Innovation Systems in the Bioeconomy: Course essays

#BIOHEL2017

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The course “Innovation systems in Bioeconomy” helped me to understand the connections between different fields coming together in the context of innovation and assisted to grasp the whole dimension of the bioeconomy and innovation approach.

The input and discussions during the lectures and excursions as well as fruitful interactions and consultations with other course participants supported my learning process. The best part of the course was to actually meet other people working in the same field and dealing with similar topics. This circumstance of being confronted with similar problems and getting the possibility to share experiences brought a very special connection between all course participants, students and lecturers.

This was a unique opportunity for me of which I am glad not to have missed out.

Take home message by Sabine Neuberger, University of Applied Sciences (Germany)
The need to integrate political science concepts with innovation systems approaches to bioeconomy

by Alex Giurca

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This essay represents a critical reflection after attending the NOVA PhD course “Innovation systems in the Bioeconomy”, held between 28.08 and 01.09 at the University of Helsinki, Finland. This five-day course aimed to provide a systematic overview of innovation, innovation systems, and their role in industrial transformation towards a forest-based bioeconomy. The present essay reflects upon the course content and provides a critical discussion about possible gaps in the current innovation systems debate. This essay is structured as follows: first, a series of concepts and approaches presented during the course are briefly summarized and discussed. Second, three main “white areas” in current debates around bioeconomy innovation systems are highlighted. Finally, a series of important concepts and insights from the political science literature - that could prove promising in addressing some of these “white areas”- are discussed.

Background- Innovations for the Bioeconomy

The one-week course covered a series of topics, ranging from general conceptual frameworks dealing with technological transitions (e.g., the multy levels perspective Geels (2002) and technology innovation systems (e.g., Bergek et al. (2008), to more organizational-focused discussions around organizational culture of innovation (e.g., Hogan and Coote, 2014); business models (e.g., Sörensen et al., 2013); ambidexterity (e.g., Hansen et al., 2015); service dominant logic and innovativeness (e.g., Hult et al., 2003); change management; new product development and innovation diffusion (Hansen and Breede, 2016; Roos et al., 2014). The premises of these discussions was the bioeconomy concept and its implications for the forest and wood sector.

The bioeconomy is an emerging macro-political concept that is already shaping entire science and technology policies in Europe and beyond. Although there is still much debate around its meaning, the bioeconomy can be understood as the transition from a fossil-based economy to an economy where the basic sources for products, chemicals and energy would be derived from renewable biological resources (McCormick and Kautto, 2013). The forest sector, with its abundancy of raw materials, knowhow, expertise and technological infrastructures, is seen as an important sub-sector of the overall bioeconomy.
(Hetemäki, 2014). For example, in forest rich-countries like Finland, the forest sector is seen as the main driver behind the national bioeconomy (MEE, 2014).

Yet in order to achieve a more momentous transition towards a bio-based economy, the European forest-based sector would have to undergo a process of “creative destruction” (Hetemäki, 2014). This process can be understood as an “industrial mutation”, where economic activities or sectors eventually decline and vanish, while at the same time new technologies, products and business models emerge. The main reasons behind this continuous evolutionary process is maintaining the market economy (Hetemäki, 2014), or in this case, for achieving a bio-based economy. Such processes have been well documented in European and US industries from different sectors, where companies had to continuously adapt, innovate and reinvent themselves. Yet “traditional” forest based industries, characterized as mature, resistant to change, and lacking innovation, have often found themselves taken aback by structural changes that eventually led to their decline (Hansen and Breede, 2016). A series of such structural changes currently affecting European forest products markets are caused by e.g., digital media replacing graphics papers; policies focused on climate change and renewable energy or by investments in R&D aimed at the renewal of the forest-based industries towards the bioeconomy (Hetemäki, 2014).

It was from this perspective that the discussions in the NOVA course started. The discussions set out from the premise that a transition to a more sustainable bio-based economy is necessary and inevitable. Yet how the forest sector navigates through this transition will have major implications for many of its traditional industries. Thus, whereas some segments of forest industries in Europe are in decline (e.g., graphics papers) or stagnate (packaging papers, sawnwood), other segments are on the rise (e.g., biochemical or engineered wood products). Potentials for new production concepts and business models are emerging, such as lignocellulosic biorefineries, bio-product mills or prefabricated wood elements (Hurmekoski and Hetemäki, 2013). However, in order to adapt to such structural changes, forest companies would have to embrace innovation and foster an innovative culture (Hansen and Breede, 2016; Roos et al., 2014). Additionally, as the forest sector is gradually diversifying its forest-based activities, traditional actor networks are changing, and new actors are entering into the forest-based sector (e.g., energy and chemical companies as well as private investor groups) thus fundamentally reshaping traditional business structures.

Criticism- three “white areas” in the discussion
Although the course provided a basic overview of the most relevant concepts related to innovation systems in the forest-based bioeconomy, I found that it lacked some more fundamental discussions around the very nature of the bioeconomy concept, as well as the lack of attention to agency and the “politics of transitions”. Below, I will briefly outline some of these criticisms, and refer to relevant literature from the political science field:
• **What is bioeconomy?** Besides climate change, maintaining economic growth and employment are central arguments for transitioning to a bio-based economy. Most policy incentives present this as an uncontested evolutionary process that serves to maintain the vitality of capitalism, or of the market economy. Yet there is very little debate about the limits of growth in the bioeconomy, the pressures on natural resources and on the environment. In the NOVA course as well, most discussions seemed to revolve around ‘how can companies make bioeconomy happen?’ rather than first dealing with more fundamental questions of ‘what is bioeconomy?’ and ‘why should we make bioeconomy happen?’ For example, Goven and Pavone (2015), provide a more Marxist theoretical perspective by describing bioeconomy as mainly a political project, not simply or primarily as a technoscientific or economic one. They argue that this project is meant to bring about a particular set of political–institutional agendas such as increasingly commodifying nature and knowledge. Additionally, they warn scholars about the potential risks of unintentionally contributing to the legitimation of the bioeconomy project without fully understanding the political interests behind it. It is thus perhaps worth noting that there is more behind the bioeconomy discourse than just pure philanthropy and environmental concerns. It is here where questions related to power, political interests and lobbying come into play. New business models and technological innovations will not necessarily provide easy technical fixes for our environmental problems. More fundamental shifts in behavior, consumption, limits to growth and even de-growth would need to be addressed in future bioeconomy discussions.

• **Is the bioeconomy truly sustainable?** Empty rhetoric about sustainability seems to repeat itself yet again under the bioeconomy. Recently, a growing number of academic publications have criticized the bioeconomy’s approach to sustainability and sustainable development. For example, Kleinschmit et al. (2017) find that bioeconomy strategies present sustainable development in a rather rhetorical way that mainly serves to promote technical solutions and economic efficiency. Nature products are seen as detached from their natural and social surroundings, and innovations are mainly perceived as technically engineered processes (Pülzl et al., 2014). Similarly, Ramcilovic-suominen and Pülzl (2017) argue that sustainable development is often used by policy-makers, stakeholders and the private sector, as a ‘selling point’ for their agendas and goals. They find that the EU bioeconomy policy leans strongly towards prudentially conservationist, utilitarian and instrumental approaches to sustainability. Particularly in Finnish forest policy, Kröger and Raitio (2016) find that the dominant pathway to sustainability aims to safeguard increased timber production that mainly promotes a production-oriented forest policy, with less emphasis on environmental or social concerns. Mustalahti (2017) argues that the Finnish bioeconomy policy, at least in its current form, seems to be rather detached from social aspects, and maintains that the current discourse relating to
the forest-based bioeconomy does not place sufficient weight on the interaction between citizens, decision-makers and bioeconomy proponents.

- **Agency, power and the politics of transitions**
  Different frameworks dealing with innovation systems were discussed at the beginning of the NOVA course. Particularly, the technological innovation system (TIS) framework (Bergek et al., 2008; Hekkert et al., 2007) was presented as a promising approach for studying innovation systems under the bioeconomy. This framework has been used in recent years in a variety of empirical studies, often single country case studies focused on bioeconomy innovations, mostly in the area of lignocellulosic biorefineries (see e.g., Giurca and Späth, 2017; Hellsmark et al., 2016). Purkus et al. (2017) went one step further by arguing that the bioeconomy can be regarded as a TIS in itself that encompasses mature technologies in the diffusion phase (e.g. construction wood) as well as new technologies in the innovation stages (e.g., biorefining processes), or a combination of both. However, the explanatory ability of the TIS framework has been contested, especially if one takes into account issues related to the “politics of transitions”. For example, Kern, (2015) argues that the pervasiveness of politics influences other functions in the TIS such as ‘market formation’ and ‘legitimation’. He calls for deeper theoretical assessments of who is actually driving (or hindering) TIS processes and how. Furthermore, Kern asserts that the analysis of actors and actor strategies should go beyond firms focusing on market entry, and generating knowledge, and should focus more on investigating the political agency of different actors and their activities of coalition building, lobbying, creating narratives etc. Although efforts have been made in this direction (see e.g., Ahlborg, 2017; Hess, 2014) the politics of technological innovations, particularly under the emerging bioeconomy, is in need of deeper empirical and theoretical assessments.

**The way forward**

Overall, the NOVA course provided an interesting platform for discussing different frameworks and concepts for studying innovations under the bioeconomy. Coming from a forest and environmental policy background, the discussions around innovations from organizational, business and marketing perspectives were particularly interesting for me. However, these discussions also left a series of open questions in the bioeconomy innovations systems discussion. I summarized and discussed different “white areas” under three main critique points: first, “What is the bioeconomy?” - where I reflected about the meaning of the political concept of bioeconomy and its implications; second, “Is the bioeconomy truly sustainable?” – where I addressed the concept of sustainability and its rather rhetorical interpretation in different bioeconomy policies; and third, “Agency, power and the politics of transition” - where I discussed how political science can complement the TIS literature. Particularly, this latter point has inspired me to dig deeper into the politics of transitioning to a forest-based bioeconomy, and has encouraged me to further pursue this issue in my PhD. In the near future, I aim to produce a theoretical
The need to integrate political science concepts with innovation systems approaches to bioeconomy assessment on the influence of agency, coalition building and narratives for the forest-based bioeconomy transition. The newly gained insights into technological transitions and organizational and business studies will surely come in handy for this endeavor.

I am grateful for the opportunity to participate in this course and look forward to future collaborations with tutors and colleagues from the NOVA network.

References


Innovations needed – barriers of multi-objective service development for Finnish private forest owners

To ensure the sustainability of forest use in Finland we need to strengthen the provision of ecosystem services other than timber production. At the moment the ecological status of Finnish forests is not good enough to maintain the biodiversity (Rassi et al. 2010). Policy makers urge for increased amounts of timber harvested and the forest industry aims for that. This puts pressure on the forest management and felling practices to safeguard the good status of biodiversity that has mainly been threatened by the forest management practices. At the same time there are more and more forests left outside of active management (Suomen Metsäkeskus). Socio-demographic changes of forest owners are one cause, but a recent study (Haltia et al. 2017) indicate that one reason for leaving the forest untouched is that the forest owner doesn’t find services that would meet their objectives and expectations about how the forest should be managed. Forest owners are less often economically dependent on selling timber and therefore increasingly more interested in forests’ other benefits, such as biodiversity conservation, recreation or landscape protection (Hänninen et al 2011).

Forest owners’ increased freedom of choice and manifold objectives for the use of forests set pressures for forest planning and advisory services to meet the changing demands to give forest owners information they need by means they are used to exploit (Mattila and Roos 2014). Integrating multi-
objectivity into forest management introduces complexity and requires changes in the practices of organizations that advise and implement operations in the forests (Primmer 2010).

Organizations offering services for forest owners in Finland are mainly the same that are involved in timber procurement and forest industry. They have a long history of tightly regulated forest management that was aimed to maximize even timber flows for industry (Mattila et al. 2013). Big companies such as UPM or Stora Enso are old and well established, they are considered having been of low innovativeness and their main business turnover still comes from the very traditional timber products. These organizations also offer forest advisory services to forest owners they buy their timber from. In addition to forest industry companies the forest management associations (FMA) (local associations with professional staff led by forest owners) and numerous private, mostly recently founded, and still rather small and local, forest enterprises offer advisory services. Also the FMAs have a long history of tightly controlled operations and obligation to advise forest owners for good management of their forests.

