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Exploring business model innovation for sustainable production: lessons from Swedish manufacturers

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Abstract

Businesses globally are facing changes these days. To remain viable, business model innovation provides a strategic renewal mechanism. However, there are only few studies that investigated such challenging undertaking in light of changes for sustainable manufacturing systems. This study aims to explore practices towards establishing more sustainable production systems of the future. The investigation is based on publicly available data from selected Swedish manufacturers. Closeness of innovations towards some business model archetypes is discussed using the aspects of value proposition, value creation and delivery, and value capture. The findings indicate that a more structured and integrative way of understanding business model innovation for sustainable production is needed. They also imply that the value capture aspect of business models needs to address how different stakeholders, not just the business firm, capture different forms of value. The learning from this study could be used for designing more structured and large scale future research in the subject matter.

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Keywords: business model innovation; shared value; sustainable production

1. Introduction

The heavy environmental burdens of traditional production and consumption are well recognised. There is a strong demand nowadays to make production processes as sustainable as possible. However, there may be differences as to what a sustainable production means and comprises of. Different innovative approaches could add to the design and management of sustainable production systems. The primary (and traditional) purpose of production systems is to create value to customers, subsequently leading to wealth generation to owners. Therefore, it is logical to consider the overall strategic process of creating and capturing value through what the production system has to offer, to discuss the sustainability of a production system; one way of addressing the issue is through investigation of innovation in business model [1]. Establishing a truly sustainable production system requires a transition that demands a lot of effort. Such transition from traditional thinking should start with rethinking value as
“agreed upon” by the customer (plus other stakeholders) and the production system offering it. For this reason, consideration of business model innovation for the intended transformation towards sustainable production system of the future is an important and timely issue [2].

Research at the intersection of sustainable production and business model innovation is limited, particularly compared to the vast literature on business models and sustainability on their own right. This study sets out to investigate possible learnings regarding innovative initiatives for creation of business models for sustainable production, taking the context of Swedish manufacturing.

2. Sustainable production

According to the United Nations Environment Program, UNEP, sustainable production (and consumption) can be viewed as the creation (and use) of products to address human needs and bring better quality of life while the use of natural resources, toxic substances, emissions and pollutants over the lifecycle of a product are minimised in such a way that needs of future generations are not jeopardised [3]. This definition is very generic and does not distinguish between consumption issues and production issues. Another definition provided by the Lowell Center for Sustainable Production (LCSP) states that in sustainable production the processes and systems that create the products and services should be economically efficient, resource conserving, non-polluting, as well as safe and healthful for stakeholders [4]. This definition presumes consideration of implications of products throughout their lifecycle; hence, superiority of long-term gains over short-term profits is underlined if and when achieving both is not realistic.

The possibility that businesses could improve economic performance by reducing environmental impact has been identified as early as 1997. However, there is a continuing debate as to how much aligned the environmental, social and economic sustainability objectives of businesses can be at different decision hierarchies; sometimes, requiring the aforementioned compromise to be made on short term economic gains [5]. On the other hand, providing more socially-focused value may improve customers’ experience rather than immediately and directly affecting profits. For example, providing customers with information about intended life of a product such as number of washes a garment could take and still looks good [6]; and embracing fractal and modular approaches have been mentioned as initiatives that could improve multiple dimensions of sustainability including the economic one. Different forms of configuration to reuse and or recycle waste and bi-products from production processes for secondary use have as well been suggested as a way of “creating” closed loop production systems [2].

These examples demonstrate moves from an “exchange” based value that traditional production systems propose versus “use” based value that connects quality and function with the users’ and other stakeholders’ emotions, experience and engagement. Such move, in its higher order form, entails innovating the business model of the producer in terms of the four pillars: value proposition, customer interfaces, revenue model, and the infrastructure involved in pursuit of sustainable production system [1]. It is argued in extant literature that this move brings about several opportunities for a sustainable future [6]. However, these transitions could often be challenging. One reason is that traditional business models have economic relevance at very high volume (e.g. in textile and garment or utilities). This could have motivated companies could be motivated to move operations to lower-cost countries. Financial figures might have looked better in doing so, but the environmental impacts would remain the same (if not worsened due to changing regulations and practices) if sustainability is not built in the way value is created and captured.

