ETLA Working Papers

No. 34

15 February 2016

Esa Viitamo
Seppo Luoto
Timo Seppälä

Network Positioning through Manufacturing Services

Lessons from the Contract Manufacturing Industry

Suggested citation: Viitamo, Esa, Luoto, Seppo & Seppälä, Timo (15.2.2016). "Network Positioning through Manufacturing Services – Lessons from the Contract Manufacturing Industry".
ETLA Working Papers No 34. http://pub.etla.fi/ETLA-Working-Papers-34.pdf

ETLA ELINKEINOELÄMÄN TUTKIMUSLAITOS
THE RESEARCH INSTITUTE OF THE FINNISH ECONOMY

ISSN-L 2323–2420
ISSN 2323–2420 (print)
ISSN 2323–2439 (online)

Network Positioning through Manufacturing Services – Lessons from the Contract Manufacturing Industry

Esa Viitamo
Aalto University

Seppo Luoto
University of Wasa

Timo Seppälä
The Research Institute of the Finnish Economy, and Aalto University

Key words: contract manufacturing, competence, servitization, value networks, outsourcing

Abstract

Through early adoption of new production technologies and service-based rivalry on the outsourcing customers, contract manufacturers integrate and enhance the efficiency of global supply networks. These influences evolve differently, however, depending on the network strategies and the competences of the contract manufacturing firms. Based on the recent findings in contract manufacturing this paper challenges and supplement the mainstream of servitization literature. In our focus the essence of servitization is not the shift to, or the specific requirements of running service business. We conclude that servitization appears more as an outcome when the firm aims for higher profitability through repositioning downstream in the industry value networks. Successful positioning and servitization is contingent on the customers' outsourcing strategies and the accumulated competences of the contract manufacturer. While services seems to be a prerequisite for the firms' survival in contract manufacturing business, their main purpose is to enhance customer value and retention rate in the long run. Our findings suggest that the way out of the 'servitization trap' is a shift towards Original Design and Manufacturing concept where differentiated value adding modules can be integrated into replicable solutions for various customers and market segments.

Acknowledgements

This study is part of FIMECC Rebus research program that advances relational business practices and R&D collaboration. Timo Seppälä has received support for his work from iPlate research project that considers integrating platform competences toward network effects. The study is funded by Tekes, the Finnish Funding Agency for Technology and Innovation. We like to thank our industry partners of Scanfil, Petteri Jokitalo and Tommi Kangas for their support and valuable comments.

Contents

1 Introduction

According to academic research and managerial reports, manufacturing companies are increasingly shifting their strategic focus from offering mere products to develop services and integrated solutions, product-service –combinations or systems for their customers (Baines et al., 2009; Cook et al., 2006; Neely 2008). This paradigmatic change has been widely connected to the term 'servitization' initiated by Vandermere and Rada (1988). By this companies aim to get competitive advantages in the global products markets (Wise & Baumgartner 1999) increasing product sales, lengthening customer relationships with life cycle approach, creating growth, balancing the effects of economic cycles and responding to changes in customer demand in the end products markets (Quinn et al., 1990; Brax 2005).

Owing to the stated benefits of service development academic scholars have also put relatively much attention on the topic. Servitization studies include various change–related terms such as 'move towards service orientation' (Martin & Horne 1992), 'moving downstream' (Wise & Baumgartner 1999), 'transition from products to services' (Oliva & Kallenberg 2003), 'a trend towards integrated solutions' (Johnstone et al. 2009) or 'a shift from selling product to selling Product-Service Systems' (Baines et al. 2009). The change here refers mainly to manufacturer's internal change whereby the organization enables its product-service offerings (Martinez et al. 2010). But the concept of change includes also aspects of organizational structures, delivery channels, and marketing efforts and general business models e.g. contract manufacturing (CM) (Quinn et al. 1990; Turunen, 2013).

A *stylized fact* is however, that the operative costs of newly introduced services are often difficult to cover by selling prices. Some scholars have pointed out that servitization may even cause negative consequences for the firm value (Fang 2008) and margins (Neely, 2008). On aggregate, the mixed evidence of its evolutionary character and profitability may foster *servitization trap*[1] that hampers viable business development[2] and innovation. As a response, many scholars have pointed out that industrial companies need to 'exploit the existing business of goods and services concurrently' (Windahl & Lakemond 2010) and emphasize the importance of traditional product and technological excellence (Salonen, 2011). This line of thinking is associated with the ongoing trend to digital platforms as well (Ailisto, Mantylä & Seppälä, 2015). In a similar vein, we assert that service development is viable when it is subject to broader strategy and allows product-service concurrencies and product-based technological excellence to evolve from the firm's accumulated competences.

[1] Previously scholars have argued on behalf of servitization talking about 'commodity trap' (Mathieu, 2001; Ulaga & Reinartz, 2011). Here we turn the discussion into respective the possibility of 'servitization trap'.

[2] As such the notion of 'service paradox' is being coined (Gebrauer et al. 2005), depicting an absence of expected benefits when diversifying into service activities. While several authors are suggesting a lack of managerial attention and skills to manage effectively service activities to explain this phenomenon, the nature of the underlying service business model might be playing a crucial part as well. To the extent that services become more independent, experiencing economies of scope might become more difficult. On the other hand, service paradox may be alleviated by the ongoing digitalization that via higher productivity and service reconfiguration works for enhanced profitability.

Using contract manufacturing (CM) as an empirical case we argue that any product-service solutions that a manufacturing firm is delivering on competitive basis, mirrors its goals on value creation and capture, positioning in the value networks, and the pool of assets and competences available to the firm. Hence, the competence-positioning approach to product-service development links the service development to the resource-based and the Porterian views of the origins of competitive advantage (Porter, 1985)[3]. For the demonstration of our argument, the paper is constructed as follows. Chapter 2 outlines briefly the empirical case and methodology, whereas the key characteristics of the contract manufacturing industry are presented in Chapter 3. Chapters 4 and 5 provide the key facts and historical milestones of the case companies to highlight the different development paths chosen by the firms. To illustrate the chain of logic and the role of services in the CM strategy, a more detailed analysis of the company differences is conducted in Chapter 6. The findings and their implications are discussed in Chapter 7.

2 Empirical case and method

Our methodological frame is a comparative case study (Yin, 2014), where the choice of CM draws on specific industry characteristics. The growth of services and other business activities in CM is principally driven by outsourcing of production and the related activities by the customer, or OEMs (Original Equipment Manufacturer). This implies that service development builds on existing customer demand and the creation of new services markets by the clients. The fact that the CM industry is manufacturing business without an own product fades away the distinction between manufacturing and services that are equally important in fulfilling the value proposition to the customers. This enables address the critical elements of servitization objectively and contribute to theory construction too (Eisenhardt, 1989). It is hypothesized that when a firm decides to include services and other intangibles in its offering on competitive basis it needs to have corresponding competences in technology and supporting human skills. In their absence, servitization is deemed to fail and the firm falls short of business credibility in the eyes of customers.

Our argumentation of the causalities in service development builds on primary and secondary data of the case industry. While most of the secondary data is sourced from the annual reports, industry outlooks and databases (e.g. Orbis database, 2016) the primary data is collected using participatory methodology and observations of two case companies. We highlight our argument with two electronic manufacturing services (EMS) companies that represent *polar cases* in the contract manufacturing industry. To enhance its networking and service competences, *Scanfil* with its academic partner Aalto University joined in a publicly funded research program in 2014. On the basis of action research methodology (Silverman, 2010) and a number of industry-academia workshops and interviews conducted in 2013-2015, a detailed view of Scanfil's business operations, and the development needs as well as the solutions thereof was created. In case of *Elcoteq* the primary data draws mainly on the personal experiences by the industry practitioner and one of our authors, Timo Seppälä, who worked as an account director (2002-

[3] See e.g. Wernerfelt (1984); Barney (1991); Teece et al. (1997); Porter (1985) and Porter (1998).

2007) of Nokia mobile phones in Elcoteq. In summary, the data collection and analysis combines theoretical, observational as well as experiential approaches.

3 Industry characteristics and trends

In the contract manufacturing (CM) industry the manufacturer contracts with the industry customer (OEM) for the delivery of specific components or products. In standard cases, this means *outsourcing*[4] of the manufacturing, and related activities by the OEM. The operational driver is to enhance ROCE (return on capital employed) by specialization and utilization of the economies of scale and scope in manufacturing, raw materials procurement and in pooling together resources. Outsourcing frees up customers' assets such as inventories of products and equipment. Moreover, the customers can focus on their core activities and respond to sudden variations in demand more quickly and efficiently.