Forest sector organizations have been found to be inert and isomorphic (Primmer 2010). Inertia means that the organizations have a limited ability to recognize and react to changes in their operational environment, isomorphism is a tendency of organizations and their practices to develop toward uniformity as a result of coercion, normative pressure or mimicking (Primmer 2010). In this light it is reasonable to consider that forest advisory services in Finland lack innovativeness and it is hard to change the long traditions of rather one-sided advisory services that are built rather upon the implementation of law and regulations than on serving the needs of a customer, the forest owner. The chemical and mechanical forest industries have the characteristics of incumbent firms,
but I argue that the timber procurement and forest advisory services are as incumbent as the other parts of the value chain.

Hill and Rothaermel (2003) refer with the term “technology” to the scientific methods and materials used to achieve a commercial or industrial objective. Forest sector has developed and effectively continuously implemented new practices such as mechanization of harvesting and GIS-based forest inventory systems. After being firstly introduced decades ago changes in these technologies are incremental technological innovations that build upon the established knowledge base used by incumbent firms and they steadily improves the methods used to achieve the firm’s objectives (Hill and Rothaermel 2003). In contradiction with incremental innovations, a radical technological innovation involves methods and materials that are novel to incumbents, and are derived from either an entirely different knowledge base or from the recombination of the parts of the incumbent’s established knowledge (Freeman and Soete 1997, as in Hill and Rothaermel 2003). Operations and advisory services for timber production oriented forest management has been the business as usual to forest sector actors, and they have developed it incrementally to meet the growing demands for efficiency. However, the change to multi-objective forest management and advising forest owners with multiple objectives seems to be a radical technological innovation of one kind. It includes different knowledge base (e.g. information on ecology or practices for efficient uneven-aged felling) and recombines parts of the incumbent’s established knowledge (efficient forest management). New knowledges need to be applied and combined and they partly replace the current knowledge and practices.
Legal regulations about the function of FMAs and about the management of forests in Finland has been recently released as a consequence of changing forest owner requirements and expectations. Especially FMAs have lost their special standing as the official organization advising forest owners. The advisory services have moved to a fully market-oriented situation where the customer is free to choose their service provider and the services they want to have, if any. This new market situation happened at the same time with changes in the form of services meaning digitalization and with growing demands for more diverse service contents (e.g. uneven-aged felling, game friendly management), and in the period of bad economic situation.

Innovativeness itself should not be an objective, but it may be a necessary precondition for the company to be able to perform profitable over a longer period of time. Innovativeness, meaning an organizational culture that easily adopts new and novel approaches to serve clients’ versatile needs, helps service firms to differentiate from their competitors and hence to compete more successfully (Hogan and Coote 2014). In forest advisory services that means a capability to cost-effectively offer multi-objective, tailor-made-alike services to forest owners who have different objectives and different amount of resources (knowledge about forests and time to invest in learning).

It can be argued that there is a lack of service innovations in the Finnish forest advisory service market. Innovation adoptions are organizational responses to external environmental changes (Subramanian 1996). Change in forest owner structure and behavior is an example of external environmental change. The adoption of innovations by an organization is a consequence of strategic initiatives proactively pursued by decision makers in the organization (Subramanian 1996). Innovation processes are affected by all kinds of dynamic circumstances (Boer and During 2001), and hence the bad situation of the world economy and the demand for cost-effectiveness when the market
situation is new might explain the hesitance to put resources to innovate and trial new ways of working. Trialing requires time and costs money (Boer and During 2001).

As innovating and trial and error development processes need personnel and other resources, they require commitment and involvement from top managers (Boer and During 2001). If the management doesn’t want to allocate resources for developing new kind of services for forest owners, which at least in the development phase take more time than business as usual, it is very hard for an individual forest professional to offer those to customers. Hence the changes must originate from the leadership level (Hansen and Breede 2016) and the organizational culture must support the innovativeness. Organizational culture is a social force that significantly influences market performance, employee attitudes and organizational effectiveness and hence elicit desired organizational outcomes (Hogan and Coote 2014).

Jaruzelski et al. 2011 grouped companies based on their innovations strategies. They found the group “need seekers” as the most profitable and outperforming their rivals. The central character in the group was the active and direct engaging of both current and potential customers to help shape new products and services. These companies acknowledge often unarticulated needs of the customers and manage to bring the respective new products and services to the market (Jaruzelski et al. 2011). That kind of strategy would help to create new services for the new forest owner groups whose needs and preferences are not yet that clearly articulated. However, that kind of thinking has been lacking in the Finnish forest organizations, as they have been rather only implementing policies and tightening environmental regulation than following the logic of organizational adaptation to changing environment (Primmer 2010).
The “need seeker” strategy of co-creating new services resembles the concept of co-production by Vargo and Lusch 2016. It refers to the creation of the value proposition, meaning design, definition and production of a tangible product or an intangible service product and to “value co-creation” which is the actions of multiple actors contributing to each other’s wellbeing.

Value creation for multi-objective forest owners would require the networks of actors co-creating the services by combining different knowledges. In addition to forest owner and they objectives and resources and the primary service provider (advisory organization) forest and environmental authorities and for example the possible recreational users of the forest could participate in the process. As Vargo and Lusch (2016) write, value is created through the integration of resources that are provided by many sources, and including a full range of market-facing, private and public actors.

Developing multi-objective services for private forest owners requires changes in ways organizations work, as the multi-objectivity itself requires taking the customer with to plan the operations and to provide knowledge about their preferences. However, as both research and practice show that multi-objectivity is a growing trend in forest owner objectives, taking this challenge seriously is the prerequisite to continue business. Some positive development can already be seen with the service offerings. However mainstreaming the new practices still requires changes in organizational cultures and attitudes of top management and employees, and support from scientific studies to provide knowledge inputs for new practices.
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**Forest-based bioeconomy: full speed ahead?**

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**Abstract**

Bioeconomy is a concept that has many interpretations: it is something forming out based on the existing and new resources, existing and new technologies, and of the traditional production, such as the forest sector, as well as of the new industries emerging across old sector borderlines. How can we make sense of the developments if the accustomed classifications and metrics are becoming outdated?

This paper reflects upon the NOVA course “Innovation Systems in the Bioeconomy” discussions vis-à-vis my own study field, i.e., forest sector foresight and the question of increasing role of services. It starts with food for thought on what we need foresight for in system transitions, summarizes examples from the course week how the increasing role of services relates to the evolving bioeconomy, and concludes ideas to connect the multi-level perspective (MLP) on socio-technical changes with the service-dominant logic (SDL) conceptualizations: innovations take place both in technological and market niches.

Key words: bioeconomy, forest-based sector, services, transitions, multi-level perspective (MLP), and service-dominant logic (SDL)
Introduction

Finally on April 10th, the M/S FBS was ready to depart from its harbor to New Work, city of dreams on the other side of the Paradigmatic Ocean. The trip had been prepared since the beginning of the new millennium, and 2,223 fortunate ones had gained access to the record-breaking journey. The vessel was a highlight of the latest engineering work, efficiency and economies of scale: not only was it rapid and cost efficient to build but also renewable and, thus, practically unsinkable. The engines were roaring, eager to proceed – with bio-based fuels, of course. Everything that could be substituted with wood had been substituted, and the rest would be done so on the go: laboratories onboard ensured that by the arrival to New Work all would be bio-based. The M/S FBS was certified according to the highest standards: its stocks were abundant of biomass for various material uses, and its diversity of species, micro climates, air, soil, fresh water and recreation opportunities were to fulfill the needs of the passengers and the crew. Latest satellite technology was in use for an early warning system detecting the challenges ahead. Slight anxiety rose from the fact that there was a lifeboat capacity with only 1,178 seats, but this all was designed for efficiency: fast-growing species would provide material for building more lifeboats during the journey – besides the little seedlings looked very cute on the front deck, spreading their branches like kings of the world. The trip started with high spirit. In the evening of the April 14th, the high officers gathered on the bridge. The lights of the early warning system blinked playfully. They had done that already in the harbor, because the system was expected to calibrate itself based on the data accumulating during the journey. Captain lifted his Champaign glass: “We’re not even running with a full capacity, can you imagine! And such a clear sky. What you say, full speed ahead?”

The above story is inspired by the ocean liner Titanic that set sail from Southampton for New York in 1912. The analogy is not a promising one, but it tickles imagination. How would the story continue: will the M/S FBS reach New Work?
Innovations are about new ideas shared with others, put into use and spread to other contexts. Or in products-language: innovations are inventions that are launched in the markets (Garcia and Calantone, 2002) or new combinations of means of production (Schumpeter, 1934 in Weiss, 2011). Whether innovations are of technological or non-technological character, radically new or incremental through practices and interactions (cf. Toivonen, 2016), they require entrepreneurs that are ready to take a risk: not all challenges ahead can be foreseen. The M/S FBS can be understood as an innovation system, comprising of the old forest-based cluster which is extending towards new collaborators and potential customer fields (e.g. energy, chemicals, pharmaceutics, construction and so forth), as well as towards totally new industrial activities that novel technologies would enable (cf. Purkus et al., 2017).

Bioeconomy is naturally more than the forest-based solutions, and as such, it brings afore also tensions towards the future. Bioeconomy is promoted as a new production paradigm: shift from a petroleum-based economy to processes using renewable biological resources and new (bio)technological solutions; “an economy where the basic building blocks for materials, chemicals and energy are derived from renewable biological resources, such as plant and animal biomass” (McKormick and Kautto, 2013; Bauer et al., 2014). Yet, there are diverging ideas of a bioeconomy and the ways envisioned to it: industry federations, NGOs, governments, politicians at international, national and regional levels, but also researchers from different disciplines emphasize different viewpoints. In the European-level processes even the term “bio-based” is dedicated to a specific purpose somewhat different from its first connotations in a forest sector context (see “bio-based products” or “bio-based industry” in JRC, 2016). Overall, the technological and economic goals of bioeconomy strategies are claimed to override the perspectives of a societal transformation and sustainability (McCormick and Kautto, 2013; Bugge et al., 2016). Also the forest-based sector actors themselves have varying understandings whether this concept is about anything new, how much of new or how much of something useful for the traditional forest sector (Hurmekoski, 2017 by
A. Toppinen during the NOVA course. The necessary renewal of the traditional sectors proceeds parallel to the emergence of new bio-industries, and this causes ambiguity. At the same time research collects evidence to support decision making towards a *forest-based bioeconomy*. In fact, which bioeconomy are we talking about: is it just a tip of an iceberg that is coming visible?

The alternative interpretations of a possible future are material for futures studies. Foresight analyses are practical application of futures studies and they address *futures in plural*: although we cannot predict the future based on the past developments, it is possible to improve the decision-making of today as well as our preparedness to face the future when the plans do not realize. The journey of the M/S FBS may start with flags high for the “bioeconomy”, but by the destination New Work there are also other currents in the sea. Some of them were also mentioned during the NOVA week, such as, “circular economy”, “green economy”, “sharing economy” or “service economy”. My own research looks into the increasing role of services as a phenomenon for investigations of forest sector foresight.

**Service economy developing parallel to the evolving bioeconomy**

Today the services sector contributes some 70-80% of national value added and employment in the EU. This, however, is not a full picture: services are embedded in all economic sectors. For example, forestry as a statistical category within primary production includes forest owner services, thus, manual forest work but also various management and planning services. Also the division between manufacturing and services blurs: business services contribute an important input to the manufacturing operations, and manufacturing companies themselves produce services along their value chains, offer services to their customers with their own personnel or, for example, collaborate with external service providers to provide more extensive solutions to their customers.

Such developments are not unfamiliar in the forest sector either: Wood products companies provide building information model tools for architects and engineers to support use of
their products, pulp companies offer technical services to their customers, and the wood procuring companies offer private forest owners with services for harvesting and after-harvest forestry work, but also financial and legal services for managing the forest property. Services are a means to differentiate oneself from the competitors, and companies seek for better understanding of how their products and operations contribute to the customers’ processes.

During the NOVA week also other examples of serving the customers were highlighted: the forest machine manufacturer Ponsse provides its potential customers with a virtual experience to test the machine operations (Parviainen presentation). The customer encounter in the sales process and the after-sales services provide important information for developing the product. The textile and clothing design company Marimekko offers consumers experiences: the feelings that the product and its use convey are important, and transparency of the whole supply chain is part of the story both for the garments made of wood-based fibers and of responsibly sourced cotton. The examples highlight that the tangible and intangible elements of company offerings become inseparable: there is no one without the other.