3. Business models for sustainable production

A business model describes a series of closely related activities that an organisation performs to do business with relevant actors. It can be defined as “the rationale of how an organisation creates, delivers, and captures value” [6]. With this definition, a business model consists of four elements (also referred to as pillars): value proposition, customer interface, infrastructure, and revenue model. The pillars cover mechanisms that connect the blocks: (i) value proposition with (ii) value creation, delivery, and (iii) value capture [7]. The definition mentioned above is a popular one, and has been tested in different studies. It has convenient applicability in production systems. This
paper employs the definition by referring to the three blocks of value to discuss case examples. It is to be noted that value capture in the definition refers to the organisation under question only; it does not include how other stakeholders might capture or share some form of value out of the overall business model. However, it is important that the values are well aligned to stakeholders considered [8]. Therefore, the value capture aspect is extended in this study so that other stakeholders are included at this value block.

Defining business models is a strategic level issue and is a prerequisite to properly capture value [9]; business model innovation is a possible source of competitive advantage if properly done [10]. Business model innovation can be seen as an attempt to redesign prevailing business model. The level of innovation needed to be regard as a business model innovation [1], [9] can be debated, though. For the purpose of this study it is taken that both minor and major alterations to a business model can be considered as part of business model innovation as long as they have a recognisable bearing on the three blocks of value.

Business model innovation for sustainability can be defined as ‘innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organisation and its value-network create, deliver value and capture value or change their value propositions’ [1]. Based on the definition, they provide a list of business model archetypes wherein innovation is made with regard to one or more of the value creation-delivery capture continuum. For example, product longevity under encourage **sufficiency** archetype focuses on value proposition such that the product is designed to provide maximum possible usable life, providing environmental and social sustainability. Educating the customer/end user on the use of the product is another way of innovating business model for sustainability that can add to the long term economic gains under the same archetype.

Business model innovations could focus on technological, social or organisational elements [1], [9]. These elements can be seen in terms of the triple bottom lines of sustainability: environmental, social and economic. Example innovative efforts in these categories can be rooted in what traditional forms of the business used to do and adopted such that they foster sustainable production approaches. For example, production systems have long been trying to optimise material and energy use in production. Manufacturers, then, have an opportunity to innovate their business models by covering the entire business system with such effort and connecting to value proposition.

4. Methodology

4.1. Selection of example cases

This study sets out to explore the possible learning that can be taken from manufacturing firms in Sweden regarding business model innovations for sustainable production. For this reason, a form of purposive sampling approach has been found sufficient. We want to learn from companies that have relatively better chance motivation and leverage to initiate activities for sustainable business model innovation. Small and big firms both may have the chance to start initiatives directed to sustainable production. But big firms tend to have better resources to leverage for this cause. Among such firms, the ones that have customers and operations in different legal systems have strong motivation to pursue business model innovation for sustainable production. Besides, these firms often have competitive market position which, if not kept evolving, may be taken by challengers. Given the Swedish industrial policy priority on sustainable production, the Swedish manufacturing sector provides a relevant context. Having considered these issues, firms with high turnover and number of employees have been taken into account. The sample space was limited to companies that have manufacturing operations in Sweden. Furthermore, the companies considered for the study have had some noticeable initiatives in relation to environmental sustainability that is beyond just regulatory compliance [5].

Accordingly, eight manufacturers from different subsectors were picked based their turnover in 2016 (according to www.va.se, accessed 2017-12-19). Of these, four were shortlisted based on availability of sufficient public data as well as properly presented sustainability report as an initial condition.
4.2. Data collection and analysis

The study relied on publicly available data from company websites, annual reports as well as press releases. This approach has been used in recent studies for identification of sustainability related practices by different researchers [1], [11]. Activities related to sustainability and business model are strategic issues [11]. The study relies on the higher public scrutiny of these large firms to extract activities and initiatives pertaining to sustainability objectives leading to innovation of their business models.