Contract manufacturing is 'work without a product'**.** As CM firms do not produce own products, operations are more focused on quality management, cost control and customer orientation manifested in mass-customization. Manufacturing itself is usually organized as team-based services work (Lüthje, 2002**)**. The key strategic competence of a CM is the expertise of *manufacturability*. The utilization of economies of scale and scope implies a cost-based strategies, where the goal is to minimize the overall costs of production, capital and the coordination of supply chain activities. This necessitates flexible employment of labor and manufacturing assets, adoption of the latest production methods, low inventories with efficient supply chain management as well as optimized allocation of production and resources across the manufacturing sites. The importance of the latter requirement is fostered by off-shoring of the manufacturing activities by the multinational customers. The actual locations of CM plants are guided by the low labor costs, asset cost and logistical costs with respect to the key suppliers, customers and their markets and targeted markets.

By the industry slogan, contract manufacturing is *all about service business*. The dynamics in customers' business environment caused by the changes in the end products markets, the commoditization of technologies in different phases of the product life cycles as well as the lack of own manufacturing and service capacity, foster business innovations and repositioning in the value networks. In the conduct of CM business it is important to see the dependencies between customer's strategic goals, its operative actions in global offshoring and outsourcing, and CM's competencies. The ability to correctly anticipate and adapt to the industry trajectories on customer's side (McGahan, 2004) is influential on CMs' long-term success. CM is distinctively co-evolution with the customers; typically the customer is the master and the CM supplier is the servant (Seppälä, 2013a; 2013b).

[4] More generally, companies having strengths in other areas may contract out data processing, legal, manufacturing, marketing, payroll accounting, or other aspects of their businesses to concentrate on what they do best and thus reduce average unit cost. Outsourcing is often an integral part of downsizing or reengineering.
See http://www.businessdictionary.com/definition/outsourcing.html#ixzz3zTf5kwDA

In standard cases manufacturing and related services are contracted out in the life cycle phases where the value added as well as the selling price of the sub-system is lowest. Usually, the customer approaches CMs with a manufacturing or service asset, product or service design or any other object that it intends to procure or outsource. Often the customer discusses with several possible candidates and puts manufacturing contract out to a competitive tender. After the engagement of all various stakeholders the supplier for outsourced object is decided by the customer. When the object of the contract is a *new* product, the processes prior to the volume production include manufacturability assessments, prototyping rounds and ramp-up of the final product.

Customer strategies in CM may vary from a concentrated mode with few customers to a diffused mode involving several customers and customer industries. As in every business it is central to have a 'right composition' of profitable customerships that fit to the CM's overall business model. To build long-standing customer relations and loyalty CMs offer various type of value adding services that build on its core capability, the expertise of manufacturability and manufacturing services. Typical value adding activities include design services in conceptual product development and engineering as well as mechanical, electrical and software design assistance. Testing services include e.g. in-circuit, functional, environmental, agency compliance, and analytical laboratory testing.

An important dimension of CM strategy is the extent of *horizontal* (scope) and *vertical* (depth) integration into customer's operations. Horizontal strategy increases the responsibilities and the scope of the CM's offering with respect to the customer, in other words the number of subsystems outsourced. Extensive horizontal growth usually implies a *systems operation* (Prencipe et al., 2011) model where the production of the components of the insourced solutions are further contracted out by the CM (see Chapter 6). As horizontal strategy involves a higher commitment to customer-specific solutions it also sets limits to the number of viable market segments for the CM.

Vertical integration (backwards) instead, implies a narrower scope of the offering and narrower interface with respect to an individual customer. In vertical integration the main parts of the components are produced in-house. This enables production efficiency and specialization into standardized components and sub-systems that can be offered to several markets segments and OEMs. The differences in horizontal and vertical strategies reflect the key strategic choices of technologies and capabilities that are further manifested in the assets, products and services of a CM (see Chapter 6).

Generally, low-cost strategies – including vertical integration - is associated with limited opportunities for high profit margins and value added (Porter, 1980, 1985; McGahan, 2004). In a similar vein, it is difficult to extract high value-added from tangible products or standardized services (Maskell and Malmberg, 1999). However, starting from basic manufacturing centered mode there exists a continuum of value adding options available for a manufacturing firm (see e.g. Mudambi, 2008). This is highlighted by the U-shaped curve in Figure 1 depicting a firm's value chain activities. From the perspective of a manufacturing firm, value, differentiation as well as the opportunities for higher profitability can be enhanced by acquiring intangible

capabilities and moving either downstream (right) to activities including marketing, after-sales and brand management, or upstream activities (left) where value is enhanced through R&D, design and new product introductions (NPI).

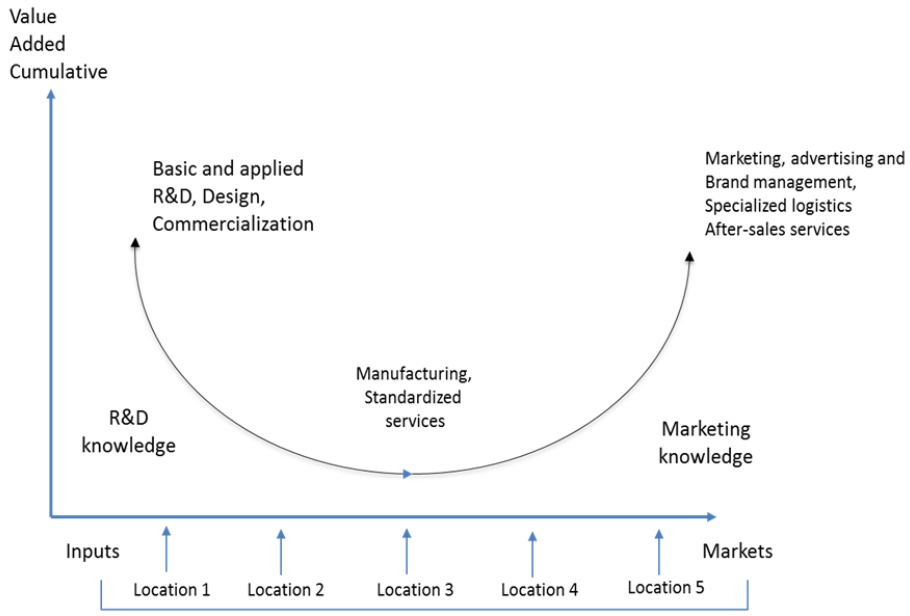

Figure 1. The 'smile curve' in value creation (Mudambi, 2008).

Since CMs do not have their own products, the upstream and downstream activities in Figure 1 are in standard cases auxiliary services offered to support OEM's NPI and the maintenance of the existing products. In the CM industry the standard value adding strategy is vertical integration and move upstream 'services' to (customer's) R&D, design and NPI. This also assumes the acquisition of respective technological knowledge and production technologies. While product development is primarily focused on the customer's offering, the upstream activities need to be adapted to the CM's own manufacturing processes. The value adding services in moving downstream are in turn related to the delivery of the subsystems, after-sales and maintenance.

In general, a shift to horizontal strategy that enhances CM' manufacturing responsibilities of customers' technological system enables (implies) a bigger leftward and rightward leap to the value adding services than vertical integration into generic technologies and components. In summary, horizontal and vertical strategies and the associated technology space define the competence profile of the CM and its position in the customer's supply chain. This in turn creates differing opportunities to introduce and commercialize value adding services by the CM.

4 Case Elcoteq

Founded as an electronics manufacturing services (EMS) company, *Elcoteq* (1984-2011) became to be known as one of the leading original design manufacturer (ODM[5]) in the communications technology field[6]. The company provided globally end-to-end solutions consisting of design, NPI, manufacturing, supply chain management and after-sales services for the whole lifecycle of its customers' products. In 2007 the company had operating revenue of 6 billion €, it operated on four continents in 15 countries and employed approximately 19 000 people. Since its foundation Elcoteq became strongly oriented to telecom industry.

Towards the end of the 1980s Ericsson and Nokia started looking for the expertise they needed outside their own companies and both decided to become customers of the microelectronics unit of Lohja Corporation, the precedent of Elcoteq. In 1991, the microelectronics unit, owned at that time by Metra Corporation, was sold to its executive management in MBO. This was the start of the company's history as an independent company.

The rapid growth of Elcoteq in the 1990s made it necessary to increase its management resources and obtain external financing. When market conditions were favorable, the company became listed on Helsinki Stock Exchange in November 1997. The years 1998-2000 saw the peak of rapid growth in the telecom industry. Elcoteq's goal was to get the lion's share of the booming growth in outsourcing, and international expansion was essential for achieving that goal. The funds from the share issue were used to establish an international network of manufacturing plants. Within a couple of years the company had increased its capacity many times over. In 1999, the network of plants covered more than ten countries in three key regions of economic growth: Europe, America and Asia. At the turn of the millennium the growth of the telecom sector declined fostering rivalry and excess capacity in the EMS business. With a radical cost cutting program Elcoteq built a modern and cost-competitive network of plants that employed the same consistent manufacturing methods. This strategy was unique and differs from the growth strategies pursued by most of rival EMS manufacturers.

