Increasing role of services: trends, drivers and search for new perspectives

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Abstract

Increasing role of services is often described as tertiarization of the economy, that is, the increased share of the services sector employment and value added. In business and engineering sciences the same phenomena are investigated at the level of company operations, value networks as well as system innovations and system-level transitions. What was described as a service economy in fifty or twenty years ago, are not the same ideas of a service economy that are investigated today. This chapter provides a broad overview on the increasing role of services: how this phenomenon has been addressed in different fields, including the forest-based sector research. Taking the observation from the research on services and related changes in business and production systems, three developments in the forest-based sector are described: biorefineries, building systems and forest big data exemplify the challenges in assessing the role of services and their outlook. The forest-based sector and its role in the evolving circular bioeconomy can contribute to the development of service economy conceptualizations, but clarification of the core concepts is needed: without an overview on the issues, concepts and models of service research, it is difficult to position the forest-based sector or its services into a wider debate about evolving production modes or what is called as a 'service economy'.

Key words
services, forest-based sector, service economy, bioeconomy

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1.1 Introduction

Increasing role of services is recognized as one of the major trends both in the developed and developing economies (De Backer et al. 2015). Often this trend is described as an increase in the number and volume of services. Today the services sector contributes 70-80% of employment and value added of the developed economies, and services trade represents 21% of the global trade flows. Manufacturing and services sectors are closely interconnected: the input acquired from external services providers is estimated to contribute 40% of the manufacturing output and, vice versa, services cannot be provided without the necessary infrastructures and other material provisions supplied by the manufacturing industries. Furthermore, 40% of all occupations in manufacturing are in fact service-type occupations, such as R&D, management, accounting, legal services, marketing, distribution or after-sales services (Pilat et al. 2006), and 30% of the manufacturing companies themselves sell also services (Neely et al. 2011). Overall services are embedded in all economic sectors. Existing statistical metrics do not fully reveal these developments, and technological advances make the assessment ever more challenging due to new types of services and service concepts emerging in the markets.

During the past decade, the increasing role of services has also gained interest in the forest-based sector research (Hetemäki 2011; Toppinen et al. 2013; Näyhä et al. 2014). Role of the forest-based services – or bioeconomy services – is expected to increase as part of the economic and productive processes of the future circular bioeconomy (Hetemäki et al. 2017). Yet, data and information are lagging to assess services and their potential. For example, there is a lack of outlook for the forest-based tourism, health and recreation services, or the exports potential of consultancy, education and training (Hetemäki and Hänninen 2013, Näyhä et al. 2015). Furthermore, forestry and sustainable forest management (SFM) provide an important service to society by maintaining and enhancing the ecosystem services (for example in the EU Forest Strategy, see Pelli et al. 2017). These are the services that nature, or forests as such, provide: wood and other raw materials and products, air and soil quality regulation, carbon sequestration, habitat and biodiversity, as well as contribution to human health, spiritual and aesthetic experiences (Millennium Ecosystem Assessment 2005).

This chapter provides a broad overview on the increasing role of services: how this phenomenon has been addressed in research on services and what it implies for the forest sector. Overall, the growth of the services sector in general macro-economic terms has been recognized since the late 1950's, and there are research traditions in several disciplines investigating services, what the increasing role of services implies, and what kind of trends and drivers are detected for future research. Today the multi-disciplinary field of services research includes, among others, economics, business sciences, engineering sciences and socials sciences. The forest-based sector already applies outcomes from these research fields in its own investigations as well as in the company operations. However, the research remains scarce and scattered.

This chapter first summarizes the trends and drivers perceivable in research on services, and then, gives an overview on the forest-based sector research and its interest in services. The service economy of today is not the same phenomenon than the service economy discussed over the past decades. Taking the observation from the business and engineering sciences, how they have evolved to research services and related changes in business and production systems,

three forest-based sector developments are described. The examples from biorefineries, building systems and forest big data illustrate the challenges we face when trying to make an outlook for the future services. Instead of seeking to assess intangible services separately from the tangible production, a synthesis view is taken on service systems. The approach stems from the business and engineering sciences, and today its concepts are applied also for example in what is called as 'service science' engineering human and technological systems together. The chosen method does not provide an answer to the question what the future services are or their share in the economy. The chapter seeks to improve understanding about the increasing role of services, how it has been addressed in different fields, and what kind of opportunities and challenges unfold addressing this phenomenon in the forest-based sector context.