This study uses identification of activities that can be related to different archetypes for sustainable business model innovation. Archetypes identified in extant literature [1], [11] have been used as references to identify relevant activities in the selected manufacturing firms. The analysis was made at two stages: first identified initiatives from each company were mapped according to the archetypes they belonged to. Then a much closer observation was made on one firm that appeared to have better details for describing the connection of the initiatives with the three blocks of value. By having this kind of analysis as a starting point, future research could explore for generalisable patterns based on industry or other parameter of interest. The second stage of the analysis has been presented before the first one for convenience.

5. Findings

5.1. Description of example cases

The manufacturing companies selected in this study are among the top 10 manufacturers having manufacturing operations in Sweden. They belonged to automotive, machineries or apparel industry sectors as generic categories. Annual revenue and average number of employees in the year 2016 for these companies were more than 100 billion SEK and 40 000 respectively as shown in Table 1.

<table>
<thead>
<tr>
<th>Case</th>
<th>Industry</th>
<th>Employees</th>
<th>Turnover~ (2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>α</td>
<td>automotive</td>
<td>40 000+</td>
<td>100 billion SEK</td>
</tr>
<tr>
<td>β</td>
<td>machineries</td>
<td>50 000+</td>
<td>120 billion SEK</td>
</tr>
<tr>
<td>γ</td>
<td>apparel</td>
<td>110 000+</td>
<td>200 billion SEK</td>
</tr>
<tr>
<td>δ</td>
<td>automotive</td>
<td>80 000+</td>
<td>300 billion SEK</td>
</tr>
</tbody>
</table>

5.2. Business models for sustainable production: examples

The findings from the four case examples have been structured according to the business model archetypes reported in extant literature. For example, Bocken et al. [1] have identified eight archetypes under three dimensions: technological, social and organisational. A slight modification is made to add a third archetype of inclusive value creation for the third dimension. Table 2 reports innovation dimensions, corresponding archetypes, and examples of innovative initiatives in business model for sustainable production identified from case company α.

The general pattern of sustainable business model archetypes identified in the remaining three case examples (β, γ, δ) is similar to that of α; therefore, the need to report all detailed example initiatives is reduced. Each case company had at least one initiative that belonged to each dimension. Among the nine archetypes, closing the resource loops, adapting stewardship role, and repurpose for society/environment have been covered by each of the companies, in most cases with multiple initiatives. Besides, maximising material and energy efficiency has been considered with multiple initiatives by all but one case (company γ).

If we consider the number of initiatives for business model innovation for sustainable production, each company had different count. That is, companies α to δ in sequence had the following number of initiatives under the technological, social and organisational dimensions in respective order: α(9, 6, 5), β(3, 1, 1), γ(5, 4, 1), δ(7, 5, 4). One apparent pattern as a between-case comparison is that the number of initiatives decreases as one goes from
technological to organisational sustainability dimension. What cannot be seen from the findings, however, is the extent of implementation and effort required by the initiatives taken by the firms. That is, it is not necessarily true that a firm with three initiatives in one category has stronger sustainability over another one with only one initiative.

Table 2. Examples of sustainability archetypes in company α

<table>
<thead>
<tr>
<th>Category</th>
<th>Archetypes</th>
<th>Example initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>Maximise material and energy efficiency</td>
<td>Manufacturing with and for low carbon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lean manufacturing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased functionality</td>
</tr>
<tr>
<td></td>
<td>Closing resource loops</td>
<td>Circular economy, closed loop</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reuse, recycle, re-manufacture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use excess capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extended producer responsibility</td>
</tr>
<tr>
<td></td>
<td>Substitute with renewables and natural processes</td>
<td>Move to renewable energy sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zero emission initiative</td>
</tr>
<tr>
<td>Social</td>
<td>Deliver functionality rather than ownership</td>
<td>Product oriented PSS-maintenance warrant</td>
</tr>
<tr>
<td></td>
<td>Adapt a stewardship role</td>
<td>Consumer care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resource stewardship</td>
</tr>
<tr>
<td></td>
<td>Encourage sufficiency</td>
<td>Consumer education-communication, awareness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Product longevity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frugal business</td>
</tr>
<tr>
<td>Organisational</td>
<td>Repurpose for society/environment</td>
<td>Social and biodiversity regeneration initiatives</td>
</tr>
<tr>
<td></td>
<td>Develop scale up solutions</td>
<td>Flexible working</td>
</tr>
<tr>
<td></td>
<td>Inclusive value creation</td>
<td>Collaborative approaches-sourcing, production</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peer-to-peer and sharing model</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creating value for broader customer base</td>
</tr>
</tbody>
</table>

