several customers, towards which the supplier has to commit and with whom one has to develop joint processes. This needs to be taken into account when developing service business: the economics of scale do not follow the same logic as with products. So, on the other hand the supplier gets committed customers, but on the other hand the economics of scale in services may be difficult to gain over these customers.

Shifting the business focus from transaction based investment product deliveries towards lifecycle services may also change the entire earning logic of the supplier. Whereas the supplier previously earned mainly from the delivery of the investment product, in future, a great deal of the income may actually come from the lifecycle services related to the delivered investment. Well known examples of this kind of shift in earning logic are two Finnish companies, Wärtsilä and Kone. Wärtsilä produces diesel engines and related power plant and ship engine room solutions. Kone produces elevators and electric stairways. For both of these companies services play a major role. Wärtsilä's total sales in 2004 were 2 473 million € of which services comprised approximately 38% (936 million €) [16]. The share of services for Kone in 2005 was even higher, 60% of the total pro forma sales [11]. Mainly these services were lifecycle services (i.e. services that are provided after the delivery).

The transition from an investment product supplier to a lifecycle service partner is, however, not easy even for large companies. For instance, Metso corporation (paper machines, control systems etc.) tried with a service concept called "Future Care", which however needed to be refocused (see: [14]). The original Future Care was not fully accepted by the customers in the way it was planned in the beginning. After the refocusing, Metso has recently reported good success for its service business.

The transition towards lifecycle service business is even more challenging for companies that deliver investment products as VOs, because of the *temporally*

restricted nature of these VOs. How can these companies commit to the long time collaboration with a customer who wishes to buy knowledge intensive services from the deliverer (a consortium of companies in the case of VO) of the investment product? It must be noted that these services are not only large maintenance projects, but also smaller tasks. Figure 2 illustrates this change of business focus. “One-off” deliveries represent the traditional transaction or single delivery -oriented business focus. The “Lifecycle service (&commitment)” represent the lifecycle service -oriented business focus. In the “one-off” deliveries each service in the middle-of-life -section is a single transaction. In the “lifecycle service (&commitment)” the services during the delivery and the middle-of-life (and even during the end-of-life) are lifecycle services, to which it is often necessary to commit already during the delivery of the physical investment project.

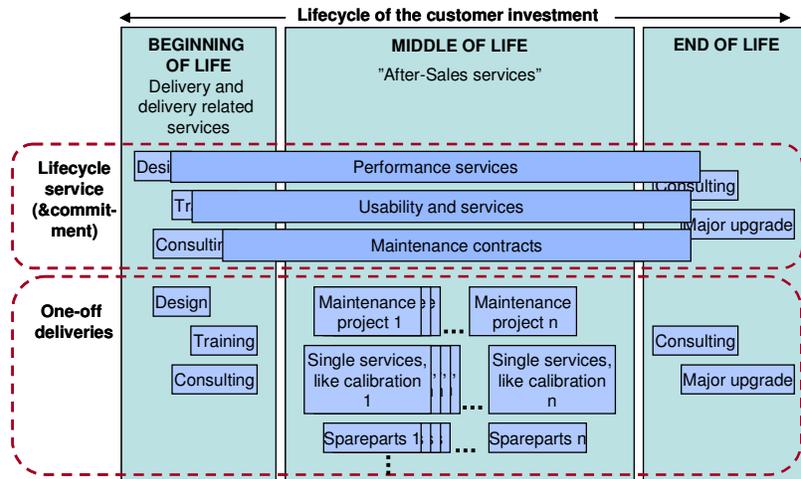


Figure 2 – Value to a customer regarding a single solution – from separate value adding transactions to lifecycle services. Modified by VTT from a summary of BestServ Industrial Service Business Forum discussions [1].

3.3 Challenges for VOs when business focus shifts towards lifecycle services

This chapter summarizes the challenges that the described business focus shift causes. The focus is on challenges that especially VOs will face due to their nature. Our overall focus of this study must also be kept in mind. We concentrate on manufacturing industry VOs that produce investment products and whose customers are now saying that the ability to provide lifecycle services is one central precondition for getting the deal at all. Table 3.1 summarizes the challenges that the business focus shift causes for these kind of VOs. The issues to the table 3.1 came from the figure 1.

Table 3.1 Summary of business focus shift needs and challenges for VOs.