The conclusion of the strategic revision in 2002 was that the 'considerable expertise and experience of the company' should not be wasted in the wireless communication *products*. Rather, the focus should on the services of those customers whose products were ideally suited to the company's *knowhow*. It was also made apparent that manufacturing, material services and logistics did not form a sufficiently broad service portfolio. Design, engineering and after-market services should also be added. The first steps towards increasing the design expertise were the establishment of NPI (New Product Introduction) centers. In 2002 Elcoteq acquired a mobile phone and telematics company Benefon's R&D team, which extended its services to engineering, R&D and software development. According to CM's management Elcoteq could then talk of

[5] An original design manufacturer (ODM) is a company which designs and manufactures a product which is specified and eventually branded by another firm for sale. Such companies allow the brand firm to produce (either as a supplement or solely) without having to engage in the organization or running of a factory (http://rockleighindustries.com/oem-odm-manufacturing.html).

[6] The main secondary data sources in this section are annual reports and the Orbis-database https://orbis.bvdinfo.com).

having a full (technology driven) service portfolio that laid the basis for business development towards ODM concept (see Figure2).

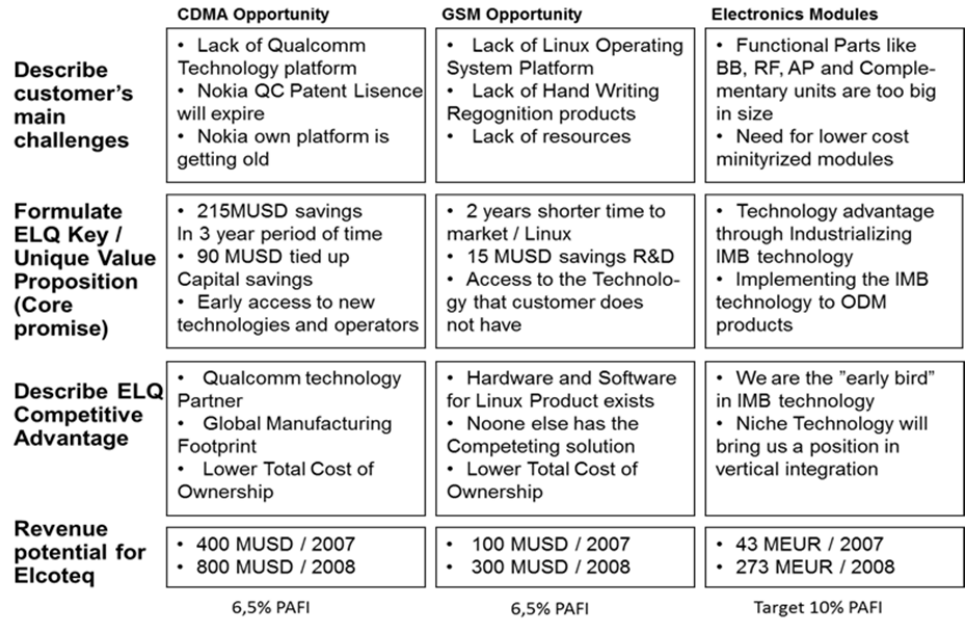

Figure 2. Customer's challenge and Elcoteq's value proposition illustrated (source: Elcoteq, 2006)

The business risks of concentrated customer strategy was recognized by the management already in the 1990s, and while attempts to expand into new customer segments in the industry electronics were made, the share of Nokia's mobile phones of the total revenues remained high. For the net profits it was close to 100%. Concentration was also fostered by the loss Ericsson's production to an Asian competitor of Elcoteq. Yet the company aimed to be the global leader in the mobile phone sector, which required constant increases in the manufacturing capacity. The business risks were enhanced by low profitability (relative to turnover) that remained close to zero in 1998-2010 (Orbis database, 2016). All these developments reflected Elcoteq's *high-risk-fast-growth strategy*.

The concentrated customer structure implied that the growth of business was increasingly reliant on Nokia's sales volumes and also the insourcing of R&D, manufacturing and related service activities from Nokia. This enabled develop the capabilities and knowledge base in the mobile phone technologies. Instead of integrating backwards to internalize the supply chain activities of the components and subsystems, which was the strategy e.g. of the main rivals in Asia, Elcoteq expanded its offering horizontally to the subsystems of the mobile phone technologies (Seppälä, 2013b). Elcoteq became an ODM and systems integrator that coordinated and mobilized a wide range of complementary manufacturing activities and capabilities in the supply chain (see Hobday et al., 2005).

Insourcing, systems integration and the capability development led to a new business trajectory where Elcoteq started to develop its own mobile phone products in parallel of being Nokia's

systems (ODM) supplier. Hence, the full-service and competence portfolio that was originally designed and offered to the key customers, was increasingly used for developing an own mobile phone concept and introducing it to mobile network operators. The plans to become an independent ODM (or OEM) were however, not realized early enough as Nokia switched to cheaper Asian suppliers. This led to eventual bankruptcy of Elcoteq in 2011.

5 Case Scanfil

Scanfil is an electronics manufacturing services (EMS) company having its headquarters at Sievi Finland[7]. The stated mission of the company is to 'help its customers to success by providing a reliable, effective way of making the product and organize the supply chain. Scanfil's customers include international operators in the automation, energy, data transmission and health technology sectors, among other industries, and companies operating in fields related to urbanization. Typical products manufactured by Scanfil include equipment systems for mobile and telecommunication networks, automation system modules, frequency converters, lift control systems, analysers, game and slot machines and meteorological instruments' (Annual Review, 2014). In 2014 the company had operating revenue of € 215 million, it operated in six countries and it employed 1782 people, of whom 1545 in the company's units outside Finland. The proportion of employees working in China was 43%[8].

Since its foundation in 1976 by Jorma J. Takanen, Scanfil focused on mechanical components for the electronics industries. After the first acquisitions in 1980 the company expanded to the production of electronics, which brought about higher credibility in providing contract manufacturing services. The 1990s was the era of strong expansion, as the turnover grew from EUR 5 million in 1991 to over EUR 220 million by 2001. The plant of Oulu was established in 1990 and in the mid-1990s Scanfil became a systems supplier for the telecommunication and electronics industry. As a response to the structural changes in the global CM industry and the main customer segments at the beginning of the 2000s, new kinds of strategic moves were initiated. In 2001 Scanfil started a rapid internationalization through acquisitions in the low cost countries; China, Hungary and Estonia. These decisions were boosted by the respective moves of the main Finnish industry customers earlier, and in 2004 the number of the personnel outside Finland exceeded the number of personnel in Finland.

A central enabler of the growth was the merger with another Finnish CM, Wecan Electronics in 2002. Wecan was an international contract electronics manufacturer that produced and sold telecommunications products and services to telecom systems suppliers, in particular to the manufacturers of wireless (mobile) communications network systems. Wecan had 190 employees in Finland, 200 employees in the Estonian manufacturing unit and 85 employees in

[7] The main data sources in this section are annual reports, company interviews and Orbis-database (https://orbis.bvdinfo.com).

[8] The overview of Scanfil's business history here extends to mid-2015. In fall 2015 Scanfil made an acquisition (Partnertech) which moved it closer to Elcoteq's operation model (see http://www.taloussanomat.fi/porssi/2015/05/25/scanfil-ostaa-ruotsalaisen-partnertechin/20156564/170).

the manufacturing unit located in China. In addition to enhanced vertical integration to the upstream activities the merger fostered expansion of the customer base and the supply network as well as the utilization of economies of scale in manufacturing and logistics. In first of October 2002 the new company Scanfil plc became listed at Helsinki Stock Exchange.

Figure 3. Milestones in Scanfil's business history (source: Scanfil, 2015).

Another important decision in the 2000s was to shift from a concentrated to a diffused customer strategy. While Elcoteq became heavily reliant on Nokia's mobile phone business in the 1990s, a similar relationship developed between Scanfil and Nokia's telecom networks division. Until the beginning of the 2000s the global growth of the network operation business ceased and caused marked decline in EMS' orders. Owing to its generic and narrower technological focus in the EMS business - as compared to Elcoteq, Scanfil was able to reduce Nokia-reliance and convert its services to more diffused markets segments. Successful transition was fostered by its global presence close to the key markets of the big Finnish and other international OEMs. Of the single customers KONE became one the most important and the unique features of that partnership have been used as benchmarks for the business model innovations at Scanfil[9].