To establish better understanding from the value perspective, a few initiatives evident in company α (from Table 2) were described for what they entail with regard to value proposition, value capture and delivery, as well as value capture. Table 3 reports findings on this issue. For instance, the company had manufacturing with and for low carbon on usage as an example of the ‘maximise material and energy efficiency’ archetype. In this initiative, the company offers an increment to the core value in its value proposition by making the vehicles work with better efficiency during the economic life for the business customers. In order to realise and deliver this value the company made long term relationship and agreement with the customers to continuously assess their transport service performance. The resulting value is captured by the customers through reduced fuel consumption, and better overall operating cost; drivers of the vehicles would enjoy a safer, less noisy work environment; environmental pollution per usage of the vehicles would be less; the customers would have an additional benefit of monitoring their own performance nearly in real time. Therefore, customers enjoying these values would tend to remain loyal to company α, and this in turn translates to increased revenue.

It is to be noted that this business model innovation archetype example takes into account the carbon footprint of the product in its useful life, consistent with the definition adopted for sustainable production. Some earlier research publications might focus only on carbon reduction during the production of the vehicles which is a small portion compared to carbon release during the life of the product. This argument has been reiterated in the annual reports of most of the case companies. As illustration, company γ state: “The greatest climate impact from a garment’s life cycle is outside the company’s own operations” in their annual report.

The third business innovation archetype example shown in Table 3 has to do with making energy sources renewable. In the same fashion as before, the approach has a potential to cover the product lifecycle. For example,
company γ mentioned in their report how they managed to use more than 90% of electricity from renewable sources in their premises, including sales offices; the innovation mentioned from company α has to do with usage of less polluting and potentially renewable electricity for running commercial vehicles instead of fossil fuels. As a value proposition it counts on value that is future oriented as more and more of such vehicles go operational in larger extent. In the social dimension of value capture, it has a potential to give pride for the public using those commercial vehicles which could somehow influence patterns of mobility. Supply side value is also crucial in this business model innovation example because it has big potential for different partnering infrastructure and service (e.g. installation and management of wireless charging stations) vendors to get more and involved at local scale as implementation of electrified commercial vehicles expands.

6. Discussion and conclusion

6.1. Discussion

The fact that some examples of sustainable production business model archetypes are found does not necessarily explain how well these initiatives have been implemented. It is only an initial understanding that should be further explored. Even so, interesting observations are made from the cases discussed in this paper.

Table 3. Initiatives related to example SBM archetypes (case α)

<table>
<thead>
<tr>
<th>Sustainable production model innovation example</th>
<th>Value proposition</th>
<th>Value creation and delivery</th>
<th>Value capture (upstream, internal, downstream, society)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing with and for low carbon on usage</td>
<td>Life cycle-based optimisation of vehicles with improve operational efficiencies for customers</td>
<td>Working together with partners to optimise specific transport assignments</td>
<td>Reduced fuel consumption, noise and inefficiencies mean better safety and security, higher profit and better reliance on the company’s products and services, brings stronger loyalty</td>
</tr>
<tr>
<td>Extended producer responsibility</td>
<td>Global presence and collaboration with both customers and suppliers</td>
<td>Working together with customer to the extent of addressing their environmental impact</td>
<td>Environmental impact tackled at all possible levels, for lower cost and increase sales opportunities</td>
</tr>
<tr>
<td>Move to renewable energy sources</td>
<td>Electrified busses (with wireless charging at stations) and trucks</td>
<td>Product development activities and partnership to realise electrical transport systems</td>
<td>Market leadership through new developments leading to more revenue; business customers have reduced reliance on fossil fuel and smaller running cost; positive contribution to society and environment through reduced footprint</td>
</tr>
<tr>
<td>Product-oriented PSS-maintenance, extended warranty</td>
<td>Unique and complete transport solutions offered</td>
<td>Complete solutions as a way of reducing the large waste in transportation</td>
<td>Customers profitability is what drives profitability for the company</td>
</tr>
<tr>
<td>Collaborative approaches-sourcing, production</td>
<td>Partnerships to provide enhanced value in form of wireless charging, connectivity, and vehicle automation</td>
<td>Partnerships bring cove competences adding more value to product-service offerings</td>
<td>Competitive pricing for the augmented product service system; increased uptime and real time data provision for business customers; added revenue and profit for collaborating suppliers</td>
</tr>
</tbody>
</table>