Furthermore, digital technology has enabled emergence of new types of markets and operation models which reach beyond typical market actors; Airbnb and Uber are perhaps the most often cited examples. It has become challenging to define who is “producer” or “customer” in the online platforms, but similar situations can also develop in the more tangible production setting. During the NOVA excursion to Riihimäki Circular Economy Village, the waste management company explained that it has a contract with paper recycling organizations, but it is a business secret who pays to whom; in other words, we were not told whether the transaction is based on raw material supply (waste paper) or on service provision (waste treatment), or for example, whether the contract is defined with a threshold point when the roles of who pays to whom change. A service-based economy is not an issue of mere increase in number and volume of services, but a more profound change how production, distribution and usage can be organized.
The increasing role of services, its drivers or impacts on production processes have gained little attention with regard to the bioeconomy development (Pelli et al., 2017). In fact, if the definition of a bioeconomy is strictly limited to the *production and conversion of renewable biological resources* (EC, 2012), services remain invisible – although the production cannot run without maintenance, delivery channels, trade, retail, R&D, expert services a.s.o. And services are also opportunities for new businesses and sources of innovation. The NOVA course introduced organizations which operate within the Finnish innovation system; VTT and LUKE both are knowledge-intensive service organizations that contribute to RDI for the Finnish bioeconomy, as well as sell their services in the domestic and international markets. When these organizations were asked about services in bioeconomy, we ended up discussing nature-based tourism and recreation services. Indeed, these are an important part of the bioeconomy, too: The Finnish bioeconomy strategy explicitly recognizes nature-based tourism and new businesses related to ecosystem services as opportunities within the bioeconomy context (Ministry of Employment…., 2014). However, also the knowledge-intensive (business) services provide opportunities for economic growth and exports.

Also totally new services can be envisaged to emerge due to the technological advancements in bio- and nanotechnologies, sensor and digital applications etc. in a similar way how information and communication technology (ICT) led to emergence of new types of services (Chang et al., 2014; Gallouj et al., 2015). If bioeconomy realizes as a new production paradigm, why would the services businesses remain unchanged; for example, why would the tourism and recreation sector operate in the new bioeconomy in the very same way that it does today? From the foresight point of view, not only better data and metrics are needed about the role of services, but also new conceptualizations to understand the developments ongoing in production at large: *services effect on the evolving bioeconomy, but also bioeconomy effects on what will be defined as services or ‘as service’ in the future.*
Multi-level perspective to transitions towards a bioeconomy with a service lens

If the definitions and metrics to describe the economy are changing, how is it overall possible to assess the future developments? Addressing the bioeconomy as a production paradigm change calls for an analysis framework of systemic developments, i.e., understanding the changes of technology and society as interlinked. Changes that evolve over long time through complex processes, are not fully manageable or predictable, and involve often also sustainability considerations are studied as transitions of socio-technical systems (e.g. Markard et al., 2012). In several presentations during the NOVA week the multi-level perspective (MLP) by Geels (2002; 2005) was taken as a structure to guide analysis. It describes transitions across three nested levels: niches where radical innovations take place, regimes as established dominant socio-technical systems that enable but also constrain radical innovation, and landscape which represents the trends and developments that are beyond influence of the regime and niche players.

In my research, I understand the increasing role of services as a regime-level change. The phenomenon has evolved over several decades in the primary production, manufacturing and services sectors, and it affects how the necessary infrastructures, knowledge and material flows are organized and managed. Landscape-level drivers behind these developments have been technological advancements, international trade speeding up the use and dissemination of new applications, and increased interdependencies of the networked operations (see e.g. Gallouj et al., 2015). Services innovations are developed in niches, but regimes also use services to direct and support the gradual system change. Services are part of the knowledge structures of innovation systems, and not necessarily even recognized as separate entities of value creation, innovation or business opportunities: these services would not exist without the (tangible) production and technology processes that they are connected with (cf. above observation from the VTT and LUKE presentations).
Bioeconomy stretches across traditional sector borderlines. For example biorefineries are addressed as questions of biomass supply, new technologies and development of new materials, products and processes that connect traditional primary production to sectors such as chemical industry or energy sector (Bauer et al. 2014; Purkus et al., 2017; Giurca and Späth, 2017). New solutions cannot be developed without the further downstream production. The bio-based substitutes do not necessarily directly drop in to the customer industry processes but require adjustments by the customers too. For example, the Ioncell method for viscose production that was mentioned during the visit to Marimekko, is a long R&D process that affects only one step in the supply chain from pulp to fiber, to yarn, to textile …and finally to a design garment. Development of new bio-based solutions requires connecting the dots in a new way: value proposition of a pulp company shifts from a mere raw material supplier that provides its direct customers with technical services to an ecosystem player that seeks to support formation of the whole supply chain (see, e.g. http://bioproductmill.com/articles/towards-a-carbon-neutral-society ). Instead of mere supply-and-demand of efficient raw material processes, also new ways to integrate resources, mobilize necessary skills, capacities and contacts are needed.

Service research seeks to analyze these processes as socio-economic transactions: innovation is not only sought by R&D for new technologies or new products, but innovation is understood more processual and embedded in the interactions where products and services are exchanged (Toivonen, 2016). The service-dominant logic (SDL) by Vargo and Lusch (2004; 2008) stems from the marketing management field. Instead of value in exchange, focus is on value in use: value is co-created in resource integration of multiple actors. Services in plural refer to separable outputs and processes from the tangible goods or production, while service in singular means using one’s competences for the benefit of another party. The service lens by SDL highlights three aspects for the investigations of system transitions (cf. Viljakainen et al. 2013 about business models):
1. *customer’s networks and context of use* are as important as the producer’s supply chain networks for value creation. An industrial logic – or a goods-dominant logic (GDL) by Vargo and Lusch – is based on linear value-adding chains, and it does no more fit well to networked operations, often enabled with technology that connects the user with different stages of production and, thus, opens up feedback loops to continuous product/process development. The linear value-added chains will be part of the production also in the future, but they are nested in processes which require more systemic view on resource integration and re-configurations.

2. *integrated view on goods and services* is applicable both to business-to-business, business-to-consumer and consumer-to-consumer contexts – or as Vargo and Lusch put it: to any actor-to-actor context. The marketing field uses concepts such as ‘value propositions’ (summarily in Payne et al., 2017) to describe and analyze the ways how value becomes defined, created, co-produced or co-created. Value propositions – as the definitions of expected benefits of a product/service or a company, or for example, implementation of a sectoral strategy or government policy – provide parallel angles to understand how value co-creation forms out of the producer’s as well as customer’s networks.

3. *markets as systems are dynamic and adaptive*, thus, not manageable by any single player.

Vargo and Lusch (2011; 2016) describe service ecosystems with three nested levels: the producer-customer dyad where service for service exchange takes place (micro level); networks of networks connected through the dyad interactions (meso level); and the institutional arrangements that both enable and constrain value-co-creation (macro level).

The service ecosystem (Vargo and Lusch, 2011; 2016) is a system view on *markets*, and its conceptualizations can be used to complement the MLP with the perspective of emerging and evolving markets (see summarily in Table 1).
Table 1. Multilevel perspective (MLP) to socio-technical change and the three nested levels of a service ecosystem with a service-dominant logic (SDL) by Vargo and Lusch.

<table>
<thead>
<tr>
<th>MLP</th>
<th>SDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape: external trends and developments outside the influence of actors</td>
<td>Macro level: institutional arrangements, ‘rules of the game’ that enable and constrain value co-creation</td>
</tr>
<tr>
<td>Regime(s): established organization of socio-technical solutions (e.g. how energy, mobility, housing are organized) that enable and constrain radical innovations</td>
<td>Meso level: networks of networks, i.e., both the producer’s supply network and the customer’s network that create and affect the value co-creation context</td>
</tr>
<tr>
<td>Niches: protected spaces for testing and experimenting radical (technology) innovations</td>
<td>Micro level: service for service exchanges (producer-customer dyad)</td>
</tr>
</tbody>
</table>

Similar to Markard and Truffer’s (2008) Technological Innovation Systems that emerge across different regimes and parallel developing technological niches (see e.g. Giurca and Späth, 2017), SDL describes ‘networks of networks’ that emerge from the service for service transactions. This adds on incremental innovations to the MLP framework: emerging markets are enabled and speeded up by the technological development, but analysis is on accumulating practices-level innovations that spread out and multiply in the value co-creating networks. Such developments may remain unrecognized although the process itself changes profoundly. For example, think of consumers and citizens getting accustomed that the producers or service providers use previously accumulated data about the customer as basis for designing their next offering; thus, what we have accustomed to expect
from our Google searches replicates to our visit to local supermarket, to library, to public agency …and to what we expect from natural resources management.

To conclude

We need research-based fact finding and decision support tools to guide us towards the future. Yet, future is to be made. If indeed the metrics are changing, and we focus on analyzing the future bioeconomy only with those concepts that we have data available about the past developments, we limit our horizons not only about the future, but also about the present developments. Foresight analyses collect systematically data and information from multiple sources, multiple angles and knowledge fields. Also the most unlikely and fictitious future is already here – there are just too many signals that we can recognize it. It is worth to keep an eye on the drivers behind perceivable trends, their possible change factors, weak signals as well as sources of uncertainty and surprise. We need innovations: the incumbents to explore grounds nearby their vicinity, as well as the entrepreneurs to effectuate and test radically new ideas. Sustainability challenges call for new ways to connect the upstream and downstream operations; to substitute the existing materials and products with bio-based ones, but also to rethink the processes and redefine what constitutes service in the future bioeconomy (cf. Markard et al., 2012)

So, coming back to the story of the M/S FBS that was depicted in the introduction, we do not know how the story ends but are we prepared for the journey: Do we sail off alone or make sure that contact to other vessels nearby maintains? What kind of maps do we need or, for example, how should we calibrate the warning systems: Do we expect to know the waters ahead and their currents, icebergs, hurricanes, trash vortex or what it may be? Can we use the resources of the Ocean in some novel ways to ensure that the M/S FBS succeeds? Overall, should we head towards destination New Work or, rather, make the new continent home with us? – Or do you already see the troops queuing for a spaceship and wondering what the big fuzz about the M/S FBS is…
List of references


In addition to these, also the lecture slides, incl. the Titanic exercise (McCaffret and Pearson, 2015) by E.Hansen, as well as expert presentation and study visit notes from the NOVA course have been utilized in the essay. And the author gratefully acknowledges the Group of Sara, Pipiet and Arttu for their idea about the M/S Biotanic – bricolage is one form of innovation, too!
To what extent will service dominant logic (SDL) affect managerial innovation?

Introduction

The emergence and development of service dominant logic has received great intention. Conventionally, researchers and managers adopt more linear and static methodology such as Porter five forces analysis and value chain analysis to understand how can companies innovate so as to cope with ever-changing environment. However, current society has promoted new ideologies such as shared economy and calls for new perspective to examine relations between different stakeholders, while most of conventional methods are producer centric. In such circumstance, service dominant logic (SDL), which focuses on value co-creation and emphases resources exchange via networks in a boarder context, shows great potential to help managerial innovation.

This essay will examine the extent to which SDL will affect managerial innovation. In this essay, firstly, the concept of innovation and service dominant logic will be clarified. Then, both benefits and uncertainty of impacts of SDL on managerial innovation will be discussed. Based on the above discussion, it appears that although SDL has inspired managerial innovation from a boarder context, more practical impacts remains to explore further.

Theory of Innovation and Theory of Service dominant logic (SDL)

Innovation can be defined in various way and at different levels. According to Webster’s dictionary (1999), innovation is “the making of change in something
established” (Välimäki et al., 2004). Schumpeter, who is reckoned as the pioneer economist in innovation theory, identifies five categories of innovations (Rogers, 1998), including, for instance, introducing a novel product and qualities changes to an existing output or entering into a new market. It seems that Schumpeter defines innovation as a process of making fundamental changes which leads to a marketable product (North & Smallbone, 1998). Porter, on the other hand, sees innovation as a process for an enterprise to create its competitive advantage and maintain it stepwise in order to succeed in the competition (Välimäki et al., 2004). Since this essay focuses on firm-level issue, it is wise to borrow definition of innovation from Porter. However, what porter neglected is that innovation should be a non-liner process which also involves consumers’ participation, as highlighted by modern stages model (Alam and Perry, 2002).