In contrast to Elcoteq, whose production system was focused horizontally, Scanfil's production system is vertically integrated (cf. Chapter 3). The benefits can be highlighted by the top management's statement in the annual review 2014; 'vertically integrated production is at the core of our manufacturing operations. This means that most of the added value work in the product manufacturing chain is carried out *in-house* and is often centralized in one manufacturing location. The same plant can provide supply chain management, design and prototyping related to productisation, sheet metal mechanic components and electronics, such as assembled circuit and system boards, cable products and busbars, as well as the final assembly and testing of the product. We believe that this enables us to provide our customers with the best

[9] KONE-Scanfil partnership shows similar features as the co-evolution concept in Nokia-Elcoteq collaboration (see Chapter 6).

possible package based on competitive pricing, fast deliveries, flexibility and reliable operations'.

To reduce customer risk and the impacts of cyclical fluctuations Scanfil has actively expanded its customer base in the 2000s and 2010s to cover various industries. To meet the demands for global presence and short lead times, Scanfil invests constantly in its ability to control costs and supply products and services of right quality at right time, while managing risks in logistics chains that are becoming increasingly complex. As a medium sized company with more limited resources to utilize economies of scale than Elcoteq, Scanfil has pursued a cost-cutting approach that assumes a continuous adaptation to the demand fluctuations. This is manifested e.g. by flexible hire of labor force. Hence, in contrast to Elcoteq's fast growth -policy Scanfil has been following *low-risk-moderate-growth strategy*.

In line to the company's traditional business concept, Scanfil's in-house product development programs have not been a significant part of the company's cost structure and product development has been mainly conducted in collaboration with the key customers. The traditional focus in EMS operations is also reflected in the company's approach to services, which stresses vertical linkages of activities and the life cycle aspect in the delivery of components and sub-systems. To quote, 'the key element in Scanfil's operations is the provision of a comprehensive service package to the customers. Scanfil's services include sourcing and purchasing, planning of production processes and technologies, manufacture of prototype series, transfer to serial production, diversified and flexible production of electronics and mechanics, product testing as well as comprehensive logistics management' (Annual report, 2014).

6 Comparative analysis

6.1 The logic of CM business strategy

On the basis of the industry characterization and the descriptions of the case companies, this chapter discusses in more detail the distinctions between the two approaches to network positioning, and the conceptual linkages between value creation, capabilities and servitization. Moreover, the purpose is to highlight how the issue of servitization – as viewed in the academic literature (see Chapter 1) – is involved in the logic of CM's business strategy. Instead of being exogenously and disjointedly decided by the top management, servitization follows endogenously from the more fundamental decisions, starting from the company's risk-profitability preferences. The discussion of the company distinctions here builds more on Elcoteq's standpoint as the systems operation model with ODM concept represents an extension to the basic manufacturing model (EMS) applied by Scanfil.

The chain of logic in CM's business planning and the characteristic differences between the case companies thereof, are summarized in Table 1. The planning process starts with decisions regarding (1) growth, risks and expected profitability. Based on high risk tolerance and scale-intensive growth, Elcoteq's goal was to expand to (**2**) higher value adding business activities to enhance long-term profitability. This in turn assumed the acquisition of complementary, systems

related competences. From the value adding target and the competence requirement follow other attributes of the operating model, namely (**3**) the supply chain approach (systems integration in Elcoteq), customer orientation (concentrated in Elcoteq) and service orientation (full service portfolio in Elcoteq). All these attributes (1-3) influence the potential for (**4**) generating revenues and profits that in case of Elcoteq's was eventually not realized as expected. The actual business performance is influenced e.g. by the managerial skills and the extent to which the risks (insourcing, customer concentration etc.) are realized.

		Elcoteq	*Scanfil*
1	**Growth, risk preferences**	**High risk, scale-intensive**	**Low risk, cost control**
2	Value adding target	Expansion to high value added activities	Limited to low value added activities
2	Scope of competences	Systems-related	Manufacturing-related
3	Supply chain approach	Horizontal; systems integration	Vertical; component integration
3	Customer orientation	Concentrated (focused)	Diffused
3	Service orientation	ODM: full service portfolio	EMS: product-related services
4	Business performance	Low (in this case)	Moderate (in this case)

Table 1. The key causalities in business planning and the role of services in CM.

6.2 Value adding target

In pursuing the high value added goal Elcoteq expected its operating profit to rise. Furthermore, Elcoteq expected that its customers would rely more extensively on its product-service offerings. All main competitors in the 2000s were conducting traditional strategies focusing more on various low technology component manufacturing and assemblies i.e. lower added value activities. The value adding target, which is contingent on OEMs' willingness to outsource and the credibility of the CM's competences, involve specific congruencies in the business concepts and responsibilities as well. The business responsibility that is associated with higher value added business concepts implies better opportunities for entrepreneurial innovation and thus potential for higher profitability. The various business concepts and their implications for the value adding service offering are highlighted in Figure 4.

Basic *EMS concept* is based in print-to-build contract. Print-to-build is a process in which a manufacturer produces products, equipment, or components according to the customer's exact specifications[10]. It involves collaborative design for manufacturability and manufacturing of mechanics, electro-mechanics, and engines i.e. placing components with different type of surface mount technologies into ready-made printed circuit boards and further integrating mechanics and

[10] Typically an engineer provides drawings and the manufacturer is responsible for producing the part or piece of equipment to spec, using the correct materials. The design specifications often include performance and quality requirements. Print-to-build falls under the general category of contract manufacturing, and is occasionally referred to as build to suit (http://www.arcpacific.com/build-to-print).

electro-mechanics subassemblies to it, and running testing for different type of manufacturing failures. *cDesign* (collaborative design) *concept* involves hiring of specific engineering resources and competencies of CM to the customers' research and development programs. In cDesign CM is only responsible for delivering technical competences (employees) under full customer's supervision.

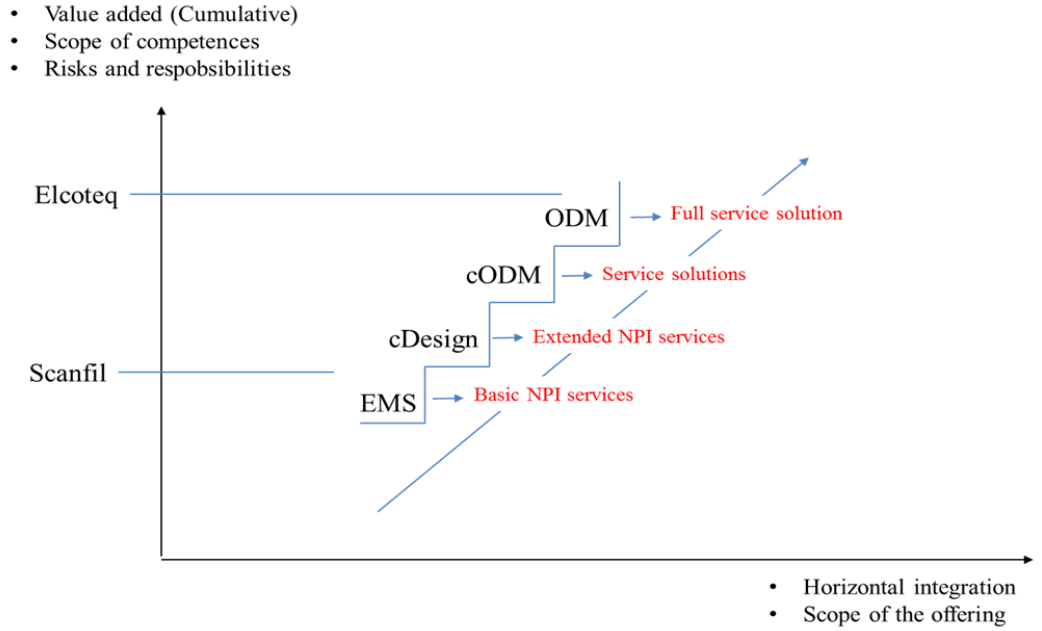

Figure 4. Value added, risks and responsibilities in CM business concepts.

In the *cODM concept* (collaborative original design and manufacturing) CM sells a whole technology module (including industrial design, software, hardware, mechanics etc.) typically for a fixed price to the customer that holds and provides the original design and/or original industrial design. In cODM concept CM has higher degree of freedom in constructing the complete solution, and hence influencing its business profitability. To a higher extent this holds for the *ODM concept* too. In the ODM concept (original design and manufacturing) CM delivers industrial design, original design and manufacturing, i.e. selling a complete product including hardware, software and possibly industrial design for fixed price, covering also the responsibilities of after sales including warranty repair and spare parts delivery i.e. a complete product with life-cycle services. In summary, to appropriate the benefits (higher profitability) of the higher value added business concepts, new managerial competences, entrepreneurship and risk-taking capacity to complement technical competences is required.