Issue	What is emphasized in lifecycle service business?	Challenge for service supplier (network/VO)
Supplier competencies	<p>Supplier needs to understand <i>customer processes and business</i>.</p> <p>Understanding of <i>customer business environment</i> is needed.</p> <p>Ability to <i>collaborate on daily basis in service delivery</i> is essential.</p>	<p>Long term customer relationships needed, because understanding of customer processes and business is challenging, and expensive and time consuming to gain:</p> <ul style="list-style-type: none"> - The organization that coordinates the lifecycle service business must not change too often. - The companies that deliver the services on site must not change too often. <p>⇒ Solely inheritance from previous VOs is not enough to enable delivery of subsequent lifecycle services, <i>but it is probable that mainly the same companies must participate and commit to the service deliveries for a longer time.</i></p> <p>Customer needs to trust on the supplier and that the supplier is not going to enter customer's core business, and thus is not a threat → <i>strategic (management) level collaboration between supplier (coordinator) and customer is needed besides the operative level.</i></p>
Content of exchange	<p><i>Service bundles and tailored services: value-shop approach for configuring the service.</i></p>	<p>There is a need to manage several areas of expertise → there is a need to involve specialists from different companies (like during the delivery of an investment) → <i>one company can not deliver all the lifecycle services alone or take the responsibility of them alone. Already when the lifecycle service is sold to the customer, there must be an agreement among the required companies that they will commit to the delivering of the services.</i></p>
Commitment	<p>Relations towards customer</p> <p><i>Intimate, necessitates trust and collaborative approach (even development of joint processes).</i></p> <p>Partners locating near or at the customer site are often needed for lifecycle services.</p>	<p><i>Companies that deliver the service may not change too often because seamless collaboration necessitates joint development work through which the trust evolves. This restricts, which companies can be involved in service deliveries.</i></p> <p><i>Coordination need towards the customer and between the companies that participate lifecycle service business increase.</i></p>
	<p>Length of relations</p> <p><i>Long and continuous. Necessitates commitment (ability to commit).</i></p>	<p>Readiness to commit to a long time business relationship. This requires models and solutions for pricing, delivery practices, and the risks related to the length of the relationship. <i>The total lifecycle service can not be delivered as several subsequent VOs with no connection between them and with (partly) different companies every time.</i></p>
Competitive position	<p><i>Knowledge about the customer and solutions, which add value to the customer are important (price may be less so)</i></p>	<p><i>Long term income if knowledge of customer and customer needs and solutions are kept on higher level than the competitors are able to do. The competitors are clearly in more weak position, because their relations to the customer are more distant and therefore they may not be able to develop the same knowledge.</i></p> <p>Knowledge intensiveness may even change the earning logic: instead of single one-off deliveries, the income comes from lifecycle service agreements and the income is known quite a long time in advance. This is because it is easy to find a new supplier to a commodity, but more difficult to find a new supplier to a task, which requires in depth and wide knowledge of customer operations and business.</p>
Risk sharing	<p><i>Shared risk with customer concerning the investment.</i></p>	<p><i>Sharing risk among the companies that offer the total lifecycle service. Long term risk sharing between companies.</i></p>

4. POTENTIAL WAYS FOR RISING TO THE CHALLENGE AND QUESTIONS FOR FUTURE RESEARCH

The problem related to service business around capital goods is already addressed by some studies, but the viewpoint has much been from customer viewpoint [13]. The supplier viewpoint seems to be less paid attention to, though some examples exist even in the field of VOs. For instance, in Karvonen et al. [9] there is a chapter dedicated to sales and services issues. However, in the VO context the challenge related to service business is often addressed from technological solution viewpoint or from the viewpoint that there is a problem that needs to be solved fast and a VO is created for that problem. These all are still very relevant, but they consider that the single (service) delivery - oriented VOs are solutions to this: the business and solution still comes from a single delivery. For instance, this can be seen in Kauer et al. [10], where the starting point for a VO creation is a complete problem description and a task list, and the VO ends on documented customer order (service report and invoice).

However, our approach concentrates more on taking the responsibility of some operations that the customer does not perceive as their core business. I.e. in our understanding the challenge related to the lifecycle service business is not the efficient creation of VOs to solve some well defined single problems. Rather the challenge is the long term commitment to whatever the customer finds valuable: the maintenance as a whole, the performance of the investment, or the availability of the investment. Further, in the business that we described as lifecycle service centric, also the earning logic changes. Whereas previously the income was transaction based, in the lifecycle service business it is based on long term agreements. Single transactions are not that valuable to the customer as the entities (lifecycle services) that are provided. Simultaneously, in the lifecycle service focused business the organizations that provide the services must commit to the long term collaboration with the customer - they can not be "freely" selected VO per VO (see table 3.1).