Businesses that genuinely pursue sustainability do so because it is the right and smart thing to do [10]. Several examples exist that discuss how businesses build profitable businesses by first caring for the environment and addressing the needs of stakeholders. In a way, nature should be considered one of the stakeholders [10]. This is partly what seems to be apparent from the studies. Companies that strive for more sustainable business model appear to have surpassed regulatory requirements towards achieved much better targets in almost all the three dimensions of sustainability, even though sometimes it may be unclear and uncertain as to what these targets should be.
It is also clear from the cases that innovations addressing one sustainability challenge often lead to opportunities for capturing more value could have been missing, overlooked, or wasted. Therefore, business model innovation in view of sustainable production really pays off not only environmentally and socially but also in terms of economic viability in the long term. However, more challenges are also uncovered with such effort, like in a moving target practice.

Innovation examples on sustainable production archetypes obtained from the cases mostly appear as fragmented initiatives. If we follow the argument that forwarded by Teece [9] the chances that such scattered efforts would lead to fruitful sustainable production business model would be limited. Without an emergent and fruitful business models, the struggle to establish production systems of the future is challenged. Perhaps, redefinition of value is a primary requirement. By redefining value in extended form as something shared by the business, customers, suppliers and society in general [12], our perspectives on the value proposition – value capture continuum could change.

Transitions in the business role of firms striving for sustainable business offerings are apparent; some years ago αwould have been recognised for the durable heavy trucks that customers would pay premium for. This was illustrated by case α providing business customers with a broad-based complete solution augmenting different forms of value from mobility and autonomous control to real time performance analysis and security.

The competitive gain that such transition brings is not difficult to imagine. Multitude of stakeholders can capture and share value derived from those initiatives. Besides, the connection between the strong potential to expand market share and sales with business model innovation with environmental benefits and positive social impact as the implementation expands are apparent.

However, much yet remains unexplored to improve the scattered efforts into an adaptable strategies that lead us steps closer to envisioned sustainability goals far beyond legal compliance. Companies can – and should – exploit opportunities to derive economic value while improving environmental and social impact [12]. With this comes the increasing need to identify and map multiple forms of value generated for different stakeholders [1].

In connection with the aforementioned argument, extended producer responsibility seems to be one key area to integrate the benefits of different business model innovations for sustainable production for better dealing with lifecycle impacts of products [13]. This could be especially important as we move further with the sustainable production systems of the future with network manufacturing and dominance of cloud based IT infrastructure.

A challenge also remains on how to measure the values created as well as direct and indirect links between social implications and economic gains of business model innovations for sustainable production. Future research could direct efforts to identification and quantification of these links.

6.2. Concluding remarks

The cases discussed in this paper provide some good examples on making production systems more sustainable as a way of doing business. Large firms often have the motive and resources to pursue innovative approaches for sustainable production. This can be better utilised as a competitive advantage if aligned with business model that the company is pursuing. In fact, the current changing business landscape with a lot of uncertainties and severe environmental and social implications require that business models be emergent, and adaptable. These are also important traits for sustainability that manufacturers could benefit from.

The business model innovation archetypes prove a good generic way of pinpointing good practices and learning from good implementers. However, there are some indications of differences among different industry sectors that we may have to find a way to weight the relevance of the archetypes by sector with future research.

6.3. Research limitations

This research is not without limitations. To start with, there is not a very clear definition of business model innovation in the context of sustainable production to base analysis on. Additionally, the exploratory approach used does not enable for concrete generalisation. The study also does not distinguish differences in implementation levels of archetype example initiatives in different firms as it relied on qualitative analysis of publicly available data. This
study can be enhanced in the future to apply, for example, automated content analysis [11], or implementation of predefined analytical structure.

References