Theories of service have developed progressively in recent years. Having explored knowledge-intensive business services, Toivonen et al. (2007) in their service model argues that services are appreciated by customers. Therefore, each service comprises a customer-unique process and a customer-perceived output. A company should develop as much as it can the best experience processes and attractive outputs to customers.

However, definition of service from service-dominant logic (SDL) perspective differs. According to Vargo and Lusch (2008), service is a process rather than a unit of output, a basis rather than a unit for exchange. It refers to the process of utilizing one’s
knowledge and skills through performances and processes for benefits other other parties. The core logic behind this is value co-creation. SDL reckons that value creation should be mutual and reciprocal (Vargo and Lusch, 2016), in a way that not only enterprises offer inputs for customers, but also customers provide benefits for the firm financial or intangibly. In fact, one can also understand “service” from a resource-based perspective that the process of offering service is the process of integration and exchange of resources essentially. Lusch et al. (2010) argues that usefulness of a particular resource to one depends on resource availability, one’s ability to remove resistances for resource utilization and also one’s ability to fuse them.

Although SDL also recognizes service perception by customers from both output and process perspectives and that value added is perceived and interpreted by customers, SDL highlights importance of customers as co-producers of service who evaluate service from two these above two angles. In addition, embedded in this framework are content and structure of service, which implies the necessity to examine service from a systematic point of view. As a matter of fact, an actor-to-actor (A2A) perspective has been promoted by Vargo and Lusch (2011, 2016). Basically, A2A transfers the focal actors to a more general and broader context, in which all social and economic participants are resource integrators. It indicates that neither producer-centric view nor customer-centric view is acceptable in this theory. Rather, analysis is dynamic in the system among multiple actors who create value together. On top of this, SDL argues that a network should not be limited to an aggregations of actors. Instead, it is a self-
adjusting system (Vargo and Lusch, 2011). Dynamic as such, networks will adjust itself (Wieland et al., 2016).

Benefits of SDL on managerial innovation

Undeniably, service dominant logic has shed lights on managerial innovation. First of all, the A2A point of view changes the perspective for a firm to examine its relationship. Customers used to be treated as targets of sales, as evident in conventional value chain methodology. Nevertheless, Vargo (2009) asserts that firms should appreciate customers as resources, not just targets of sales, via connecting customers to their networks and supporting customers in value creation process. For example, information about customer expectations can be sourced together in different stages of innovation. Also, firms can equip customers with necessary skills. Based on the context, firms can increase efficiency through effectiveness. Apart from resources of customers in terms of knowledge and skills, A2A ideology also imply the importance to mobilize networks with other stakeholders and actors, from firm-level perspective to a broader level of service ecosystem networks. As a matter of fact, it is suggested, the way to forester innovation lies not only in contexts of markets, but also public, regulators and other agents (Toivonen, 2016; Dodgson et al. 2013; de Vasconcelos Gomes, 2016). Therefore, firms should not neglect resources from public and other institutional. Of course, the following question arise as which internal capabilities are necessary to absorb external benefits and cater SDL-based business operations? Five core capabilities are raised accordingly to Janssen and Hertog (Toivonen, 2016), including capabilities for
knowledge searching, transformation and application.

Secondly, under the spirit of SDL, there is the innovation institutionalization (Vargo and Lusch, 2011). Institutions are coordinators of multi-actor value creation, and manifest themselves in various forms, such as laws, informal norms and conventions. From the point of view of SDL, institutionalization is the underlying collective mechanism in co-creation, reformation and improvement of value propositions. Results of institutionalization can be new practical knowledge and new process (Vargo et al., 2015). Examinations of network interactions always reveals inconsistencies and contradictions in intra-institutions at firm-level, leading to prevention and lack of capabilities for accepting new value proposition, and calling for institutionalization. On top of that, Vargo and Lusch (2016) also promotes an important role of institutions in market innovation – stabilizing new practices. Despite of dynamic and ever-changing environment, novel practices need to be stabilized and integrated into existing systems.

Moreover, albeit indirectly, SDL has inspired development of company-level business
models. After analyzing literature on business model and the service-based business model, Viljakainen et al. (2013) provide an advice to adopt a novel business model construct relied on service-dominant methodology which depicts customers as value co-creators instead of target of sales. The adjustment from previous product-centric point of view is executed by four major components of an enterprise business model: value proposition, resources, revenue model and market characteristics, as illustrated in figure 2&3 (Viljakainen et al., 2013). This model can be useful particularly in servitizing manufacturing, a term referring to companies possessing services in their offering while keeping material products as business core. Quite interestingly, however, Viljakainen et al. (2013) find SDL limiting the role of product provider to value propositions despite promotion of value co-creation as a ubiquitous phenomenon. Grönroos (2011) also points out that service logic model works better, since in service logic theory product providers will take part in customers’ value creation procedure through actual interaction with customers.

Figure 2. original business model canvas (Osterwalder, 2004); Figure 3. Integration of service logic with the business model construct (Viljakainen et al., 2013)
Uncertainty of SDL and its effects on managerial innovation

As a matter of fact, albeit continuous theorization, context of SDL framework can be too ubiquitous to practice for companies. In some other cases, scholars may not able to define service clearly and use other terms, such as service encounter (Sørensen et al., 2013). Scholars may also find relevant items more useful and practical, such as service logic (Grönroos, 2011). In fact, although several original foundational premises (FPs) of SDL are relatively microscopic, providing inspiration to managerial innovation (Vargo and Lusch, 2004), the purpose of FPs has shifted to a broader perspective on value co-creation later (Vargo and lusch, 2011). For example, Vargo and Lush (2008) modified FPs from initial enterprise-centric wording to relatively generic terms, as evident in the sentence “all economic and social actors are resource integrators”, which indicates a network ideology in the process of value creation (Vargo, 2014).

Secondly, the recently-developed rigid SDL notion has been focusing on networks, where value and service is co-created by participations of every actor, but it has not touched down closely to firm-level and failed to provide solutions at micro-level for managers in different situations. For instance, SDL has not described much about how to adjust intra institutions to forester managerial innovation in a matured un-innovative companies. More often, the pivotal issue in matured companies failing to respond to innovations of new entrants is not that incumbents do not understand innovation or inactive in organization networking, but rather because of the institutional inertia within organization and among related networks of stakeholders (Hill and Rothaermel, 2003).
Perhaps, as Jaruzelski et al. (2011) summarized, what firms missing is the right institution and structure which can dedicate existing recourses to innovation effectively.

Additionally, SDL seems to treat different actors equally, while importance of different resources in managerial practice at different temporal and spatial conditions is likely to vary. Reddy and Reinartz (2017) points out that current trend of digitalization has influenced society tremendously, in a way that highlight intangible value (mainly customer relationship) rather than conventional tangible value (monetary returns), especially in platform-dominated society. However, SDL does not really tell how to prioritize importance of different actors.

**Conclusion:**

To sum up, SDL truly have changed the perception of firms and their relationship with related stakeholders from traditional liner static point of view into a network-based chasing value co-creation perspective. SDL’s focuses on A2A networking and embedded institutions have shad lights on innovation institutionalization, business model transformation and other managerial innovations. Nevertheless, SDL fails to explain how mechanism works in more detail. Neither has it contributed to explain how the network and institution work in different cases in different temporal and spiral conditions. In reality, value of firms’ complementary resources is contingent on the institutional environment (Fuentelsaz et al., 2015). Relationship between SDL and managerial innovation requires further research and more efforts.
References

Innovation system: Development of the biorefinery framework for bioeconomy in platform economy

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Abstract

An emergence of a digital platform economy brings greater efficiency and effectiveness of existing value chains, processes and services for individuals, companies and society that enable direct interactions between two or more distinct actors. Biorefineries are considered an important pathway to the development of combinatorial innovations in bioeconomy. The purpose of this work is to developing a framework for biorefinery combinatorial innovation business model of the building collaboration platforms and new businesses perspectives focused on resources mobilization, digitalization, and servitization functions for supporting future of platform economy. The work concludes by harnessing the disruptive technologies and platform economy through local and global cross- small and medium enterprise (cross-SMEs) partnerships with research community that accelerate innovations in bioeconomy.

Introduction

The hope for less fossil-based products, greenhouse gas saving and more sustainable future relies largely on the bioeconomy. Different organizations have devised definitions for bioeconomy, based on their contribution to the content in developing their specific sectors. Bioeconomy, in a general term, is an economy that utilizes the renewable biomasses and turns them into a sustainable production of value added products such as food, feed, bioenergy, bio-based products and services [1]. Biorefinery becomes the remedy for shaping innovation system in industries, especially forestry sector, for the competitive global
Hence, many different industries form a corporation in bioeconomy, link the products and services cluster to share the desire of successful transformation from invention to innovation [3]. The term between invention and innovation has a fine line of a distinction. The former refers to a creation of a brand new product / device or a process introduction for the first time while the latter is an act of adding values or making a change in the existing product or process or service [4].

The device, iPod was an example of Apple CEO Steve Job’s innovation and Apple invented nothing, but its process innovation revolutionized the music industry and global economy that have affected Finland’s conventional paper industries and competing products on market since 2007 [5]. Hansen et al. (2006) stated that research on innovation could be organized by three broad categories: organizational innovativeness, new product development, and innovation systems [6]. Three types of innovation research – product, process and business system – can be categorized according to its antecedents; the individual level, the organizational level, the inter-organizational level and the institutional/regional level [7]. Key drivers of the innovation system are learning and capabilities, networks, demand and users as well as institutions and policies [3]. Currently, researchers pay attention in technological innovation system (TIS) for biorefineries. How a framework of biorefinery business model evolve have been key consideration in innovation system, which not only on technological breakthroughs, but also on many other types of factors. This work aims to attempt the development of a conceptual framework of the combinatorial business model of the biorefineries collaboration platforms and new businesses perspectives focused on resources mobilization, digitalization, and servitization functions for targeting future of platform economy.
**Resource analysis**

Finland’s 2017 renewable energy sources was from wood and wood byproducts (27%), followed by peat (5%) and hydro (4%) [8]. Forests are Finland’s most important natural resource. Some three-fourths of the country area is covered by pine, spruce, and birch being the predominant species [9]. Although peat is not a renewable resource, it is included as a field biomass with approximately 9.3 million hectares of the land area and 0.06 million hectares of peat production in Finland [10]. As demand and competition for limited resources increase rapidly, biorefineries can be an important part of an efficient use of resources and raw materials [2]. Haapala et al. (2015) listed some potential bioeconomy inputs and outputs in Finland (Table 1) [11]. The bioeconomy system in which the renewable resources are primary feedstocks from land and sea, as well as wastes as secondary resources. Moreover, different kinds of resources such as financial (capital investment), human (capabilities, skills, knowledge) and material (infrastructure and raw materials) are required during research to technological innovation system [2]. A firm can exploit those resources in order to achieve sustainable competitive advantage by using a resource-based view (RBV) tool: valuable, rare, inimitable, and non-substitutable [12]. Resources are valuable when they help a firm to conceive or implement strategies that reduce costs and increase value [13].

Some of the potential biomass resources in table 1 have not exploited in Finland, yet new uses are constantly discovered [11]. Such indication appears because most innovation at the corporate level is incremental; focusing on improving an existing product’s development efficiency that allows an organization to keep the existing customers engaged and creates short-term revenue. In the context of innovation, the presented research is in line with one
of the definitions of innovation by Schumpeter (1934): the conquest of a new source of supply of raw materials or half-manufactured goods [4]. Alternatively, finding renewable resources can support Finland’s bioeconomy goal such as a low carbon, resource-efficiency society, and a sustainable economy.