To achieve the commitment, the lifecycle service business necessitates creation of a specific Service Network or Breeding Environment. Its rules and practices may be somewhat different from those of Manufacturing Networks. On the other hand, in many cases the Service network and the Manufacturing network are overlapping: they have partly the same partners. [8] Also, the different lifecycle service tasks require different preparedness from the Breeding Environment: Preventive maintenance tasks may be foreseen and planned beforehand, but repair tasks come unexpectedly and require fast reaction time. In both cases one alternative is to view them as Service Virtual Organizations which are not dissolved after the task but only switch to a stand-by state, from where they can again be evoked when needed – the commitment differs in this *modus operandi* from the prevailing one.

One way to accumulate experiences over single VOs (and thus create long span view to business) is so called *inheritance*. Inheritance is considered to be systematically collected information of VO operational phase. This information is gathered during the VO lifecycle and it is used to facilitate the utilization of experiences and knowledge related to the object of the collaboration and to the collaboration practices, processes and partner combinations. The inheritance management is a way to record and learn systematically from experiences. Proper inheritance management includes e.g. following: Saving the VO experiences in

utilizable format; sharing the experiences among partners; taking care that the experiences are utilizable in the next VO initialization, planning and execution; communicating the experiences towards the VBE in utilizable format in order to enable the use of experiences in the next VO. [4]

The previous research with its solutions together with a proper inheritance management seems to clearly support the lifecycle service-oriented business of collaborative organizations. Still many challenges, which relate to the different nature of the lifecycle service business, remain unsolved:

- How to be able to commit and offer the lifecycle services, which require risk sharing, already when preparing an offer for an investment product delivery? This commitment means in practice commitment to future service VOs with pre-agreed price and other principles. This involves the coordinating company (or organization) as well as the companies that actually deliver the services.
- What kind of organizing the lifecycle service business necessitates from the networked organizations:
 - What kind of role and responsibility can the VBE bear?
 - What kind of responsibilities and roles require that there is a single company (a single legal entity) that bears the responsibility?
 - What this coordinating company (or other form of organization) must require from those companies that commit to the actual future service deliveries?
 - How to define the responsibilities between the VBE and the customer and how to integrate to the customer processes?
 - How to serve different customers which potentially have different service needs? How to make one VBE able to take care of different customers?
- Modus operandi and business issues:
 - How the modus operandi of the lifecycle service -oriented VOs truly differs from the modus operandi of the delivery -oriented VOs?
 - What are the consequences to the VO business concept if the earnings come from long term commitment rather than from timely limited deliveries?

5. CONCLUSIONS

5.1 The lifecycle service business sets challenges for manufacturing industry VOs

The customer needs of manufacturing VOs are changing. Customers are increasingly interested in solutions, i.e. delivery of an investment product and the related services both during the delivery and during the operation of the investment. The deliverer of the investment (e.g. a VO) must already during the delivery be able to offer also lifecycle services and commit to them too. This sets challenges for the companies that collaborate as VOs when they focus their business on lifecycle services.

These companies need to develop their own competencies so that they match the customer processes and business environment. They also need to be able support the

customer, and to do this, collaborate with other supplier companies, also in cases that are not explicitly specified in the service contract. All these activities and competencies necessitate readiness for long term commitment towards the customer and towards the other service suppliers, because developing these skills is costly and time spending. Risk sharing towards the customer is often related to the lifecycle services. Therefore, also the supplier companies need to have some capabilities to bear and share long term risks related to the lifecycle services that are not as rigorously defined as the work these companies are used to deal with – the one-off deliveries.

The lifecycle service business also opens up new opportunities. It often provides an opportunity for a longer term cash flow, which is also more predictable in advance. In lifecycle services also the competition is often knowledge centric and the price does not play that an important role. Gaining knowledge concerning the customer, customer's processes and solutions gives a competitive edge to the prevailing service provider(s). This competitive edge is hard to break.

The existing research has already addressed the challenge related to Virtual Organisations in service business. However, it seems that still more research work is needed. This is because the existing research has mainly concentrated on IT solutions and single services that need to be delivered. The lifecycle service – oriented business, however, necessitates longer term commitment and related long term risk sharing. As such, the VBE-VO concept seems to fit for the lifecycle service business too, because it enables combining knowledge of different companies in order to produce complex lifecycle services, which none of the companies could produce alone. Large enterprises in manufacturing industry can already show some success stories related to the lifecycle service business, but the VOs will still have to improve in order to be able to say that the lifecycle service business is good business for them.

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