6.3 Scope of technical competences

In an ideal case CM's competencies are instantly balanced with the customer's outsourcing strategy of tangible and intangible assets. Along with insourcing the competences directly from the customer, CM's credibility to offer horizontally integrated solutions competitively can be

enhanced by acquiring the competences via acquisitions, recruitments and continuous up-grade of the human skills. For instance, Elcoteq invested proactively into research and design capabilities by acquiring Benefon's design unit at Salo in 2002. Through this acquisition Elcoteq was able to serve new portfolio of customers, and shift from lower added value manufacturing projects to higher added value technology and design projects.

Technical and related competences can also be enhanced through learning and knowledge accumulation during the manufacturing contracts. Elcoteq's first customer in design was Siemens mobile phone business unit. The design of Siemens' GSM mobile phone was based on its operating system MAT. In 2005 Siemens' mobile phone business was acquired by BenQ, a Taiwanese ODM, which led to the termination of the Elcoteq – Siemens agreement. Yet, the Siemens-case was central in enhancing Elcoteq's capabilities in hardware and software of different communication technologies at various levels of the technology stack, and also in sourcing, supply chain management and contract law. Figure 5 illustrates technical competence building in the case companies[11].

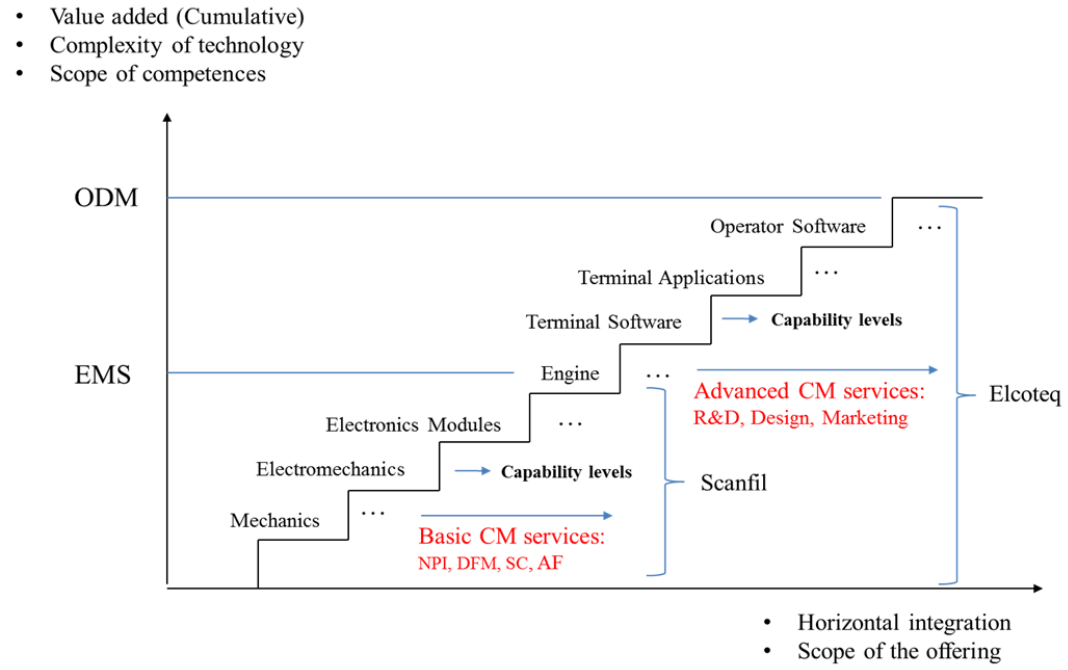

Figure 5. The ascending levels of technical competences in the CM business concepts.

During the same period of time and earlier Elcoteq was designing mobile phone accessories for Nokia Automotive business unit in Germany. Furthermore Elcoteq had its first mobile phone design project for Nokia Copenhagen product creation center. Later Elcoteq was supporting Nokia CDMA business unit in San Diego, and Nokia Enterprise business unit in Finland. Prior to the launch of Elcoteq' own mobile phone products, however, Nokia terminated all mobile phone programs with Elcoteq.

[11] Note that the term *engine* in Figure 5 refers generally to an assembled product or devise, which in case of Elcoteq is a mobile phone.

6.4 Supply chain approach

Business evolution towards higher value adding activities and the parallel transition from EMS to ODM concept is associated with a respective move from *vertically* (backward) to horizontally (forward) integrated operating model. The actual consequences of the two different approaches in Elcoteq and Scanfil to value creation and supply chain management can be highlighted with simple statistics. The percentage share of value added of the operating revenue, VA/OR is an index that measures the relative importance of internal value creation of the firm to its external purchases in generating revenues. High index values indicate manufacturing orientation or vertically integrated model, whereas the opposite indicates systems integration where externally sourced sub-systems and components are central in the firm's value creation processes. In 2000s the average value of VA/OR has been 24% for Scanfil and 9% for Elcoteq (Orbis database, 2016).

In general, horizontal integration is more risk exposing, as more business risks are assumed on behalf of the customer in comparison to vertical integration. Owing to lesser outsourcing, EMS and cODM concepts are more risk adverse and hence assume less business risk on behalf of the customer. Through the adoption of ODM concept Elcoteq became one of the first EMS manufacturers having the responsibility of manufacturing the mobile phone from start to finish. This was based on a new *relationally* oriented mode of collaboration with the customers and suppliers named as *co-evolution*.

The guiding principle in co-evolution was to continuously improve the performance of Elcoteq-operated *ecosystem* in which the constituent firms supplying the subsystems commit to. The commitment was facilitated by the managerial view that if the ecosystem as a whole works better than the competitors' supply chains, each link in that chain will profit and be successful (Orbis database, 2016). Such a relational approach differs radically from Scanfil's *transactional* approach where high number standard components are procured from competitive global markets. Hence, in addition to the technical competences horizontal integration requires supplementary capabilities related to advanced sourcing and procurement practices by the CM. These competences are involved and characterized in the conceptualization of systems integration (see e.g. Prencipe, 2011)[12].

6.5 Customer-orientation

The number of customers and customer segments served by a CM is influenced by its value adding goal and further the supply chain model. In opposite to Scanfil where the customer

[12] Systems integration necessitates technical competences to deal with unpredicted interactions between the components and uneven development of the underlying technologies. It requires capacity to design and test systems with new architectures, as well knowledge of the technological fields of the sourced components and subsystems (Brusoni et al, 2001). There is also need for additional integrative knowledge which is characteristically *social.* Social capabilities are related to ways how contractual and relational governance are co-employed to create trust, that is, to make the suppliers deliver the sub-systems and mobilizes required capabilities.

industry structure was deliberately diversified in the early 2000's[13], Elcoteq's ODM concept became increasingly focused on mobile phones industry and Nokia. This led to enhanced customer risks in the overall CM business. In the early 2000s Elcoteq had tens of contract manufacturing customers ranging from consumer electronics to industrial electronics. After divesting industrial electronics in 2004 Elcoteq focused on fewer number of customers divided into three different business segments; Nokia Mobile Phones, other consumer electronics customers, and telecommunication equipment manufactures. In 2005 and 2006 Nokia Mobile Phones' role in Elcoteq's customer portfolio peaked. In the end of 2005 it represented approximately 60% of the company's revenues and more than 100% of the operating profit and cash flow. In the end of 2006 Elcoteq Nokia Business Unit was running Nokia Mobile Phone business with negative working capitals. To appropriate the benefits of a concentrated customer structure while at the same time being a strategic player in a powerful OEM's ecosystem - puts high requirements on the negation skills and the capability to foresee the industry trajectories.

6.6 Service-orientation

The proactive role in supporting customer's technology and product management enabled Elcoteq move away from the commoditized manufacturing (EMS) concept towards ODM with enhanced technological base and higher value adding capacity in research, design and production technologies. Value adding capacity is embedded in different elements of labor and investments both in tangible and intangible assets, and the expectations of rents and operating profit. As indicated in Figure 1, horizontal strategy in Elcoteq implied a wider scope of service offering ranging from research to design, from design to manufacturing, from manufacturing to aftermarket services, and from aftermarket services to recycling. Scanfil in contrast adopted a narrower focus with a deeper involvement in specific subs-systems, their SCM and life cycle requirements.

In the vocabulary of the CM industry the transition to cODM and ODM concepts is interpreted mechanistically as deepening servitization, where the horizontal scope of the offering is increased with new technological modules and production responsibilities outsourced by the customers. From the service research standpoint, however, such an interpretation is not unequivocal as the outsourced object is typically a technological system whose value is composed of intangible activities (e.g. design) and tangible objects. Hence, the industry slogan that CM is 'all about services' needs to be elucidated by the inter-dependencies between the technological system delivered, and the value adding activities that support the technological system through its life cycle. This inter-dependence defines the degree of service-orientation highlighted in Figure 6.