1.2. Trends, drivers and multiple research interests on services

1.2.1 Services sector, economic growth and international trade

The services sector contributes 70–80% of national value added and employment in developed countries, and its share is increasing also in the developing countries. The traditional division of economic sectors, especially the borderline between manufacturing and services has become blurred: business services contribute an important input to the manufacturing operations, while manufacturing companies themselves also produce services along their value chains and offer services to their customers. Well-developed knowledge-intensive business services (KIBS) are recognized important for the success of the manufacturing industry in internationally distributed production (De Backer et al. 2015). Business services refer to for example financing, legal services, accounting, human resources management and marketing.

Technological development has speeded up the international trade, and the most competitive combinations of resource use are sought by distributing production internationally. Instead of trade in goods and services produced in one geographic location, interim goods are traded between different locations. For example, in the electronics or automotive industries, interim goods are imported not for producing goods for the domestic markets, but for producing goods for exports. These so-called imports for exports play a significant role for the regions that have specialized in specific production tasks in the supply chain. In such global value chains, the developed countries tend to focus in services tasks, such as headquarter functions, research and development, intellectual property rights, design and marketing, while more routine production and assembly tasks have been located to the low-cost countries. This development, however, has not been unidirectional, but also the higher value-added services tasks have become distributed internationally. Information technology has radically reduced the cost of moving ideas across borders and the tasks such as management, marketing and R&D have become offshored (Baldwin 2016). Intangible assets are often the most valuable ones: Today for the value of a manufacturing company, the patent portfolio may be more important than its physical capital assets.

The interdependencies of the services and manufacturing sectors as well as the dynamically changing configurations of the global value networks call for new means to grasp the developments. Work towards this goal is already ongoing, for example, to develop international input-output analyses (Stehrer et al. 2014; Taglioni and Winkler 2016) and trade-in-tasks analyses (summarily in Kenney 2013; Sturgeon et al. 2013; Ali-Yrkkö and Rouvinen 2015). The bioeconomy developments and increasing pressure on renewable resources require more investigations on the interconnections between services and the primary production, too.

1.2.2 Services and sustainability

In the sustainability studies, for example, Product-Service Systems (PSS) investigate different forms of sharing, re-use, repair and other processes that are developed around the tangible products (summarily in Mont 2002; Tukker 2004; Tukker 2015). However, the connection between services and sustainability is not unambiguous; although replacing the material goods with increasing use of services is perceived to decrease pressure on natural resources, also services use material resources. In fact, the easier the use of services is made, such as the digital applications in consumers' everyday lives, the more people use them, and the more resources are needed for the necessary infrastructures. Services can affect transformations in the economy, for example, in finding solutions to resource efficiency, environmental concerns or other societal challenges – but these outcomes are not to be taken for granted (Gallouj et al. 2015)

At the same time, resources are becoming scarce for satisfying the needs of the increasing global population. Access to the raw material sources becomes critical, and resource-efficiency needs to be improved. The efforts towards more circular economies and processes of material flows will require new types of services. That is, the tangible production of extraction, processing, production and assembly can be expected to become ever more amalgamated with the intangible services, such as transportation and logistics, standards and testing, and all data and knowledge flows necessary to design and manage production, distribution and use (as an example of the reviews across different research fields, see Boehm and Thomas 2013).

1.2.3 From services to systems in business and engineering studies

Company-level investigations on the role of services have been carried out in several fields. Overall, the emergence of services research in the business studies field stems back to 1970-1980s, when the growing service companies, such as financing and hospitality businesses, called for the business schools to address the specificities of services as a separate lane of investigation in marketing (Fisk and Grove 2010). Typologies were developed how services were different from tangible goods, and later, also how the intangible and intangible value creation could be integrated in an optimal way. One of the popular typologies has been to define services as intangible, deeds or performance; heterogeneous, different at each time of delivery; inseparable, produced and consumed simultaneously; and perishable, thus it is not possible to store them – these typologies have several challenges (see for example, Zeithaml et al. 1985).

Today the business analyses comprise of studies on the services sector companies specifically, and on business development in more general terms. Research questions are, for example, how new services are developed, what affects success in services, how value becomes co-produced in interaction between the service provider and the customer, or how markets emerge through resource integration. For the past 10-15 years, service research has gained more and more emphasis in parallel to services research (Bitner and Brown 2008; Ostrom et al. 2010). Highlighting the difference between these two: the research on services is interested on services companies or services business, thus emphasizing the specificities of services, while the service research elaborates a synthesis view and is interested in value creation in any producer-customer or provider-user interaction (example of one such approach, see service-dominant logic by Vargo and Lusch 2017).