Table 1. Potential bioeconomy inputs and outputs in Finland (Haapala et al. 2015)

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forests (saw timber, ornamental trees, wood fibre, energy wood, stubs, felling waste)</td>
<td>Building materials, furnishing and decoration, energy, biochemicals, biomaterials</td>
</tr>
<tr>
<td>Peat</td>
<td>Energy</td>
</tr>
<tr>
<td>Field production – non-food (reed and grass)</td>
<td>Energy / fuel, biomaterials</td>
</tr>
<tr>
<td>Field production – food (vegetables root, grain, oil plants: turnip rape and oilseed rape)</td>
<td>Energy/fuels, biochemicals, biomaterials</td>
</tr>
<tr>
<td>Blue resources (micro-organisms, algae, water)</td>
<td>Food, proteins, enzymes, fuels, biochemicals, biomaterials</td>
</tr>
<tr>
<td>Water and sewage treatment sludge (industrial and municipal)</td>
<td>Energy / fuels, biochemicals, biomaterials</td>
</tr>
<tr>
<td>Fish (natural and farmed)</td>
<td>Protein and enzymes</td>
</tr>
<tr>
<td>Livestock</td>
<td>Protein and enzymes</td>
</tr>
<tr>
<td>Agricultural waste/animal waste (manure)</td>
<td>Energy / fuel, enzymes</td>
</tr>
<tr>
<td>Wild plants (lichen, berries, fungi)</td>
<td>Health, hygiene / beauty products</td>
</tr>
<tr>
<td>Farmed berries and fruits</td>
<td>Health, hygiene / beauty products</td>
</tr>
<tr>
<td>Gas forming at rubbish dumps</td>
<td>Energy / fuel</td>
</tr>
<tr>
<td>Recycling materials (plastic, paper, cardboard, textiles)</td>
<td>Fashion, fibre, new polymers, composites</td>
</tr>
</tbody>
</table>

Performance effect of invention vs innovation

The quest to convert inventions (promising ideas for products) into innovations (commercialized products) is a central feature of technological progress and economic growth [14]. Earlier researchers have defined the relationship between exploitation and exploration of technological knowledge as the balancing between innovation and invention [15, 16]. Theoretically, an adaptive system that engage in exploration without exploitation is likely to suffer the costs of experimentation, systems that only exploitation may trapped in suboptimal
equilibria [17]. Exploitation has the performance variable of 0.054 compared to exploration [18] because the returns to exploitation are ordinarily more certain, closer in time and closer in space than the returns to exploration. Firms that invest primarily in exploitation may show a higher short-term performance than firms that engage in exploration. According to Stendahl et al. (2008), most scholars agree that the innovation process consists of the following basic phases [19]:

- theoretical conception + technical invention + commercial exploitation.

A well-run business can do a radical innovation when its vast resources, expertise, management talent to problems that it understands and in which it has a stake, then it can have a greater impact on social good than any other institution or philanthropic organization [13]. When the invention moves toward the market, business skills become more important than technical skills that the process needs increasing investment and quantities of time from the skilled people [20]. Markets are not naturally existing phenomena be formed by identifying and articulating demand, but often develop from niche markets; however, biorefinery products can be a very wide range of fuels, chemicals and bioproducts that intended for mass markets [2]. The conversion of invention to innovation and development in a biorefinery business model for platform economy must exceed a typical monopoly approach.

**Biorefinery framework**

The world is heading toward to platform economy; in which 30% will grow in Finland by 2030, on the other hand Finnish national economy will shrink by 30%. Companies such as Amazon, Etsy, Uber, Google and Facebook are creating and expanding platform economy that enable a wide range of digital business with human activities [21]. Platform refers to a product,
technology or organization that enable direct interactions between two or more distinct actors saving cost, creating flexibility and competitive advantage [22]. Biorefineries in platform economy can support for building collaboration platforms and fast new businesses growth through digitalization and consumer-driven business models. Servitization is one of the value added processes to sharpen the competitive edges and conforms to the appreciation of intangible resources in addition to tangible ones due to higher profits, market opportunities, creation of new business and sustainability [23]. We therefore consider developing a framework in biorefinery combinatorial innovations business model with servitization concept for the future of platform bioeconomy.

The conceptual input-output framework developed in the present work is focused on a true partnership of two biorefineries companies, in which a new source of raw material combined with half-manufactured goods or forest and agricultural sidestreams and linked with them demand industries delivering bioproducts by using existing technologies (Figure 1). This system generates direct and indirect impacts for business, people, environment and sustainable process that attempt to build servitization in future of digitalization based platform economy. The output in this work entails the high-value low volume bioproducts with adding value as data analysis and data server through application of ICT knowledge, innovations and technologies. The results are transformed into supporting services for products, processes and business as consultation, training, business optimization and solutions that partnerships and collaboration projects expected from the private companies, small and medium enterprises (SMEs), institutions networking and public sectors [24].
Conclusion

The purpose of this framework has been to synthesize current learning from NOVA course – “Innovation system in the bioeconomy” how the combinatorial business model can be created, developed and diffused by using existing technologies remains in the biorefineries processes. In summary, the combinatorial innovation approach in biorefining system entails by unleashing the power of digitality with the fundamental and practice of knowledge, innovation and technologies, but also ambidexterity and hybrid strategy concept together with research community, local and global cross-industry partnerships including SMEs that successful transition involvement in 2030 bioeconomy in and beyond Finland.
References


Accelerating innovation processes in the bioeconomy: Reflections on context dependencies and levers

Barbara Hedeler

Summerschool “Innovation Systems in the Bioeconomy”
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1 Introduction to the topic

The transition to a bioeconomy is a major challenge for the current economic and societal system. Innovations are key for a successful transition. The courses of the summerschool “Innovation systems in the bioeconomy” highlighted the complexity and interdependency of bioeconomy innovations. The transition and success of the bioeconomy depends on a broad variety of factors that need to be addressed. The Multi-Level Perspective (Geels, 2007) elucidates the systemic character of innovations using three separate levels: niches where new technological systems evolve, the existing regime that is characterized by mature industrial and societal systems, and the landscape representing the broader societal setting. Innovations mature in niches and gain internal momentum, but destabilization of the regime opens a window of opportunity for niches to come into the regime level. The stable nature of the regime often causes lock-in effects. Thus, destabilization of the regime and windows of opportunity are often caused by changes in the broader landscape level. The success of niche innovations results from an interplay of many aspects, actors and levels. Current discussions on climate change, increasing scarcity of resources and competitive pressure are favorable landscape changes for bioeconomy innovations to emerge. In order to use this current window of opportunity, timing is key. In innovation processes, product innovations are developed - once the production process has been standardized, process innovations evolve to optimize the production process (Garcia, Calantone, 2002). This development of innovations in the bio-based business area takes around 20-30 years and is always subject to risk and uncertainty. Therefore, it is important to accelerate the innovation process. This study aims to discuss the levers of the bio-based innovation process and key success factors to facilitate and accelerate the innovation process. It is organized as followed: first, the concept of bioeconomy is delineated using technological biorefinery value chains as
central point. Second, the levers of the innovation process are discussed using the Multi-Level Perspective as framework. Consequently, the main findings are summarized.

2 Summary description of the bio-based innovation process

The concept of bioeconomy can be approached and defined in various perspectives. In this study, the bioeconomy is delineated using the technological value chains as key starting point. As possible transitions and trajectories depend on new processes, products and materials, this approach is considered justified. The concept of bioeconomy is largely based upon the development of advanced and complex biorefineries that process wood and other raw materials to high value added products, materials and chemicals. Research developments depend on vertical and horizontal integration along the entire bio-based value chain, ranging from raw material production and sourcing to fractionation and further conversion to separation and purification processes. In order to develop the most efficient processing routes, research needs to be carried out in different scales. Piloting facilities aim to take new ideas from laboratories closer to industry and markets. The proof of concept and transition to industry can be accelerated with large-scale demonstration and innovation infrastructures. The maturity of technological innovation concepts is described using the “Technological Readiness Levels (TRL)”, a scale ranging from 1 to 9, with low TRLs describing the early innovation process in the laboratories, and higher scales describing demonstration and commercialization (Nakamura et al., 2012). Though technology readiness levels only cover the readiness of the technologies (Figure 1), and social and strategic readiness are not included in the innovation chain, it
is considered appropriate to give structure to the social and technological change (Leinonen et al., 2016).

![INNOVATION CHAIN & TECHNOLOGY READINESS LEVELS](image)

**Figure 1**: *Integration of technology readiness levels in the innovation chain* (Leinonen et al., 2016)

### 3 Levers in the bio-based innovation process

Central to the Multi-Level Perspective is the assumption that the development of technological innovations is influenced by various interactions and dependencies at various levels. In order to accelerate the process of technological innovations, a richer understanding of how these interactions and dependencies influence the innovation process is needed. For dependability, this systemic discussion is essential.

Based on the MLP framework (Geels, 2007), the innovation process is explored at three levels in the following. The niche level to discuss levers at the early stages of the innovation process, the regime level to analyze the higher stages of the innovation process, and the landscape level to discuss the dependencies and interactions of the
innovation process. For the purpose of simplification, the term innovation process is used to describe product, process, and service innovations deriving from biorefinery value chains.

3.1 Niches
Niches provide a protected space for radical innovations to evolve. Due to the complexity of biorefinery value chains, the required technological innovations encompass a broad set of research disciplines and their associated actors and networks. The collaboration and cooperation between the research fields and technology areas along the entire value chain is critical for research developments. Thus, fostering the development of networks, experimentation and learning processes in niches and the interactions between different niches is a crucial lever.

Though research developments at those low stages of technology readiness are mostly carried out by academia and research organizations. Industry is usually involved in the innovation process at higher TRLs. Though it is crucial to rethink this allocation. The development of technological solutions is increasingly complex, requiring a broad input of research fields and technology areas. Research developments are time- and resource-intensive, including high levels of risks and uncertainty. A stronger involvement of industry in these early stages of the innovation process could increase the probability of industrial acceptance and transfer of technological innovations to industry and the markets. Open innovation is often the method of choice, as it opens the innovations process and the generation of ideas to a broad set of actors (Van Lancker et al., 2016). Open innovation allows also to react on the globally changing customer behavior towards a stronger engagement and co-operation in the innovation process. This requires the development of new forms of interaction.
3.2 Socio-technical regime

The socio-technical regime constitutes the operating system of forest, paper and manufacturing industries. The traditional fields of these industries are still existing, but decreasing growth rates and increasing competitiveness from globalization force them to reinvent itself. Using the paper industry as an exemplary case, few large incumbents have already started to innovate and broaden their portfolio, but the large majority of the mature industry struggles to adapt to change (Fuentelsaz et al. 2014). Industry and firms need to build absorptive capacity and ambidexterity to identify new research developments and develop strategies to innovate. Qualitative research data shows the resistance of the forest, paper and packaging industries to change (Hansen et al., 2006). Culture is key for fostering innovations. Therefore, creating the “right” culture in industry is prerequisite to accelerate the innovation process.

The speed and success of the innovation process is finally determined by its implementation on the markets. In order to increase the success rate, involving customers in the innovation process is critical. The research stream of service innovation distinguishes between industrial production where customers are not interacting, and service production where the customer is involved (Toivonen, 2016). Service encounter-based innovations require an adaption of the design of the innovation process, as well as its forms of actor integration and organizational culture in research and industry (Sorensen et al., 2013).

3.3 Landscape

The landscape level encompasses wider societal, economic, and political developments. Thus, it is characterized by stability and slow adaptability to change. The ongoing focus in the landscape level on climate change, resource scarcity and globalization opens a
window of opportunity for sustainability solutions (Purkus et al., 2017). Though, the concept of bioeconomy itself is in direct competition with other evolvements in the field of sustainability research. Developing networks to raise the awareness for bioeconomy at landscape level is therefore critical to keep the window of opportunity for the long term.

4 Conclusions

The discussion of the innovation process from the MLP’s point of view emphasizes that the transition to a bioeconomy as well as successful acceleration of the innovation process depends on the interplay of many aspects, actors and levels. The systemic view of the innovation landscape enables the formulation of key levers at niche, regime and landscape level. A distinct pattern is emerging at all levels: the process of innovation is technology-based, but the integration of a broad variety of actors increases the rate of success. At all stages of the innovation process, the critical levers are the influence and dynamics of non-technological factors and systems on the technological system. If it is possible to build up networks and include as many actors as possible at all stages of the innovation process, the speed of the innovation process can significantly be increased.
Literature


Course essay for the Innovation Systems in Bioeconomy

“Sustainable competitive advantage in agricultural industry”

Vira Sadovska
The agricultural sector in Europe and especially in Sweden is characterized by high production costs. It happened due to the high environmental standards, expensive animal welfare, and labor-friendly laws. Significant production costs in their turn contribute to the high market prices for the agricultural products produced in Europe. While there is a variation across countries, a big number of small and medium agricultural enterprises (SMEs) are especially vulnerable under such market conditions. Since the 1990s, the total number of Swedish farms has declined by 30% including nearly half of all farms that were between 10 and 50 hectares in size; at the same time, the number of large farms (i.e. those over 100 hectares) increased by 40% (Jordbruksverket, 2016). The inability for many agricultural SMEs to compete with actors who have low production cost advantage has created the need to rethink their value proposition with an aim to achieve competitive advantage.