[13] Regardless of KONE's central role as a single customer to Scanfil's revenues and innovation, its sales is relative evenly distributed over four market segments: urban applications, energy and automation, telecom networks and medi-tech.

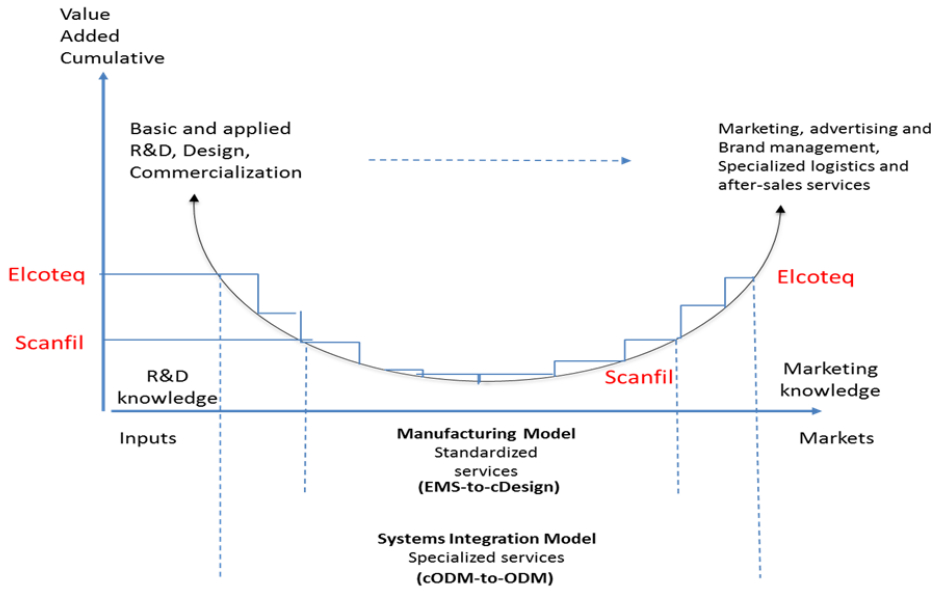

Figure 6. Illustration of service orientation in the case companies.

In the standard EMS and the cDesign concepts the role of value adding services is principally to promote the sales of manufacturing services[14] to customers. In that case CM's supply of services is predominantly external, driven by the customer's product specifications CM having limited business responsibility of the customer's product. While some of the service categories at both ends of the smile-curve in Figure 6 may be offered in the EMS and cDesign concepts too, services are characteristically *standardized* and build on the *narrow* manufacturing competences and business logic of the CM. In that case the main focus in value adding services is more on the pre-manufacturing (the left) side of the smile-curve. The differences between Elcoteq and Scanfil can be highlighted e.g. by innovation activity and brand management. In the 2000s the number of acquired *technology patents* in Elcoteq amounted to 39 and it held 3 *trademarks* for the developed products whereas the corresponding figures for Scanfil were 3 and 0 (Orbis database, 2016).

In *deepened servitization* with a parallel shift to cODM and ODM concepts the role of design becomes pronounced. When the business responsibility and the and value added of the customer's product is increased thorough own design and engineering, the other pre-manufacturing services (R&D, SCM etc.) become more systematically employed and focused on CM's own production too. In other words, an increasing part of the externally offered value adding capacity is transformed to internal functions to support CM's value creation. If the transition towards ODM is strategically viable (e.g. with respect to customer risks and the scope of technological competences) the overall value adding capacity of the pre-manufacturing services can be enhanced. A proportion of the knowledge-intensive service outputs are embedded in the solution delivered and the other part building on technologically more advanced offering, can be offered or sold directly to the customers. In a similar vein, the transition

[14] This involves the underlying expertise in manufacturability.

(assuming strategic viability) enables advanced and partially embedded services in the post-manufacturing phase. The dotted line in Figure 6 indicates that technical competences enhancing pre-manufacturing services create the platform to develop post-manufacturing services.

6.7 Business performance

Depending on strategic consistency, risk management (operational and customer structure) and managerial capabilities more generally, the transition to cODM and ODM concepts involves higher *potential* for enhanced profitability in solution sales and in value adding services. The standard EMS concept *print-to-build* implies that prices, most of the costs of the contracted object as well as the sub-suppliers are usually defined by the customer and hence the actual profitability of the EMS contracts is predetermined and visible to both parties. This leaves limited opportunities for entrepreneurship and innovation to enhance profitability and the return on capital employed (ROCE).

cDesign concept supplements EMS concept by external sales of design services by hiring out of engineering resources. This is often based on hourly fee contract that typically generates (close to) zero profit to the CM. In cODM and to a higher extent in ODM concepts the delivery price of the contracted solution is usually predefined in mutual negotiations, while most of the production costs and methods are variables to be decided by the CM. Through this *entrepreneurial leverage* there is higher degree of freedom – and financial incentives - for the CM managers to influence the profitability of the firm.

In the light of financial figures, the potential of higher entrepreneurial leverage in Elcoteq was not realized, however. The other side of the coin in extensive insourcing and moving towards ODM is enhanced product (operational) risk and the risk of concentrated customer structure. Intuitively, this should be reflected in higher short term volatility[15] in the annual profitability, which is also visible in Elcoteq's performance in the 2000s (see Figure 7). Except for the year 2010 in the focused time span Elcoteq's profitability never exceeded the profitability levels of Scanfil, which owes much to the scale-intensive growth policy, deficient managerial competences to master rapid growth as well as Nokia's strong negotiation power that was exerted on its suppliers.

Scanfil on the other hand has been conducting its risk adverse business strategy (in operations and customer structure) more successfully as indicated by the smoother development of ROCE at moderate levels of profitability in the focused time span (see Figure 7). Commitment to vertically integrated EMS concept has however, fostered *servitization trap* as highlighted in Figure 6, and therefore geared the focus in entrepreneurial innovation and growth mainly to the existing business areas. As pointed out here the way out of the trap is to proactively invest in design/engineering competences to create a solid and credible basis for the development of pre-manufacturing service activities that support internal product development as well as external service sales to the outsourcing customers.

[15] In Figure 7 volatility is measured by standard deviation (STD).

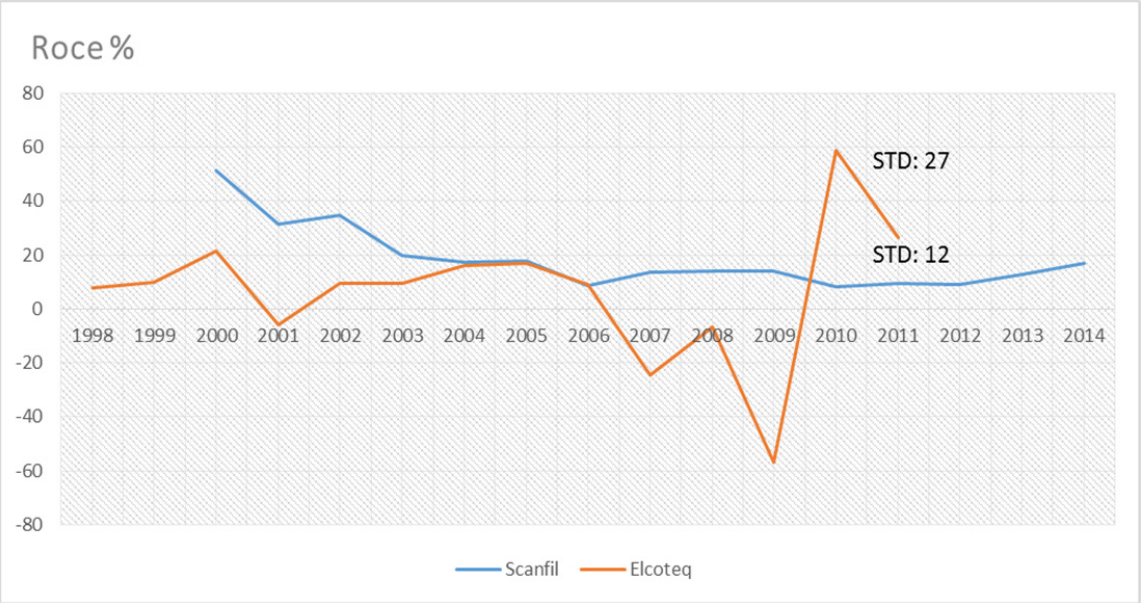

Figure 7. The development of ROCE in the case companies (source: Orbis database, 2016).