In the engineering research services have been analyzed in industrial marketing and management, supply chain and operations management, as well as IT and information systems,

among others. For example, servitization of manufacturing gained interest from the late 1980s onwards. There was a trend recognized in manufacturing companies adding their products with pre- and aftersales services, and later, moving downstream in the value-added chain to sell services mainly (Vandermerwe and Rada 1988; Wise and Baumgartner 1999; Oliva and Kallenberg 2003). Even if services increased the company turnover, they do not necessarily improve profitability of the manufacturing companies (Gebauer et al. 2005). Consequently, the manufacturing companies are not only moving downstream in their value chains, but several strategic choices are made both upstream and downstream (summarily in Baines et al. 2009; Kowalkowski et al. 2017). The engineering and machinery sectors provide several examples of these developments, such as the Rolls Royce changing its business concept from selling engines for aircrafts to selling its customers 'power by the hour', i.e., the product and its maintenance invoiced as the time that the aircrafts operate, or the IBM shifting from production of computers to engineering information systems, and further, to engineering and management of service systems. In other words, today, servitization in manufacturing is understood to include also considerable business model changes regarding how value is created, distributed and captured. There is a rich research field, not only about servitization or services in manufacturing, but also engineering of supply systems, technological or other systems necessary in production that investigate similar issues than those raised in the above-mentioned service research (as an example, see service science by Maglio and Spohrer 2008).

1.2.4 Services, technology and innovation

The connection between services, technology and innovation has several dimensions (Miles 1993). The information and communication technology (ICT) development created totally new types of services, but it also increased productivity of the old services sectors such as transportation, wholesale and retail, and business services. Outsourcing of services tasks from the manufacturing companies made services visible, but at the same time adoption of new technologies allowed the service companies to increase their efficiency and develop new services to their customers. What at first was studied as innovations in and for services, i.e., service companies adopting the new technology, has extended to a wider understanding of the processual nature of service innovations (Coombs and Miles 2000; Gallouj and Savona 2009, Toivonen 2016). Service companies disseminate new technologies as well as the practices that they learn by applying the technology into their customers' contexts. This impact extends across different customer fields, thus, manufacturing and other services companies, as well as the primary production and public-sector organizations – and through the trade of services also internationally. For example, the clean tech and green technology solutions for improving the environmental impact or resource efficiency include both the infrastructure, its development and maintenance services. Services are part of the innovation system.

Overall, interest on services and innovation accumulated in late 1990's. The innovation surveys of the Oslo manual for innovation were expanded to also services sectors in 1997, and marketing and organizational innovation categories were added in the 2005 edition of the manual (OECD and Eurostat 2005). Innovation in services is described as less technological, more incremental in nature, less formally organized, and more difficult to protect with intellectual property rights, IPR. Services illustrate more open approaches to innovation: Companies offering services interact with their customers, and they gain insights into the customer processes which they can then utilize to further improve the solution they offer. Alike, the customer improves efficiency if it opens its own processes for developing the necessary supply network, rather than acquiring a specific product or service separately (Boden and Miles 2000; Toivonen 2016).

1.2.5 Technology-enabled platforms B2B, B2C, C2B, and C2C

As already highlighted above, technology has been an important driver for increasing role of services, particularly, the digital technologies that enable accumulation of data and more efficient organization of operations. Noteworthy these developments do not limit themselves within the manufacturing-processing or the tangible production, but they extend to various forms of market exchanges. Technology-enabled platforms provide new ways how to re-connect idle resources: Airbnb became a global accommodation provider without any own hotel infrastructure investments, Uber became a global taxi company without its own car fleet, Facebook became a global media without its own journalists or media production, and so forth. Furthermore, the users can establish their own distribution channels and create added value, which is no more under the control of the traditional producers or service providers. What used to be business-to-business (B2B) and business-to-consumers (B2C) becomes several forms of transactions, including consumers-to-business (C2B) and consumers-to-consumers (C2C).