The situation in the agricultural sector is recognized by the politicians. Successive Swedish governments and agricultural advisory groups have tried to help agricultural SMEs by introducing recommendations for the sector. A large focus of past and present food strategy (e.g. LRF, 2011, Näringsdepartementet, 2017) is to encourage actors in the agricultural sector to adopt value adding strategies. The Federation of Swedish Farmers (LRF) has tried to inspire its members to explore ways to add value to product offerings making them easier to differentiate and compete in markets where price is not of primary concern (LRF, 2011).

While these recommendations might lead to positive changes in the industry, many questions are left unanswered. First of all, what changes should happen in agriculture so
that value could be created? Secondly, in what way value can be created? Finally, what is
needed to achieve competitive advantage in the agricultural sector? Certainly, the list of
questions does not end up here, but further some reflections on these questions are
presented.

The literature on value creation in the agricultural sector is far from being developed and
diverse. The preliminary literature review on the topic of value creation in agricultural
sector revealed that value in agricultural context is mostly understood as an economic
advantage for a firm. In this case, both creator and beneficiary of value is a firm, which is
consistent with the goods-dominant logic (Vargo and Lusch, 2004, 2008). Following this
logic, the role of a consumer is to utilize value in a sense of “use up” or “waste” (Vargo et
al., 2008, p. 148). To the best of my knowledge, the current body of agricultural research is
not dealing with value co-creation concept (Vargo and Lusch, 2016) and very little studies
are done based on service-dominant logic. Such conditions when value creation is present
only in a domain of a producer impose limitations on the whole field of agricultural business
studies.

Progressive marketing and strategic management literature have developed an
understanding of value with a focus on a consumer (see Grönroos, 2008; Grönroos and
Ravald, 2009; Vargo and Lusch, 2004, 2008). The concept of value co-creation was
introduced meaning that a consumer together with a firm creates value in the process of
consumption, which in this case means “completion”, “perfection” (Vargo et al., 2008, p.
148). Even above this, scholars suggest to move away from the distinction between the
roles of producers and consumers and apply instead “actor” term and “actor-to-actor” orientation (Vargo and Lusch, 2016, p. 6).

Agricultural business and research in this field can benefit in many ways from the application of service-dominant logic. The industry can be transformed towards service logic by placing consumer interests in focus. One of the consequences of such shift of perspective is the creation of new business models that are based on service-dominant logic. Typically, the main components of a business model come from both supply and demand side and are revenue structure, value proposition, resources and market characteristics of a firm (Seppanen and Makinen, 2007). There have already been attempts to apply service-dominant logic to business model construct. In Viljakainen et al. (2013) a new service logic-based model is presented. The modifications are done to the elements of the four main components, to the components themselves and to the links between the components. The financial aspects component is left without changes. Following the service-dominant logic, value co-creation lies in the heart of characteristics of a business. Furthermore, in this service logic-based model recourses are not simply identified, but integrated into collaboration with customers and partners.

Being universal and applicable to any industry, this business model has a capacity to open new horizons for agricultural business. Instead of the linear value chain where resources are used by one actor at a time, service logic allows for the creation of value networks where value is co-created by different actors. Lusch et al. (2010, p.20) defines: “A value network is a spontaneously sensing and responding spatial and temporal structure of largely loosely coupled value proposing social and economic actors interacting through
institutions and technology, to: (1) co-produce service offerings, (2) exchange service offerings, and (3) co-create value. The supply chain is a sub-part of the value network, embedded within these value networks.” Agriculture already knows the examples of cases of value co-creation (e.g. berry picking by customers at a farm garden), however, they constitute extremely small percentage in the industry.

The concept of user-driven innovation (Sørensen et al., 2013) is closely related to service-dominant logic. Following the categorization of innovation process suggested in Sørensen et al. (2013), a top-down push approach similar to traditional innovation in manufacturing goes in line with goods-dominant logic where producer is in focus and he benefits form value creation. This describes the current situation in agriculture: innovations, if they are present are initiated at the top and then implemented to the organization. Certain problems arise with this approach, such as lack of innovativeness in organizational culture, while innovativeness is a key component of success and economic growth (Hogan and Coote, 2014; Hult et al., 2004). There are links found between the innovative culture of an organization and its performance (Hogan and Coote, 2014; Subramanian, 1996), thus agricultural sector needs to change the approach to innovation process. The alternative is a bottom-up pull approach (Sørensen et al., 2013) where innovative ideas come from front-office. This process is less structured and more practice based but it allows the recognition of necessary adjustments in daily routines. Consequently, these small adjustments will lead to significant changes in core activities of an organization. From the perspective of the current situation in agriculture, the bottom-up pull approach is missing. Even above this, the recognition of the need for innovativeness in the organizational strategy is often missing.
Digitalization of business is another opportunity for agricultural sector. Digitalization lowers the costs of interaction (Reddy and Reinartz, 2017). Within the service logic-based business model where resource integration is an inherent element, digitalization can lower the costs of resource integration and information exchange between members of value network. In the context of European agriculture, cost reduction is still a pressing issue. At the same time, digitalization allows not only for cost reduction but also for the new ways of value creation. Among them, more transparency in communication with customers, the development of new products, better convenience (Reddy and Reinartz, 2017). On the company level, digitalization contributes to innovativeness, efficiency, and simplification of processes.

In summary, it can be said that the application of service-dominant logic in agriculture opens new possibilities in values creation, development of innovations and achievement of competitive advantage. For such mature industry as agriculture, service-dominant logic is the way to adapt to new challenges.
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DOES AN INNOVATIVE FIRM EQUAL TO A RESILIENT RURAL COMMUNITY?

An essay for the course Innovation systems in the bio-economy by Arttu Malkamäki

**On the origins of innovations**

During the past fifteen years, innovation has become a mantra-like concept for business and political leadership. The leaders, as many others, believe innovation and innovativeness to enable the success of an organisation (e.g. Hult et al., 2004). Before the modern-day leaders realised the potential of breaking the rules of the game for their own benefit, the concept had been welling in some circles for quite some time already.

Benoît Godin (2015), a Canadian historian, argues that innovation has its roots in ancient Greece as a political concept of introducing change into the established order, as well as a metaphor for cultural evolution in society through games and music. In his view, it is also a late-blooming incarnation of previous terms such as imitation and novation, the latter of which was used to refer to the renewal of contracts in the thirteenth century.

What is nowadays known as technological innovation was used interchangeably with the term invention in the language of the eighteenth century (Godin, 2015). Schumpeter (1939) was the first to draw a line between the two, defining invention as an act of intellectual creativity undertaken without considering its economic import at any level, while innovation occurs when organisations figure out how to translate inventions into useful changes in their operations. The rise of consumer culture,
increased numbers of patents, and the push by many western governments to set up research facilities developed a prestigious connotation around both terms; as well as a linear model of innovation, which according to Godin (2016) postulated that innovation starts with basic research, is followed by applied research and development, and ends with production and diffusion.

Breaking free from understanding innovation only as a linear model has not been so easy. Modern-day scholars, however, tend to perceive and advocate innovation as a multi-dimensional concept (e.g. Boer and During, 2001; Hovgaard and Hansen, 2004). From a philosophical standpoint, innovation could even be viewed to capture and integrate what would otherwise remain as separate activities and inquiries in order to tailor the world that society adopts (Harris, 2005, p. xi). However, with inconsistent definition and operationalisation in the ever-increasing literature on innovation, this multi-dimensionality has caused confusion among practitioners and scholars alike (Baregheh et al., 2009; Garcia & Calantone, 2002). Different disciplines also view innovation from differently and propose distinct definitions. While multi-disciplinary teams and approaches are praised and becoming more common, developing meaningful contributions without a consensual definition is problematic.

Here, I adopt the typology of Baregheh et al. (2009) to classify innovations on the basis of whether they bring about something new, or develop an existing feature of the organisation (nature). Similarly, innovations may be classified as product, service, process or technical (type), and the means used to drive and support innovation, innovativeness in other words (cf. Hansen et al., 2007), can be identified in respect of the balance of technology, ideas, inventions, creativity and market (means).
Resembling Schumpeter (1939), innovative organisations are commonly understood to adopt innovations, whereas rapid adoption has also been used to distinguish more innovative organisations from the less innovative ones (Hansen et al., 2007).

**On the origins of resilience**

In my own doctoral studies, I focus on understanding the interactions between us, human communities, and the surrounding environment we live in. Getting closer to finding a long-term balance between the two would hopefully resemble us getting closer to what we know as sustainability. My interests, however, lie in the resource-rich majority world\(^1\), where the pace of societal change is fast, and institutions such as intellectual property rights largely remain weak, corruption rampant, and the access to resources and knowledge limited (Olken & Pande, 2012; Quan & Payne, 2008).

Intuitively, I started comparing and repositioning the concept of innovation from the perspective of resilience, referring to the ability of social groups to cope with internal or external stresses and disturbances that result from social, political or environmental change (Adger, 2000; Wilson et al., 2013). In view of the literature dealing with social-ecological systems, resilience is seen as a concept of reciprocity, dealing with adaptive relationships and learning, while emphasising feedback loops, non-linearity, unpredictability, level, scale, renewal cycles, drivers, system memory, disturbance events, and windows of opportunity (Folke, 2006; Walker et al., 2006). Berkes and Ross (2013) adopt insights from psychological development and mental

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\(^1\) I try to avoid using terms such as global south, third world or developing countries, because of their divisive character and questionable perspective, majority countries remind us of how things really are.
health to complement this view, emphasising the identification and development of organisational strengths, and building resilience through agency and self-organisation, with attention to values and beliefs, knowledge and learning, collaboration, diversification, leadership, and outlook.

Berkes and Ross (2013) also consider social networks, with which I worked in South Africa recently, to host many elements of adaptive capacity, thus being a key source of resilience. For the resilience of rural communities in the majority countries, which due to the aforementioned reasons are vulnerable social-ecological systems per se, social networks are seen as particularly relevant (Janssen et al., 2006; Wilson et al., 2013).

**Networks as a confluence between the two?**

Considering the concept of innovation, and its history, it seems to confluence with the concept of resilience. Even though Baregheh et al. (2009) do not directly mention social networks as a means to drive or support innovation in their typology – they are seen as underlying means such as creativity – research on competitiveness has already some time ago placed networking into the core of innovativeness. In a systematic review, Pittaway et al. (2004) found that the principal benefits of networking for firms include: sharing of risks; pooling of complementary skills; obtaining access to markets and technologies; speeding of market entry; safeguarding property rights when complete or contingent contracts are not possible; and obtaining access to knowledge. Lack of networking was also found to limit the accumulation of a knowledge base and eventually reduce the ability of a firm to enter commercial relationships. Networks, like nothing else, are monoliths. Pittaway et al. (2004) also
bring forward that failures in networks are related to inter-firm conflict, lack of partner diversity, displacement of partner, lack of scale, external disruption as well as lack of infrastructure.

But if social networks are important for both resilience and innovativeness, are resilient/less-resilient communities in the majority countries equal or even similar to innovative/less-innovative firms? And if so, what have been the principal benefits drawn from social networks and what can possibly be learned from cases where social networks have failed or even collapsed?

In another systematic review by Rockenbauch and Sakdapolrak (2017), the authors identify that the research dealing with the link between social networks and resilience of rural communities in majority countries can be broken down into three strands: a) natural resource governance, b) agricultural innovation, and c) social support. My initial intention in this essay was to take a brief look at these links in empirical research myself, but because this systematic review was on top of my search results from the specialist database Web of Science, I did not see it relevant to replicate what had been done very recently. I will rather scrutinise their findings with the strands a) and b), while eventually discussing confluences with the literature around firm innovativeness. Strand c) could potentially be interesting, but I’ll leave the role of such external support for resilience and firm innovativeness for another essay.

Research in the first strand is concentrated around how social networks affect the ability to adaptively manage common pool resources such as forests or catchments. It conceptualises social networks as key factors for understanding collective action
and adaptive learning in any given social-ecological system – coordination to overcome stresses in other words.