Balancing optimally the capacity of design services between internal use and external sales tends to be a critical issue for both case companies and a particular challenge in the EMS-ODM transition. In 2000-2003 Scanfil had a design business unit Scanfil Engineering that was closed as a response to its low profitability and the company's orientation to basic EMS concept. Facilitated by the acquisition of Benefon (see above) Elcoteq Design Center Ltd. was distinctively unprofitable business unit throughout the 2000s. Whereas the financial performance of design services reflects the managerial capability to capture the value adding potential in the CM business more generally, the main function of the other value adding services in CM is to build customer loyalty that generates profitable customerships in the long run.

7 Summary and discussion

The drivers and outcomes of service development in the manufacturing sector has been a topic of scholarly debate over two decades. Managers and industry practitioners see that services are viable if they create synergies and economies of scope with the product and thus contribute to positive net income, whilst scholars search for universal patterns to explain servitization, particularly its evolutionary character. In this paper we point out that neither the processes, nor in the characteristics of firms' offerings are sufficient to explain profitable growth in service business. Taking a more pragmatic view of competitive advantage, we argue that any product-service solution that a manufacturing firm is delivering on competitive basis, mirrors the firm's *objectives* with regard to its positioning in the value networks, profit-risk preferences as well as the existing pool of *competences* manifested in the value adding activities, technological assets and the human skills.

To avoid the traditional dichotomy between products and services, we highlight our argument in contract manufacturing where the firms typically lack own products, IPRs, and brands. In the CM business all activities in the firm's value chain (from purchases to sales) are harnessed to serve the customer, the OEMs. To make our point concrete we examined two Finnish CM companies Elcoteq and Scanfil that represent 'polar cases' in the CM industry. The differences in their business concepts became pronounced since the beginning of the 2000s as Scanfil adopted traditional low-risk EMS model whereas Elcoteq focused increasingly on the high-risk ODM concept.

Based on the industry characteristic and the case data we identified two different business approaches to the positioning in the industry value networks that also highlight the linkages between value creation, competences and servitization more generally. The detailed comparative analysis shows how the issue of servitization – as viewed in the academic literature – is actually involved in the CM's logic of business planning. Instead of being exogenously and disjointedly decided by the top management, servitization follows endogenously from the more fundamental decisions, starting from risk-profitability preferences. The key causalities of CM's strategy are summarized in Figure 8.

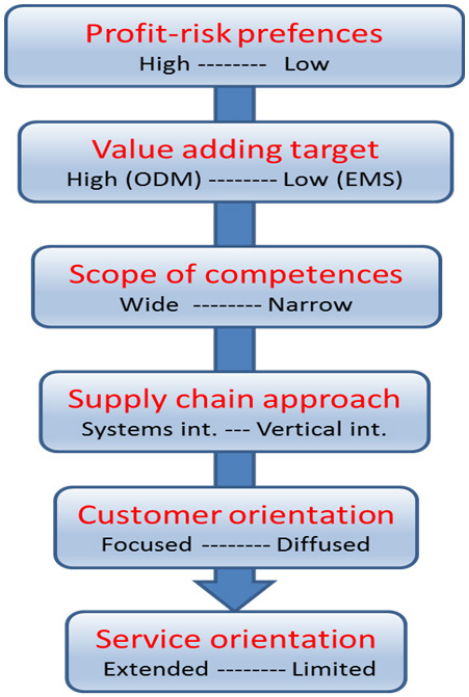

Figure 8. The role of services in CM's business planning.

In the outsourcing process that enables deepening servitization, the role of design becomes pronounced. When CM's responsibility over the customer's products and value creation is increased and builds on its own design and engineering competences, the other pre-manufacturing services (R&D, SCM etc.) become more systematically managed and focused to

support CM's manufacturing processes. Accordingly, a major part of the externally offered value adding capacity to the customers is transformed to internal service functions to facilitate CM's value creation process. If the transition towards ODM proves strategically viable (e.g. with respect to customer risks and the scope of competences) the value adding capacity and outcome of the pre-manufacturing services can be enhanced. A proportion of the higher value added service outputs are embedded in the contracted solution whereas the other part, building on technologically more advanced solution and competences, can be offered and sold to the customers. In a similar vein, the transition enables embedded and higher value added services in the post-manufacturing phase.

As the servitization studies boomed in the 1990s and in the 2000s there was an upswing of servitization projects in the Finnish manufacturing industry too. Except in a few cases, where the installed base have brought about clear economies of scale in maintenance (e.g. Kone, Metso, Wärtsilä etc.) service development has proved mixed of meager results in manufacturing business[16]. Operative costs of service are difficult to cover by the selling prices, notably when the firms have earlier offered the same services for free. Our findings of contract manufacturing support the hypothesis that the business impacts of value adding services should not be assessed with their short-term profitability only. A more important, indirect benefit of the value adding services – *pre-manufacturing R&D and design,* in particular - comes from the enhanced customer loyalty and relationality which means higher retention rate and hence lowered costs of finding new profitable customerships. Actually, these long-term benefits for the CM business can be substantially higher than the low or negative net income of service sales in the short run (c.f. Viitamo, 2012).

The profitability of individual service modules becomes even a lesser concern when shifting from EMS to ODM business concepts. When the CM's business responsibility over the customer's product is enhanced and at the same time the offering becomes a solution constructed with manufacturing, pre-manufacturing and post-manufacturing services, the need for selling the value adding services externally to the customers is diminished. Since ODM concept implies a partial internalization of the value adding services, the coverage of price-cost accounting in the solution sales is extended respectively. On the basis of internalized R&D, design and engineering there is higher potential for technology-based patents and trademarks, which enable higher credibility and negotiation power vis-à-vis the customers and option for higher profit margins. A respective leverage can be utilized in the value adding services (pre- and post-manufacturing) provided externally with the customers. On aggregate, technical competences creates the basis for insourcing and horizontal integration whereas complementary managerial skills, entrepreneurship, systems integration and proactive sales are required to make it profitable business (Teece, 1986).

What kinds of recommendations does Scanfil-Elcoteq case then provide for business development more generally? In balancing between value adding targets and risk management perspectives we hypothesize that *the optimum approach to CM business can be found along the*

[16] The focus on low value added services along with the profitability issues are reflections of the servitization trap discussed above.

continuum linking the two polar cases. For a traditional manufacturing services provider (EMS) the general message is clear: expand to cODM and ODM concepts with specialized competences and internalize part of the design and R&D services. At the same time proactively seek growth opportunities in the various market segments and customer partnerships and balance them with the hierarchy of business concepts (EMS-to-ODM) and the supply network requirements (vertical integration-to-systems integration). The customer/market-specific services and network positions in CM are enabled by digital platforms that integrate internal and external competences with the boundary spanning activities of the CM (see e.g. Aldrich, and Herker, 1977). To boost the value-adding potential, direct R&D and design on a) early involvement in the customers' product development process and b) standardization and replicability that enables technology transfer across market segments[17].

In addition to the clarified role of services in the overall business strategy (see in Figure 8), our findings provide managerial implications on how the servitization paradox (trap) can avoided by shifting from the manufacturing business logic to *solution sales logic* (c.f. Storbacka, 2011) where individual services and products are priced and embedded in the overall product-service offering. Accordingly, we hypothesize that: to enhance competitiveness and profitability in the specific products-service markets it is not sufficient for the CM to rebundle the insourced product-service modules to customer-specific, horizontally integrated solutions that utilize the pool of competences across the firm's functions. In particular, the solutions should be based on *cross-functional innovations* by the CM that enable a) higher value added to the customer, b) differentiation and adaptive replication of the solutions in other customer contexts, and c) credible signaling of the CM's competences to the customers.

The findings of our case study imply that the actual decisions of whether and how to servitize is intertwined with higher goals that define a firm's business and competitive position (Porter, 1998; Mc Gahan, 2004). Service development cannot be isolated from the wider reconfiguration of a firm's value chain that involves complex inter-dependencies between functional units; manufacturing, R&D, assembly and the boundary spanning functions (sourcing, sales). We see that intra-organizational aspects should assume higher status in the service research literature (Viitamo, 2012; 2014). Value chain configuration is in turn inseparable from the strategic decisions on positioning in the wider networks and ecosystems, and the extent this requires relationality in systems integration (Prencipe et al., 2011, Hobday et al.,2005). The proven dependency between product-service design (e.g. Windahl and Lakemond, 2010) and the operative models of managing supplier networks (e.g. Halldorsson et al., 2007) is particularly appealing and calls for more integrative approaches to the topic.