Data that the platforms collect on users and their behavior has become a valuable resource on its own. The roles and tasks, as well as the money transactions become re-configurated, thus, it changes who produces what to whom, and what is the basis of the market transactions. What can be provided as-a-service solution extends to various operations well beyond the digital world; for example, Mobility-as-a-service (MaaS) provides a digital platform that connects both public and private transportation as well as different means of mobility into one single service application for the user. What we understand as services and what we expect as service is changing. Technological change is not an add-on to the old operations, but it interlinks with the changing society. Digitalization today is not the same thing as it was in the year 2000. Earlier it was about e-marketplaces and how marketing of goods and services changes, today it is about how production is organized. At present, the big data, internet of things and robotics are expected to encourage companies to relocate their production and assembly tasks back to the developed countries (Brynjolfsson and McAfee 2014; OECD 2017).

The ongoing industrial revolution is even foreseen to make the division between tangible and intangible production ultimately artificial (OECD 2017, cf. Boden and Miles 2000). Today it is relatively easy to find examples of the digital platforms as a means of new services. The ICT development led to emergence of new types of services, and its convergence with other technologies created new operation modes. But in a similar vein, totally new services can be envisaged to emerge from the advancements in bio- and nanotechnologies (Chang et al. 2014; Gallouj et al. 2015).

1.3 Forest-based sector research on services

1.3.1 Production oriented view on services

The forest-based sector is production oriented, and its market analyses, business development and innovation models focus on the tangible manufacturing production. The data and metrics has been developed to satisfy the needs of the wood (biomass) production processes. Consequently, services, such as administration, education, research and development, and data and information services, are assessed as necessary inputs in sustaining the production, rather than own business and value creation entities (Hetemäki and Hänninen 2013; Näyhä et al. 2015).

The forest-based sector research has addressed similar topics than were summarized above from the services research. However, the investigations have not focused on services specifically, or they have used product-oriented analytic frameworks to address also services (Pelli et al. 2017). Services have been for example recognized as one part of the intangible value-creation in the analyses of the wood products industries, along with other intangibles such as the product and process qualities, renewable and traceable raw material, environmental sustainability and corporate social responsibility (e.g. Toivonen et al. 2005). New business opportunities have been investigated in non-wood goods and services, thus, including also services in the rural development, entrepreneurship and innovation studies in forestry (summarily in Niskanen et al. 2007; Weiss et al. 2011). Furthermore, similar to the knowledge-intensive business services mentioned above, the forest owner services research has addressed questions on outsourcing, innovation and entrepreneurship in forestry, and the changing customer needs (Clark 2005; Anderson 2006; Hull and Nelson 2011; Mattila and Roos 2014).

The research on services that has been carried out in the parallel disciplines may remain less recognized in the forest-based sector research. For example, services business related to forests, such as the nature tourism, has been analyzed in the marketing and business studies and the tourism research. On the other hand, in the engineering literature, the forest-based industry servitization cases are often presented among other manufacturing industries, whether it is the collaboration between the machinery and engineering companies and their customers in the processing industries or between the pulp and paper industries and their customers (Davidsson et al. 2009; Viitamo 2013).

1.3.2 Circular bioeconomy and cross-sectoral collaboration

Recent bioeconomy and circular economy strategies have emphasized the need for diversification and to cross-sectoral collaboration, thus, highlighting also the forest-based sector partnerships extending to energy, textiles, chemicals, food and other industries (de Besi and McCormick 2015; Hansen 2016; Hetemäki et al. 2017). There is also an increasing focus on significance of higher value-added products versus bulk products (e.g. Schipfer et al. 2017; Toppinen et al. 2017). Although the focus in these strategies tends to be in the biomass processes, the development of new bio-based materials and their markets requires more close collaboration along the value chains, for example in wood construction and pulp and paper industry/biorefineries (Toppinen et al. 2017; Näyhä et al. 2014).

Again, the interest of the forest-based sector research and perspectives are not in services specifically, but the substitution strategies and emerging bio-based solutions require new thinking about the customer processes and the overall business ecosystem as well as wider societal and environmental challenges, where also services play important roles. Services affect competitiveness of the extant forest-based businesses, they are embedded in the renewal processes of the whole forest-based sector, but often services are not explicated despite they are crucial parts in the innovation systems of the evolving bioeconomy (Pelli et al. 2017). It is also noteworthy, that different actors and stakeholders understand bioeconomy and forest-based bioeconomy concepts differently, which creates more ambiguities also for discussing new products, processes and services (Kleinschmit et al. 2014; Hurmekoski et al. 2018).