Rockenbauch and Sakdapolrak (2017) find that studies in this strand predominantly focus on the structure of social relations and their impact on management outcomes, treating social networks as independent variables; with a few exceptions, where the structures are affected by changes in the social, political or environmental spheres. Studies identify heterogeneity, cross-scale interaction, network density, and actor centrality as key factors influencing the resilience of social networks. However, dense (number of actual ties is close to number of possible ties) and centralised (certain actors have more ties to other actors and are hence in a more advantaged position) are found to be effective in managing simple tasks (e.g. García-Amado et al., 2012, for a community of La Sepultura Biosphere Reserve, Mexico), while fragmented networks are shown to limit communication and hence resilience (e.g. Mannetti et al., 2015, for Khomani Bushmen of Kalahari, South Africa). Successful sustainability-oriented transformation is also associated to decentralised and heterogeneous networks that pronounce collaborative ties between formal/administrative and informal/norm-based management (e.g. Gelcich et al., 2010, for coastal management in south-central Chile); and an alarming need for brokers who facilitate such collaboration (e.g. Stein et al., 2011, for catchment management areas in Mkindo, Tanzania).

However, reasons for inertia and thus failure in social networks are discussed to be related to the homogeneity among centrally-positioned opinion-leaders as barriers to collective action (e.g. Bodin and Crona, 2008, for a fishing community near Mombasa, Kenya). Moreover, social capital – the connections among individuals, and the norms
of reciprocity and trustworthiness that arise from them (Ledogar & Fleming, 2008; Putnam, 1993) – which is based on linking ties and flexible arrangements with changing roles and responsibilities are also reported to suit the meeting of the challenges of adaptive management well (e.g. Apgar et al., 2015, for the indigenous Guna in Panama). Such favourable network structures alone, however, might not be sufficient to enhance proactive resilience building if rural communities as resource-users are excluded from decision-making and building of formal institutions (Ramirez-Sanchez & Pinkerton, 2009).

According to Rockenbauch and Sakdapolrak (2017), the second strand, rooted in development economics, does not explicitly consider resilience per se, rather it sees social networks as factors shaping social learning and adaptive changes in the context of agrarian change, and hence implicitly address elements relevant to resilience. With only a few studies linking innovation systems to agrarian change, the approach of this strand is rather linear. The focus is on the outcomes of networks – the adoption of agricultural technologies or practices – hence treating social networks as independent variables.

Here, the research identifies key factors influencing social learning and decision-making processes and hence provide insights into adaptive processes crucial for the resilience of a given social-ecological system. In contrast to the previous strand, this strand highlights actor and tie characteristics rather than network structure, while challenging the assumption that simply by having more actors in a network increases the likelihood of adopting new technologies.
The studies report on the crucial role of information when considering adopting new technologies or practices – the lack of which seems to have been commonplace for rural communities. Decisions seem to be grounded in experiences and perceptions rather than participatory and thoughtful calculations (e.g. Matuschke and Qaim, 2009, for the adoption of hybrid seeds in Maharashtra, India). In terms of features of ties, social and geographical proximity is commonly reported as conducive to information diffusion: strong ties, kinship for instance, are shown to facilitate diffusion (e.g. Hoang et al., 2006, for rural villages in the northern mountains of Vietnam), whereas others emphasise the bridging and linking ties between diverse actors from civil society, public extensions, and the private sector, which allow these communities to access external sources of information and experiences (e.g. Wossen et al., 2013, for a case study of a World Bank-assisted project in Ethiopia). Unlike the research founded on governing social-ecological systems, the first strand, this strand argues that innovation requires sparse, but efficient network structures with a few central actors acting as brokers between formal and informal networks (Isaac et al., 2014, for a Ghanaian transition zone; Spielman et al., 2011, for ten communities in Ethiopia). The critical roles played by elite actors linking external actors and the community are also raised by this strand, as is the danger of reproducing power imbalances through external interventions, which also account for the main failures in such networks (Hoang et al., 2006; Spielman et al., 2011).

**Points to discuss**

The course on which this essay is based on dealt with innovation in the bio-economy, which I argue must be achieved at a global level – in the majority countries as well.
Otherwise, it can hardly be as efficient, effective nor equitable, as in the festive narratives. I hope to contribute to this topic in my doctoral thesis.

In this essay, I wanted to clarify the concept of innovation to myself, while trying to find something in it that could be useful for my own doctoral thesis. Hence, I used this window of opportunity to see if innovativeness has already been considered under a concept that was much more familiar to me – the resilience of social-ecological systems such as rural communities. I quickly realised that the literature around both concepts emphasises the crucial role of social networks.

My essay probably is not the most glorious of them all as I was at times very confused with the diversity of layers in these concepts, and I only revisited two previous reviews. However, the essence of innovation as I understood it based on our course was to break rules for your own benefit and make use of existing resources – what I guess happened, coincidentally though. This essay also adopted a lot, for example a competing definition of innovation, which, by definition, is the key for being innovative.

Regarding the lessons learned from going through these existing reviews, of which the one dealing with resilience and social networks was particularly fascinating to me, it seems that obtaining access to knowledge, whether in relation to markets or resources, is the main benefit both for firms and rural communities. Pittaway et al. (2004) do not elaborate on the conception or structure of the network as much as the recent literature on networks and resilience reviewed by Rockenbauch & Sakdapolrak (2017), but it seems possible that the findings of the latter on network structure could apply to firms as regards to the density and centrality: denser and more centralised
are efficient structures for simple tasks requiring simple information, whereas too central actors can become serious bottlenecks if not functioning well. The role of brokers, however, might not be as important for firms as it is for rural communities – firms tend to have more resources, or power, to acquire information if a need is identified, by buying it for example. For identifying these needs, however, ties to heterogenous actors might be beneficial though, which seems to be a common benefit of networks both for firms and communities.

Social networks, by definition, are relationships between humans and groups, so it would have been dramatic not to find any similarities. Firms like the ones operating in the forest products industry, could also be similar to rural communities in other ways. Both tend to be incumbent and hierarchical, and rural communities could thus be facing similar difficulties as most mature industries facing a revolutionary technological innovation in their main market. However, as Hill and Rothaermel (2003) point out, this tendency has not been universal for mature industries, so there must be outlier communities out there as well, from whom a lot can be learned from.

As mentioned above, the role of support systems, for example development aid for rural communities and national innovation systems for firms, but also the organisational ambidexterity of rural communities – pursuing of more than one strategy at once (Hansen et al., 2015) – offer interesting avenues for further research. Cross-fertilisation between the vast bodies of literature behind these two concepts could also do much more good than harm. Looking at the role of social networks was just the first, and still largely incomplete, shot.
Bibliography


Is cross-sector collaboration needed for forest companies in transition to a bioeconomy?

By. Jose Guerrero Martinez

Several bioeconomy strategies strongly advocate the need for establishing successful cross-sector collaboration for innovation at the forest company-level. Cross-sector collaboration is a management tool used by companies to address challenges in two or more sectors that companies cannot successfully address in one sector alone (Bryson et al. 2015). This management tool represents a large business potential for forest companies in the transition to a bioeconomy as they work with industries possessing a more positive demand outlook. It may be especially true for those sectors facing increasing pressure to detach from oil derivatives (Bugge et al. 2016; Näyhä & Pesonen, 2014). However, cross-sector collaboration is almost missing at the company-level in the forest sector literature because forest business is a traditional industry that builds on competition, resilience to change and different business strategies.

Similarly, strategic cross-sector collaborations with other industrial sectors such as energy, chemicals, textiles, and construction industry will help in the transitioning towards a bioeconomy (Toppinen et al. 2017). For example, collaboration across sectors is required to stimulate investment in innovative bioeconomy because it can promote value creation and development of renewable materials to replace traditional products in agriculture, marine, forestry, and bioenergy industries (Bugge et al. 2016). Additionally, promoting cross-sector collaboration is helpful to overcoming barriers and bring together different parties across sectoral boundaries which could be also fruitful in accelerating the transition to an innovative bioeconomy (Bosman & Rotmans, 2016). Likewise, it is important to
realize that despite the increasing competition and resilience to change in the forest company, cross-sector collaboration for bioeconomy is strongly advocated by researchers and practitioners. Further, many companies have started to realize that working alone will not be sufficient to remain competitive (Audy et al., 2012; Hämäläinen et al., 2011). Therefore, cross-sector collaboration should be considered by forest companies in transition to a bioeconomy because it may help to boost innovation, increase value creation, and foster technological advancements in the forest sector.

Cross-sector collaboration may help to boost innovation in products and processes of companies to meet regulatory requirements and customer needs in a bioeconomy transition. Innovative bioeconomy efforts often involve partnerships between different industrial actors. This collaboration across sectors allow forest companies to engage closely with neighboring industries (Bugge et al. 2016). Some bioeconomy strategies highlight the innovation growing that can be achieved by forest companies for establishing cross-sector collaboration (Scarlat et al. 2015). Industrial symbiosis networks can be denominated one of the possible strategies use to realizing a forest bioeconomy. For example, in a study on promoting industrial symbiosis, Velenturf (2016) explores how companies implement the innovative use of wastes and develop collaborations with secondary biomass resource suppliers for power generation or fuel manufacturing. The author suggests that sometimes companies require diversifying their resource partners in the innovation process. However, he argues that it is challenging for organizations to keep collaboration with unconnected sectors partners because companies prefer to develop resource partnerships with other companies, or in industries, that they already know. Hence, a trusting relationship among
stakeholders and promoting the benefits that partnerships with other industrial sectors can provide will help in the purpose to potentiate long-term cross-sector collaborations.

Additionally, engaging in inter-sector collaboration seems to be of increasing importance for success in forest companies in the last two decades (Hämäläinen et al. 2011; Lehoux et al. 2014; Näyhä & Pesonen, 2014; Velenturf, 2016). Research studies show that inter-sector collaboration is positive for the innovative capabilities of the companies in the forest sector. For example, innovative companies tend to cooperate more actively than those that are considered less innovative (G. Weiss, 2011). Innovation plays a significant role in the forest industry. However, only some forest sub-sectors have developing innovation systems to participate actively in horizontal cooperation of forest sector companies to increase market power or to divide production functions. Also, vertical cooperation along the supply chain to organize production processor or mechanization of forest work (Weiss, 2013). Establishing inter-sector collaboration for innovation remains as one the significant challenges for the forest sector companies in transition to a bioeconomy (citation). Inter-sector collaboration may see both as an innovation to develop new business models and as a supporting factor for innovative changes in the forest companies (G. Weiss, 2011). Hence, involving in inter-sector collaboration might be considered for forest companies not only essential to gain stronger market power or coordinate better the production process. It also might be viewed as a supporting factor for innovative changes to develop new business opportunities.

Innovation also might play an essential role in ensuring the sustainability of the forest companies in a bioeconomy transitions. The transition toward a bioeconomy era is distinguished by a high degree of uncertainty for forest companies (Purkus et al. 2017). A
bioeconomy will imply additional pressures on forestland and forest ecosystems because of the increasing demand for bio-based renewables resources by companies. It also will give rise to resource uses conflicts (Hansen, 2016; Toppinen et al. 2017). Innovation regarding the efficient use of renewable resources might play a vital role in limiting these pressure on resources. The development of innovation systems for the bioeconomy transition would allow immature renewable resource-based technologies to progress down the learning curve and reach competitiveness as fossil resource substitutes (Purkus et al. 2017). Hence, innovation systems that can decrease impacts in renewable resource will be of crucial importance. Forest companies’ innovation efforts should be driven towards bioeconomy pathways with favorable environmental characteristics and social acceptance.

Cross-sector collaboration may help to increase value creation at the company-level in the forest sector in a bioeconomy transition. Forest bioeconomy systems highlight the potential for value creation in companies through new business or products development such as the processing and conversion of forest bio-based materials into new outcomes to replace traditional products (Toppinen et al. 2017). Value creation potential to develop collaborative know-how and generate new added-value products is a significant driver of cross-sector collaboration in forest companies (Lehoux et al. 2014). Value creation throughout collaboration between energy and forest sectors is becoming increasingly essential to fill the resource gap in the bioenergy business (Näyhä & Pesonen, 2014). Additionally, the increasing global interest in renewable energy offers profitable opportunities for forest products companies to create new business models by producing bioenergy and biofuels in collaboration with the energy industry (Pätäri, 2010). Hence, to secure value creation and gain sustainable competitive advantage, companies should attain
skills and know-how through educational programs, re-combined modes of innovation, and cross-sectoral collaboration.