In summary, the industry case illustrates that the issue of servitization is reducible to the more fundamental discussion of industry evolution (Chandler, 1990), how to survive in global rivalry and what are the future drivers of competitive strategy (Ansoff, 1965; Porter, 1985; David, 1989). Traditionally, strategy scholars have followed two lines of argumentation; the resource-based view (RBV) sees that effective and efficient use of resources that a company possesses and

[17] Reflective of these ideas Scanfil acquired a Swedish CM company Partnertech in fall 2015. This acquisition extends Scanfil's competences particularly in ODM, systems integration as well as R&D and design.

can mobilize determines its competitive advantage (e.g. Wernefelt, 1984; Grant, 1991; Teece et al. 1997). Outlined in Porter (1980, 1985), the structuralist approach posits that strategic planning starts from the decision how to position in the markets. This in turn guides the choice of the means to gain the position and the resources and competences needed. An integrative approach (see Viitamo, 2008; 2012) suggests that competences and positioning go hand in hand and need careful balancing prior to any strategy implementation[18].Whilst involved in CM's chain of business logic as well, the integrative approach calls for operationalization and validation in the succeeding industry studies.

References

Ailisto, H., Mäntylä, M. & Seppälä, T., (2015). Finland – the Silicon Valley of Industrial Internet, Government's Analysis, Assessment and Research Activity, 2015/10.

Aldrich, H., and Herker, D. (1977). Boundary Spanning Roles and Organization Structure. The Academy of Management Review, 2(2), 217–230.

Ansoff, H.I. (1965), Corporate Strategy, McGraw-Hill, New York.

Baines, T. S., Lightfoot, H. W., Benedettini, O., & Kay, J. M. (2009). The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management, 20*(5), 547-567.

Barney, J. (1991), Firm Resources and Competitive Advantage*, Journal of Management*, 17, 1, 99-120.

Brax, S. A. (2005). A manufacturer becoming service provider – challenges and a paradox. *Managing Service Quality, 15(2), 142-155*

Chandler, A.D. (1990). Scale and Scope, The Dynamics of Industrial Capitalism, The Belknap Press of Harvard University Press, Cambridge, Massachusetts, London, England.

Cook, M. B., Bhamra, T. A., & Lemon, M. (2006). The transfer and application of Product Service Systems: from academia to UK manufacturing firms. *Journal of Cleaner Production, 14*(17), 1455-1465.

David, F. (1989). Strategic Management, Columbus: Merrill Publishing Company.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research, Academy of Management Review, 14 (4), 532- 550.

Fang, E., Palmatier, R. W., & Steenkamp, J.-B. E. M. (2008). Effect of Service Transition Strategies on Firm Value. *Journal of Marketing, 72*(5), 1-14.

Gebauer, H., Fleisch, E., & Friedli, T. (2005). Overcoming the Service Paradox in Manufacturing Companies. *European Management Journal, 23*(1), 14-26.

[18] Integrated approach acknowledges that strategy (re)design may be initiated either by the competences or the goal itself. In the CM case discussed here the primary issues is Porterian, i.e. whether and when it makes sense to expand from the traditional EMS concept to ODM business, and reposition downstream in the value network. The construct of Figure 8 involves an implicit assumption that also competence requirements need to be clear in the design phase of competitive CM strategy.

Grant, R. M. (1991). The Resource-Based Theory of Competitive Advantage: Implication for Strategy Formulation, *California Management Review*, Spring 1991, 33, 3, 114-135.

Halldorsson, A., Kotzab, H., Mikkola, J. H., Skjoett-Larsen, T. (2007). Complementary theories to supply chain management. *Supply Chain Management: An International Journal*, Volume 12 Issue 4, 284-296.

Hobday, M., Davies, A. and Prencipe, A. (2005). Systems integration: A core capability of the modern corporation, Industrial and Corporate Change, Vol. 14, 1109-1143.

Johnstone, S., Dainty, A., & Wilkinson, A. (2009). Integrating products and services through life: an aerospace experience. *International Journal of Operations & Production Management, 29*(5), 520-538.

Lüthje, B. (2002). Electronics Contract Manufacturing: Global Production and the International Division of Labor in the Age of the Internet, Industry and Innovation, 9:3, 227-247.

Martin, C. R., Jr., & Horne, D. A. (1992). Restructuring Towards a Service Orientation: The Strategic Challenges. *Journal of Service Management, 3*(1), 25-25.

Martinez, V., Bastl, M., Kingston, J., & Evans, S. (2010). Challenges in transforming manufacturing organisations into product-service providers. *Journal of Manufacturing Technology Management, 21*(4), 449-469.

Maskell, P. and A. Malmberg, (1999). Localised learning and industrial competitiveness. *Cambridge Journal of Economics*, 23 (2): 167-185.

McGahan, A.M. (2004). How Industries Evolve, Principles for Achieving and Sustaining Superior Performance, Harvard Business School Press, Boston, Massachusetts.

Mudambi, R. (2008). Location, control and innovation in knowledge-intensive industries. *Journal of Economic Geography,* 8 (5), 699-725.

Neely, A. (2008). Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research, 1*(2), 103-118.

Oliva, R., & Kallenberg, R. (2003). Managing the transition from products to services. *International Journal of Service Industry Management, 14*(2), 160-172.

Porter, M.E. (1980). Competitive Strategy: Techniques for Analyzing Industries and Competitors, New York: Free Press.

Porter, M.E. (1985). Competitive Advantage: Creating and Sustaining Superior Performance, New York: Free Press.

Porter, M.E. (1998), On Competition, A Harvard Business Review Book.

Prencipe, A. (2011). Corporate Strategy and Systems Integration Capabilities: Managing Networks in Complex Systems Industries, pp. 114-132, in The Business of Systems Integration, Eds. Prencipe A., A. Davies and M. Hobday, Oxford University Press, UK.'

Quinn, J. B., Doorley, T. L., & Paquette, P. C. (1990). Beyond Products: Services-Based Strategy. *Harvard Business Review, 68*(2), 58-67.

Salonen, A. (2011). Service transition strategies of industrial manufacturers. *Industrial Marketing Management, 40*(5), 683-690.

Seppälä, T. (2013a). Tracking offshoring and outsourcing strategies in global supply chains, in The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization. Lydia Bals, Peter Ø Jensen, Marcus M. Larsen, Torben Pedersen (Eds.), Springer in the Production and Process Engineering Series

Seppälä, T. (2013b). Transformations of global mobile telecommunication supplier networks, in The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization, Lydia Bals, Peter Ø Jensen, Marcus M. Larsen, Torben Pedersen (Eds.), Springer in the Production and Process Engineering Series

Silverman, D. (2010). Doing Qualitative Research, Third Edition, Sage Publications, London, Thousand Oaks, New Delhi.

Storbacka, K. (2011). A solution business model: Capabilities and management practices for integrated solutions, *Industrial Marketing Management*, 40 (5), 699-711.

Teece, D.J., G. Pisano and A. Shuen, (1998), Dynamic Capabilities and Strategic Management, *Strategic Management Journal*, 18, 7, pp. 509-533.

Teece, D.J. (1986). Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy, Research Policy, 15, 285-305.

Turunen, T. (2013). Organizing Service Operations in Manufacturing. (Doctor of Science (Tech.)), Aalto University

Ulaga, W., Reinartz, W. J. (2011). Hybrid Offerings: How Manufacturing Firms Combine Goods and Services Successfully. *Journal of Marketing*: November 2011, Vol. 75, No. 6, 5-23.

Vandermerwe, S., & Rada, J. (1988). Servitization of Business: Adding Value by Adding Services. 25 *European Management Journal, 6*(4), 314-324.

Viitamo, E. (2008). On Service Productivity – Strategic Management Perspectives, Lappeenranta University of Technology, LUT, Research Report 205, Faculty of Technology Management, Department of Industrial Management.

Viitamo, E. (2012). Productivity as a Competitive Edge of a Service Firm – Theoretical Analysis and a Case Study of the Finnish Banking Industry, Aalto University, School of Science.

Viitamo, E. (2014). Service Productivity, Technology and Organization - Converting Theory to Praxis, The Research Institute of The Finnish Economy, ETLA Working Papers, No 26, 4 September 2014, ISSN 2323–2439 (online), ETLA.

Wernerfelt, B. (1984). A Resource-Based View of the Firm, *Strategic Management Journal*, 5, 171-180.

Windahl, C., Lakemond, N. (2010). Integrated solutions from a service-centered perspective: applicability and limitations in the capital goods industry, *Industrial Marketing Management, 39* (8), 1278-1290.

Wise, R., & Baumgartner, P. (1999). Go Downstream: The New Profit Imperative in Manufacturing. *Harvard Business Review, 77*(5), 133-141.

Yin, R., K. (2014), Case Study Research, Design and Methods, Fifth Edition, Newbury Park, Sage.