An economic paradigm shift calls for connecting the socio-economic and technology processes with the ecological systems that directly and indirectly sustain also the human systems. The services that forests provide, offer diverse and growing economic and employment potential. The forest research has already made first openings towards this aim. Hetemäki et al. (2017)

call for science-based decision-making systems and development of tools how to integrate natural capital in a circular bioeconomy model. Better understanding on the role of natural capital could draw more attention towards services, including ecosystem services, in the bioeconomy strategies and assist in decoupling economic growth from environmental degradation. On the other hand, Matthies et al. (2016) have elaborated the service-dominant logic conceptualizations from the marketing field and propose 'value in impact' as a conceptual tool for economic and market analysis: the natural ecosystems and the human-based service systems could be brought into the same assessment. Pelli et al. (2017; 2018) seek to address the same question from the perspective of companies and business systems.

1.3.3 Forest-based sector and forest-based services

The interest in services in the forest-based sector research is relatively recent. Also, the concepts of what is understood by the forest-based services are still imprecise.

Hetemäki and Hänninen (2013) and Näyhä et al. (2014; 2015) defined three service categories for the forest-based services: 1) forest-related services that are directly related to forests, such as nature tourism and recreation, hunting, mushroom and berry picking as well as the services that forest produce (ecosystem services, such as soil and water services, and carbon sequestration); 2) forestry-related services, including for example, advisory services, forest management planning, forest inventory, administration, governance, R&D and education; 3) industry-related services linked to the manufacturing of forest-based products (e.g. R&D, design, production processes, headquarters functions, logistics, marketing) including the forest industry but also the supply and customer industries such as machinery and engineering, energy, chemicals etc.

In the forest-based sector strategies, the UNECE/FAO Green Economy action plan (2014) recognized the services that are related to forest products (such as maintenance, planning, servicing, monitoring, programming, patents, R&D, education and consulting), to forests (tourism, recreation, inventory and monitoring, forestry services, etc.), and to more generally the ecosystem services, thus, climate services, protection services etc. The FOREST EUROPE (2014), in turn, explicated services as a part of the green economy, rural employment and income: the green jobs in the forest-based sector refer to employment in forests and manufacturing, including R&D, administrative and service activities that contribute to preserving or restoring environmental quality.

Pelli et al. (2017) defined, based on the business research literature, three perspectives for analyzing services in the forest-based sector and its strategic partnerships of the bio-based industries, processing industries, manufacturing, energy-efficient buildings and green vehicles: 1) a production-focused view on services as activities or operations, 2) a product-focused view on services as tradable outputs, and 3) a strategic orientation on service as a business model definition how value is created. From the analyses of the R&D roadmaps they derived also a fourth category which was emphasized in the forest-based sector strategies: 'services to society' refers to the forest ecosystem services, sustainable management and use of natural resources, and the contribution of the forest-based sector to the rural employment and livelihood.

Compared with the research fields briefly discussed in the Chapter 1.2, the above forest-based services categories mix several concepts that are investigated separately in the services research: services businesses, such as tourism or business services; services produced and

offered by the manufacturing companies, such as pre- and after-sale services; services within the primary production such as forest owner services or environmental services for example related to nature conservation, and finally; the ecosystem services that stem from a very different conceptual background than the aforementioned categories. The idea of connecting all these into the evolving new production paradigm or economic model requires new thinking and relating the concepts more closely to that how other disciplines as well as companies, organizations, and various stakeholders already work on services.

This means that without further clarification and further elaboration, it will remain very challenging to deliver the ideas of forest-based services to the decision makers and wider audiences. Services – including the services to society by the forest-based sector – deserve more attention in the evolving economic paradigm. Crucial questions are also what preconditions are needed for developing new or more value-added services, who are the actors providing services and who are the customers or beneficiaries of various servicing processes. The evolving service economy of the 21st century is an interesting framework to elaborate these questions from a new perspective, but it requires translating the forest-based services to concepts and models that the actors operating in the present service economy understand.