Similarly, bioeconomy concept is understood as an economy where the basic elements for materials, chemicals, and energy are derived from renewables biological materials. Bioeconomy presents a major opportunity for forest sector firms to develop new products and business models (Hansen, 2016). Forest biorefineries are considered an integral part of the development of the transition to a forest bioeconomy (Bauer et al. 2017). Several studies exist in the literature of bioeconomy innovation system with examples on forest-based biorefinery (Toppinen, August 28, 2017). New business model development is also highlighted as necessary value creation drivers for cross-sector collaboration in forest biorefinery. Business diversification in the forest companies toward biorefineries could help to the reduction of the fossil fuel consumption and operating costs (Hämäläinen et al., 2011). Further, the willingness of forest companies to engage in new business models toward forest biorefinery will contribute to collaborative symbiosis for efficient use of industrial wastes, resource reuse, and recycling practices (Husgafvel et al. 2016). The importance of establishing collaborative networks across industrial sectors is frequently addressed for the development of forest biorefineries to access to large-scale investment, combine complementary knowledge, and create control in delivery chains (Bauer et al. 2017). In this context, knowledge diffusion between the actors is essential to turn an idea into a process or product/service on the market (Toppinen, August 28, 2017). Therefore, even though some evidence highlights that establishing new partnerships among forest companies and partners from other industrial sector is challenging, this type of
partnerships can increase the generation and distribution of value-added between stakeholder in a future forest-bioeconomy.

Cross-sector collaboration can foster the development of technological advancements for forest companies toward their transition to a bioeconomy. Technical development is a significant driver to promote cooperation at the company-level in the forest industry. Introduction of new insight and know-how from other industrial sectors, research centers, and technology providers through cross-sector collaboration could help to improve the success in the transition of forest companies to the biorefinery business (Hämäläinen et al. 2011). Further, cross-sector collaboration can enable novel, science-based technological solutions that could support sustainable development and promote competitiveness in the forest sector (Hämäläinen et al., 2011). Researchers argue that forest bioeconomy should be focused on technology and innovation management concepts. They state that knowledge generation and innovation through technological advancements of forest companies will be crucial to making the transition towards a bioeconomy (Van Lancker et al. 2016). Nevertheless, the development of technological advancements for forest companies should be based on the combination of technologies. Therefore, cross-sector collaboration can help forest companies to work on combining multiple conversion technologies, building knowledge and long-term relationships with neighbors industries.

Even though over the last decade researchers, practitioners and bioeconomy strategies have advocated for establishing cross-sector collaboration at the forest company-level in their transition to a bioeconomy, recent research shows that collaboration remains a complex subject by companies in the forest industry (Audy et al., 2012; Velenturf, 2016). Cross-sector collaboration has become a need now more than ever for forest companies, yet
it cannot solve alone all the problems facing businesses. Further, collaboration can be challenging to develop because the right conditions are not always present (Audy et al. 2012; Bryson et al. 2015). Additionally, some studies illustrate that forest sector companies feel that factors such as traditional industry culture based on competition and its resilience to change will not support the transition towards a bioeconomy (Hansen, 2016). These companies believe that a successful development, production, and marketing of high, value-added products will not be possible because forest industry has the tradition of commodities (Hansen, 2016). For example, researchers argue that in the development of new business models such as forest biorefinery, energy or oil companies will be the ones that capitalize from these models. It means that most of the profit from a bioeconomy era will be gathered by the oil and energy companies while forest companies will be only raw materials providers. Hence, forest companies should look for partnerships alliances that can allow them to capitalize on the opportunity implied from bioeconomy before companies outside the sector will fill the void.

To summarize, the transition to a forest-based bioeconomy is frequently viewed by researchers and practitioners as one of the principal alternatives to reduce the world dependency on oil derivates resources. However, this transition is characterized by a high degree of uncertainty because of the potential increased demand for bio-based renewable resources for forest companies. Further, studies on the forest-based bioeconomy transition remain scarce at the firm level in the forest sector. This context makes necessary for forest-based business to identify new strategic collaboration across industries to improve innovation, increase value creation, and foster technological advancements to stimulating the sector transition to a bioeconomy era. Therefore, cross-sector collaboration is needed
for forest companies to advance in their transition to a bioeconomy era. Cross-sector collaborations will allow forest companies to engage closely with neighboring industries, develop new business models and value chains based on biomass from the forest-based sector in transition to a bioeconomy. The forest companies that can succeed in this transition will be more profitable and will have better relations with customers and end-users.
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Transition to circular bioeconomy in forest-based sector and what is required from the companies?

There have been radical changes in the society and companies operating environment during the past 20 something years, such as, transition to knowledge and service economy, globalisation and digitalisation as well as climate change and recognition of resource scarcity. These changes have required and are still requiring a change in the mindset of the whole society and industries: how societies work and companies do business? Adaptation to changes require radical and disruptive innovations that are based on knowledge, open transdisciplinary cooperation between different stakeholders and systemic thinking (Van Lancker et al. 2016), and a company with a culture that is open for innovation is better able to respond to changes in its operating environment (Hansen 2016). Therefore, the latest ongoing transition towards circular bioeconomy with blurring sectoral boundaries is probably today’s biggest challenge for companies. Adapting to these changes require companies to reconfigure their business logic.

Bioeconomy and circular economy have many definitions depending on the point of view. Roos and Stendahl (2016) define bioeconomy as "an economy that substitutes bio-based, renewable materials and services for fossil resources" (Roos & Stendahl 2016, 182). Circular economy aims at the best use of extracted raw materials, renewable or non-renewable, by maximising the added value in making and using them (Antikainen et al. 2017). Bioeconomy should ensure economic growth while being consistent with sustainability and resilience of
ecosystems (Roos & Stendahl 2016). Still bioeconomy alone is not necessarily sustainable, because renewable resources are limited, therefore closing of material and resource loops as a part of the circular economy are required (Antikainen et al. 2017).

In addition, the traditional way of seeing the resource base as being only material has to change. For example, in the forest-based sector the whole forest ecosystem has to be seen as the resource base and not only wood, fibre and berries. Both material and immaterial aspects of the forest ecosystem need to be considered. When forest-based sector companies do business, they have to combine different uses of forests. How companies can propose, create and capture value together with different actors from the resources offered by the whole forest ecosystem?

Forest-based sector, that has been characterised as being a mature industry (e.g. Hansen et al. 2007), is facing many challenges when its operating environment is changing towards circular bioeconomy. Circular bioeconomy with new business logic possess many new features that the current incumbent companies in forest-based sector have to overcome. The market for industrial products has developed from being a seller’s market where supply is lower than demand in the 1950’s and 1960’s to a cut-throat competitive market of the 1990’s and 2000’s when the supply of products is much higher than demand (Haapala 2017). For example in Finland and Sweden a structural change is ongoing; demand for printing paper is declining globally, but on the other hand global demand for packaging materials, wood products and biofuels is increasing, while new products are developed for markets (Antikainen et al. 2017).
The key reasons for mature companies’ slow adaptation are said to be the lack of incentives and abilities to invest in new technologies and organisational inertia, and that they are embedded in the established value networks of current stakeholders (Hill & Rothaermel 2003). These reasons and strong organisational culture causes low performance and falling profitability in mature companies. The forest-based sector has faced and is still facing a big change in its operating environment and the way it does business. Therefore, forest-based sector companies need to get rid of the business perspectives of mature industry; companies need to reconfigure themselves from being merely a producer producing low value and high quantity to being a producer with a service orientation offering high value and low quantity.

Company strategy, business model and culture are key issues that need to be adapted in order for forest-based sector companies to be successful in circular bioeconomy (Hansen et al. 2007; Hansen 2016). Especially culture that enhances innovation and innovativeness in companies plays a key role in breaking the existing cultural norms, and thus facilitates organisational ambidexterity when company both exploits its current skills and knowledge as well as explores new ones (Hansen 2016). Innovation is a key term related to bio and circular economies. Innovation is a process resulting to creation of something new, e.g. product, service, technology, market, organisation or a combination of these (Boer & During 2001). It enables new superior products and services for markets. Innovation can be something between incremental and radical, and it affects someone between the whole world and an individual (Boer & During 2001).

Collaboration is a key term in innovation and in value creation. According to Normann and Ramírez (1993) a company should be seen as a value creating system, where different actors
create value together and this value is co-created in inter-organizational relationships and in knowledge exchange between companies. This value creating system consisting of the core company and other actors is called with many different terms depending on the author and the approach s/he has. It can be called a business network (e.g. Håkansson & Johanson 1992), a value network (e.g. Jarillo 1988), a business ecosystem (e.g. Moore 1993), a service ecosystem (e.g. Lusch & Vargo 2014) or an innovation ecosystem (e.g. Adner 2006). Gomes et al. (2016) point out that regardless of the term the features are pretty much the same. The ecosystem or network is meant for co-creating value and it consists of interconnected and interdependent network actors (firms, customers, suppliers, organisations etc.) where one actor is focal and operates as an integrator. The ecosystem is built on a platform where actors cooperate and compete. Gomes et al. (2016) also point out that the innovation ecosystem term is more related to value creation and cooperation when on the other hand the business ecosystem term considers value capture and competition.

Transition to circular bioeconomy means also that services, along with products, play an increasingly important role in companies’ business. The changed market conditions for industrial products have changed also the way how customers are seen; before customer was a purchaser and the production was distribution oriented, but nowadays customers are individuals (Haapala 2017) and even companies that are traditionally selling to B2B markets have to take into consideration end customers and their perceptions and needs. Therefore, adopting the service-dominant logic (SDL) as a business logic is important. According to the mindset of SDL, value cocreation takes place by economic and social actors who are involved in operant resource (knowledge and skills) integration and service exchange in a service ecosystem i.e. network (Lusch & Vargo 2014).
Business model illustrates the way how a company plans to propose, create and capture value. Viljakainen et al. (2013) have integrated SDL into the business model construct and they take a transformational approach to business model meaning that a business model can be a tool to address change in an organisation and its business model. The main components of a service-oriented business model are value proposition, resources of a firm and the way how they are integrated, mobilised and developed together with customers and partners, market characteristics which describe how value is co-created together in co-production practices with customers and partners, and revenue model showing how value is captured (Viljakainen et al. 2013). Because circular bioeconomy in the forest-based sector calls for new products and services with possibly new customers, companies have to create new or at least modified business models (Hansen 2016).

In the forest-based sector, bioeconomy is seen as ensuring the competitiveness of the sector while contributing to sustainable development (Roos & Stendahl 2016). According to Roos and Stendahl (2016), forest-based sector has many potentials and challenges related to bioeconomy. The potentials refer to

1) forest production (e.g. wood is the most abundant non-food biomass in substituting fossil materials),

2) the industry (e.g. industry’s traditional sectors will be the backbone of bioeconomy for a while before innovations and improvements arise),

3) energy (e.g. woody biomass has a low cost to use and the usage of new biofuel products will increase),
4) chemicals and materials (e.g. current and new chemicals and materials have good opportunities in substituting fossil materials), and
5) biorefineries (e.g. new bio-based products and materials are produced in biorefineries).

The forest-based sector's challenges related to bioeconomy are economic (e.g. capital costs, costs of production, new value chains, customer behaviour, and cross-sectoral cooperation), policy (e.g. support to bioeconomy and innovations, regulations) and sustainability (e.g. is bioeconomy really sustainable and how sustainability can be measured?) (Roos & Stendahl 2016).

Many of the above-mentioned potentials and challenges of bioeconomy to forest-based sector are actually current issues in forest-based sector, because its products are already bio-based. The opportunities for forest-based sector therefore lies more in the social and political changes towards circular bioeconomy when product and service offerings are more diversified and moving away from the stagnant markets of mature products (Hansen 2016).

Transition to circular bioeconomy calls for a socio-technological change when the whole socio-technological system is changing in all levels (landscape, regime and niche) meaning that change occurs in all dimensions; technologies, culture, infrastructure, industry and market structures, and user practices (Antikainen et al. 2017).

**Concluding thoughts**

The transition to circular bioeconomy requires forest-based sector companies to be open for innovation and change their business logic towards value- and service-based business models
and operating in collaborative business networks inside and outside of its own traditional sector with current stakeholders. This new business logic requires organisational culture that enables and enhances innovation and cross-sectoral collaboration in networks, and it is important both in value co-creation and in value capture perspectives.

As Roos and Stendahl (2016) state, if forest-based sector wants to be successful in circular bioeconomy it has to win over both B2B and B2C customers, understand the overall cross-sectoral business logic, and attract talents, knowledge and innovation across sectoral borders. In addition, the blessing of forest-based bioeconomy should not be taken for granted, it needs to be proven. Bioeconomy has to overcome the current and looming conflicts related to sustainability and biodiversity degradation, and make it a local and global process that includes north and south, poor and rich.

References