1.4 Future opportunities and challenges

1.4.1 Evolving forest-based sector in a service economy context

As the above broad overview illustrates there is a rich research tradition in several disciplines investigating the increasing role of services and its implications. Macro-economic analyses as well as services research have been interested in the interdependencies between manufacturing and services (Chapter 1.2). It has been recognized that the intangible services become more and more difficult to separate from the tangible goods production. In the business and engineering studies a similar development from goods and services to a synthesis view is perceivable, as well as the trend from analyses of linear value-added chains to analyses of value networks, or further, wider systems. Services such as IT systems, logistics, marketing, R&D, retail/wholesale and various business services are inherent to production processes. Often services, such as technical services that assist the customer to use a product or materials, need to be offered for the customer whether they generate separate cash flow or not.

Compared to this, the interlinkages between the primary production and services have been less investigated. Yet, similar developments than those recognized in manufacturing can also be found in the primary production: forestry is a knowledge-based activity, where public organizations and private companies utilize technology-enabled services and develop their processes to satisfy the customer needs, for example, the changing needs of forest owners. Wood procurement is not only harvesting and after-harvesting operations, but also various legal, financial and other services related to the property management are provided for the private forest owners. This development has taken place within the primary production sector, but it connects with the services sector of the economy. In the forest industry, similar to other manufacturing industries, services refer to inputs acquired from external service providers, the increasing capacities built in-house or aimed by joint ventures, as well as services added on the products for the customer.

The notion how the business and engineering sciences have evolved to address the increasing role of services in their investigations provides new perspective also to the evolving forest-based sector: what comes to the fore if we address the changes in production as a more profound

system transition, instead of seeking to assess the services separately from the tangible, material processes? Overall, is it possible to assess services and develop the high-value added services separately from the evolving circular bioeconomy processes? And from the forest-based services conceptualizations (Chapter 1.3.3) point of view; do the services to society, such as sustainable management and use of natural resources, connect with the evolving service economy? The following three forest-based sector contexts illustrate these questions. All examples are from Finland and highlight the recent developments of crossing the traditional sector boundaries.

1.4.1.1 Pulp industry: from pulp mills to biorefinery ecosystems

The biggest forest industry investment in Europe in recent years has been the Metsä Fibre bioproduct mill by in Äänekoski, Finland, which started operation in 2017. It has been introduced as a business ecosystem specializing in different bioproducts and services, and with several small-and-medium-sized companies operating together with Metsä Fibre. Resource-efficiency is the key concept of the ecosystem and, in essence, one producer's waste becomes other producer's raw material. The main product of Metsä Fibre is still softwood pulp for paper production, but the company is seeking new uses for this raw material, for example in the textile industry. The company has participated, together with other large forest industries in Finland, in technology and R&D programs with downstream partners, such as the clothing company Marimekko, in order to support the whole supply chain development from raw materials to the end customers. Even though the pulp companies' position is that of a raw material producer, they seek to enter to more value-added products, to develop a brand name for the new material and to improve their technical services so that the customers could serve their own customers better. The R&D project is still ongoing, but Metsä Fibre has already presented its first pilot garments to raise awareness of the public as well as interest of the potential investors to test and scale up the production for textiles (Palahí and Hetemäki 2017, and further information in http://bioproductmill.com/).

In this example, trying to estimate the value of services separately from the tangible production is very challenging. In fact, many of the services, such as R&D, testing, monitoring and other expert services would not exist without the investigations on novel ways to utilize pulp and its production process. Furthermore, the new materials or products of biorefineries are not necessarily directly applicable to the further downstream production but require also adjustments in the customer industry processes (Bauer et al. 2016). Development of solutions necessitates interaction across several levels of the value networks and deeper understanding of the customer needs throughout the supply chain. Services, such as necessary resource management tools, knowledge flows or data and monitoring systems, develop integrated into the tangible production processes, and they affect both the upstream supply chain and the downstream customers. Processes become re-configured through resource integration and mutual learning of multiple actors. The higher value-added services are activities embedded in production and recognizing the opportunities for transferring these skills and knowledge to another use context requires new thinking. Many of the future bioeconomy services do not yet exist because the technologies and applications are currently developing.

1.4.1.2 Wood products industry: from engineered wood products to building systems

Examples of the wood products industry leaning towards services are that a company producing wooden frames offers assembly services to its customers, or a company producing wooden elements offers the customer with a technical solution including planning, the product, its

engineering and assembly. Large wood product companies that operate in the global markets, such as Stora Enso, have developed building information model tools including country specific requirements for example on acoustics and fire safety in their key market areas. These tools assist architects and engineers to design and plan wooden buildings according to the national rules, and thus, support adoption and use of the engineered wood products, such as cross-laminated timber (CLT) and laminated veneer lumber (LVL). Even if the companies still are suppliers of varied wooden products for the construction industry and pre-fabrication of wooden elements and modules, they seek to provide solutions that assist both their direct customers as well as the supply and production networks of these customers (Pelli et al. 2018, and further information in http://buildingandliving.storaenso.com/products-and-services/building-systems)

As in the above biorefinery example, also here services do not necessarily generate new cash flow, but they are necessary for the customer adopting wood-based solutions. The wood products offer renewable sustainably-sourced materials and novel technical solutions for multi-story buildings and large-scale construction which has traditionally been dominated by the concrete and steel industries (Hurmekoski, 2016). The construction industry, in turn, can be defined as a complex products and systems sector, partly manufacturing and partly services. It integrates various supplies, materials, components, and equipment as well as engineering, design, consulting, project management, and financing services. Complex processes, capital intensiveness, and project-based activities lead to an emphasis on cost-efficient processes, risk minimization, and a slow adoption of novel technical solutions (Bröchner, 2010). Furthermore, regulations, norms and standards are local, thus, for example the planning and engineering services that are necessary for designing the technical solution need to be acquired in the country where the wood products are used. Also, assembly and pre-fabrication or on-site services are domestically sourced. It is costly to move downstream in the value-added chain, and the construction industry has strong operation modes that dominate the market. Finding higher value added from wood as material would require rethinking the solutions for the whole supply chain as well as for the inhabitants, users, tenants or businesses operating the buildings. For example, solutions contributing to human health and wellbeing, better living or higher employee productivity do not stem from the construction material as such, but the design of the built environment at large. New products and services could be provided, but the established market players are not necessarily the primary source of such thinking to develop the built environment.

1.4.1.3 Forestry: from forest data to big data

The service platforms, new digital applications and technology solutions are foreseen to support the implementation of the Finnish bioeconomy strategy by efficient mobilization and use of wood. The forest data, in turn, is developed to ensure more accurate and precision data for the decision making at different levels. Several lanes of forest big data developments are ongoing and seeking to combine the data flows from satellite-based data, laser scanning data and the data collected by harvesters during the forestry operations. Focus is on wood procurement and an efficient biomass supply, but it is foreseen that the digital infrastructure enables also improved biodiversity monitoring, and for example, development of carbon balance related tasks. The online service ‘Metsään.fi’ for forest owners and service providers (metsaan.fi) was launched by the Finnish Forest Centre in 2011. It provides the forest owners a direct access to data on their own forests. Previously they could acquire this data only if the forest expert organization had prepared a forest management plan for their property. The goal of the online service is to improve efficient utilization of the data collected by public funding

and to support active forestry operations in the private-owned forests. Parallel to this, the large wood procuring companies have developed their own information tools and services. As an example of the evolving market, the online wood procurement platform (kuutio.fi) opened in 2017 in collaboration between the forest owners and wood procuring industries. The development of these new service platforms is coordinated by the established forest sector organizations (Pelli et al. 2018).

The initiatives of an open forest data strive for platform thinking; thus, opening also opportunities for new types of services and new service providers. Pilot ideas are already tested, such as berry data applications or forests for recreation use (www.berrymonitor.com), but they are still at an early stage of development. As the examples of digital solutions in other sectors illustrated (Chapter 1.2.5), the platforms enable also consumer-to-business or citizen-to-administration, citizen-to-citizen and so forth interactions. We are just in the beginning of these developments: services as well as the service provisioning and how value becomes created, distributed and captured is evolving. If somebody has a business idea – or a strong opinion about something – there are new means to turn it into a market action and in a very quick pace test it, multiply it and sell it further.

1.4.2 New perspectives: from services to service systems?

As an overall observation from the above forest-based sector developments can be concluded that the increasing role of services is not only about the services business that we already know how to measure. The phenomenon it is also about the qualitative changes within the production processes that we do not have concepts and models to describe how the forest-based sector actors benefit their customer industries' processes and how they could improve their service to the customer industries of today as well as the ones in the future.

In marketing language what companies offer to their customers is called 'value proposition'. The value proposition answers to questions: how the customer benefits from selecting the particular product or service, what is required from the customer to use the product or service, and sometimes also how the proposed solution contributes to the customer processes in a longer term (summarily in Payne et al. 2017). Thus, even if there are no explicit services added on a product, the company serves the customer by fulfilling its need and inviting the customer to integrate its resources to create value from the company offering. For example, the forest industry companies offer to their customers timely delivery of requested quantities and qualities, traceable supply chain to ensure sustainable use of the renewable raw materials, and efficient processes to ensure competitive prices. This value proposition is repeated for products, such as sawn wood or pulp, as well as higher value-added products, such as engineered wood products or pulp for a specific product segment for example in food industry. The new bio-based solutions, which are promoted for substitution of materials with the renewable ones, such as bio-based fuels for energy, wood for multistory construction, wood-based pulp for textiles or substances for chemicals and other industries, require a new type of value proposition.

As highlighted in the above examples, the new solutions require modifications of the customer industry processes, and the forest industry companies need to think of means to assist their customers to adopt the new products. Means to assist the customers is called service, even if these engineering or other services do not provide cash flow or they would no more be needed when the customer process is fully accustomed to the new material flow. Value is not created in production, but it requires integration of the customer resources. Service research (Chapters 1.2.3-1.2.5) is interested in these interactions because they enable continuous process

development: innovation does not cease when the customer process is ready to fully utilize the new solution, but the established feedback loop between a producer and its customer generates continuous inputs to further develop both the customer's value network and the producer's supply network.

Today these interactions are technology enabled, (see the algorithm revolution by Zysman et al. 2011), but the idea is in principle the same in any service exchange. For example, a forest owner is not a target for the offer by the forest services provider, but he/she could be understood as a source of necessary knowledge and skills for the forest management and planning, and sustainable use of natural resources. The interaction between the producer and customer, or service provider and user, creates the basis for the future value creation.

The opportunities and challenges by services and service provisioning in a future bioeconomy can no more be solely assessed with the concepts of past production paradigm. For example, the internationally distributed supply chains where services have played a crucial role during the past decades do not provide a direct analogy to project the development of today's supply chains: enabling technologies are now different and new applications are already foreseen to create opportunities for new service concepts; resource scarcities have increased demand for renewable resources as well as for resource efficiency solutions, and; what is becoming more and more abundant is data and information, but the rules and practices related to the use of this resource base are developing (cf. OECD 2017). Neither the services businesses can be expected to remain the same: the knowledge-intensive business services as well as the tourism, health and wellbeing services will evolve together with the new enabling technologies and changing modes of production and distribution. These developments are taking place parallel to the evolving circular bioeconomy – whether or not the forest-based sector and its organizations are actively developing new services or contributing to the definitions what is understood by service.

In other words, there is an opportunity to rethink what are the services to be developed for future income in a bioeconomy, what is produced as-a-service based on forest resources, or in more general terms, what is provided as service to society by the forest-based sector. Without an overview on the issues, concepts and models of service research, it is difficult to position the forest-based sector or its services into a wider debate about the evolving production modes or what is called as a 'service economy'. This service economy is under construction. For example, in the research on services a shift towards systems thinking can be perceived, yet, there are several lanes of research on these service systems, such as technological systems or platforms, business-to-business networks or supply systems, markets as institutional systems or the product-service systems and their impact on sustainability. These conceptualizations provide new perspectives to assess what we understand by increasing role of services, its past developments as well as its future in the forest-based sector context.

1.5 Conclusions

This chapter provided a broad overview of the increasing role of services in the forest-based sector. Focus was on trends and drivers detectible in different disciplines investigating services and related developments as well as the forest-based sector research. What was described as a service economy in fifty or twenty years ago, are not the same ideas of a service economy that are investigated today.

Three forest-based sector developments were described. The examples do not allow projections to be concluded on the macro-economic developments or, for example, market outlooks of services. Instead, attention was drawn to the observation that the increasing role of services is not only about the services business that we already know how to measure, but also the qualitative changes within the production processes. The interdependent developments of technology and society, affected by the increasing resource scarcities, change what we measure as services and what we expect as service. These developments are ongoing. The concepts and models developed in several fields of service research could provide means to elaborate renewal of the forest-based sector, including the new services businesses, but also more profound transitions towards a circular bioeconomy.

Services – including the services to society promoted in the forest-based sector strategies – deserve more attention both in the forest-based sector research and in the circular bioeconomy strategies. However, the forest-based services require clarification and relating the concepts more closely to that how other disciplines as well as companies, organizations, and various stakeholders already work on services. Without further elaboration, it will remain challenging to deliver the ideas of forest-based services to the decision makers and wider audiences.

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