Product-Service Systems across Life Cycle

Functional Products business model elements: five industrial cases mapped to Hill categories

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Abstract

The paper addresses the Functional Products business model and how its elements are mapped to Hill categories in five industrial cases. The Hill categories include: order-winners, order-losers and qualifiers. The objective for Functional Products is to provide a function to customers with an agreed-upon level of availability, productivity or efficiency, etc. The paper outlines how different cases and their offers, based upon the Functional Products business model, can be element-wise mapped to Hill categories. Insight into the importance of the different business model elements provides valuable knowledge for an appropriate planning, design, sales and provision of Functional Products, as well as for determining how much effort, resources and money to spend on keeping the status of the element sharp, up-to-date, acceptable or just present.

1. Introduction

A prominent and emerging trend in the manufacturing industry is to integrate products, services and additional constituents in order to provide more value than the product would alone. There are a number of such concepts or offerings comprising various levels of complexity, e.g., solutions [1, 2], servitization [1], Extended Products [3], Through-life Engineering Services (TES) [4], Product-Service Systems/Industrial Product-Service Systems (PSS/IPS²) [5-6], Functional Sales (FS) [7], and Total Care Products (TCP) [8]. However, in this study we focus on the concept of Functional Products (FP) [8-11]. FP integrate the four main constituents: hardware, software, service-support system and management of operation, into provision of a function with a guaranteed or agreed-upon level of availability to the customers. Other potential contract parameters are, for instance, an agreed-upon level of productivity or efficiency. Commonly, the provision of FP is based on a long-term relationship, sometimes ranging up to twenty or thirty years, between the FP provider and the customer. The FP concept shares similarities with the above-mentioned concepts regarding the importance of increasing soft parts such as service/support, integration of additional services, knowledge/know-how, intellectual property and long-term management. Tukker and Tischner [12] have identified three main categories of PSS i.e., product-oriented, use-oriented and result-oriented, which are also applicable for many of the other concepts mentioned. FP can be considered as mainly result-oriented by providing a function/result. The FP, originating from hardware aspects, have most commonalities with PSS/IPS², TES, FS, and TCP. However, having four main constituents to develop in parallel, FP add additional complexity to the development process in question [13].

FP providers and customers are interested in a long-term relationship in order to find a sustainable win-win situation and lower the overall total costs. Thus, the value and importance of an efficient long-term management of operation is essential in most cases, since the operational costs often many times exceed the initial costs [14]. Subsequently, for the provider, it is of great importance to understand the FP business model and which of its business model elements are key to setting up a sustainable and profitable FP business as the FP offered to customers are based on the underlying FP
business model. Examples of FP business model elements are: customer value and value carrier, recipe for profit and financial stability, risk level and availability, and competence and know-how. The business model can be regarded as providing the infrastructure necessary to build offers upon, and provides the logic and commonalities for the offers based upon it, e.g., a high availability requires a service-support system, risk management, monitoring and analytic capabilities and competences, whereas the development of the offer addresses matters such as hardware reliability, maintainability, monitoring and analytic specifics. Thus, the FP business model needs to be kept in shape as well as the offers based on it. Further, as the business model elements reflect the underlying business logic, this understanding is important for planning, design, sales and provision of FP as well as for determining how much effort, resources and money to spend on keeping the status of the element sharp, up-to-date, acceptable or just present.

Recent research on business modeling and business model elements within the FP context includes the following: outline of a proposed set of business model elements [10], business models and operational tactics [15], win-win situations [16], value co-creation [14], value-based selling [17], risks related to value creation/delivery/capture [18], a proposed set of customer values related to sustainable management of operation [19], sustainable-oriented customer values [20] and general values for both provider and customer [21]. Further, the literature indicates which FP business model elements may be of interest in terms of value creation and support for the value creation. However, the research listed above does not provide guidance on why the business model elements are of importance for the planning, design, sales and provision of FP.

The concept of co-creation of value is regarded as a key aspect in many FP scenarios to achieve long-term relationships and to create necessary win-win situations [14, 16]. Co-creation of value [29-31] adds new possibilities and dynamics to the provider/customer relationship by involvement of both actors in the production and distribution of value. Thus, the co-creation of value may have a greater impact in FP contexts than it does in a pure product or service context, since FP contracts may range up to as long as twenty or thirty years.

To sum up, guidance on why and which FP business model elements are of importance for an appropriate planning, design, sales and provision of FP is scarce in the current literature. Therefore, this paper attempts to address this gap by using Hill’s framework [32] to highlight which elements are important and why they are important.

The rest of the paper is organized as follows. First, there is a section describing the research approach, which is followed by a section outlining FP and their business model elements, and a section on the Hill framework. Subsequently, the findings of the study are presented and, finally, the paper is summed up with a conclusions and discussion section.

2. Research Approach

The research approach employed in this study has been based on in-depth qualitative studies with 10 respondents representing five manufacturing companies. The empirical studies were conducted using semi-structured open-ended interviews [33-34] with respondents working for companies active in the Faste Laboratory at Luleå University of Technology, Sweden, which is a VINNOVA Excellence Centre focusing on FP Innovation. One additional company, Electrolux, which sells functional offers to customers, was also part of the empirical studies. Thus, the respondents were well aware of and knowledgeable regarding FP. The respondents were professionals responsible for marketing, services, strategy, development and sales at four international companies and one Swedish-based company:

1. Gestamp Hardtech AB (one respondent – manager tool and a section on the Hill framework. Subsequently, the findings of the study are presented and, finally, the paper is summed up with a conclusions and discussion section.

2. Volvo Car Corporation (two respondents – product strategy and marketing directors)
3. Volvo CE (two respondents – service marketing manager, advanced engineering engineer)
4. Infrafone AB (four respondents – CEO, sales representatives)
5. Electrolux (one respondent – regional category manager)

The purpose of having multiple companies with diverse focus was to ensure an advance in the understanding of the FP business model elements and their importance as well as why they are important, considering the similarities and differences between the companies (cf. [35]). Although the companies have different offerings, they all face the common challenge of how to best plan, design, sell and provide FP and/or similar concepts such as PSS/IPS, either as a provider in a partner consortium or as part of their own offerings. The companies are all manufacturing companies with roots in hardware development. However, additional complimentary components have been added to their customer offerings. What the additional components comprise and their weight or importance differs depending on industry and customer segments served. Some of the companies aim to increase their revenue from soft parts; i.e., services, knowledge or know-how, etc., as well as FP sold globally. Thus, the FP planned or currently offered by the companies vary and have different emphasis on the composition of hardware, software, service support system and management of operation.

Initially, semi-structured interviews were used, with open-ended questions [33-34] allowing the respondents to give detailed answers and the possibility to add extra information where deemed necessary [36]. The duration of the interviews was between two and three hours. In order to keep a wider view on FP business modeling, planning, design, sales and provision as well as to reduce response bias, the respondents

1 VINNOVA – The Swedish Governmental Agency for Innovation Systems
came from various parts of the organizations as well as different levels i.e., strategic, tactical and operational units. Hill’s framework [32] outlining the concept of order-winners, order-losers and qualifiers was used to attribute the business model elements in order to understand their importance and why they are important. In order to strengthen the validity of the study, data were continuously displayed using a projector during the interviews, allowing the respondents to immediately read and accept the collected data. After that, the collected data were displayed and analyzed using matrices (cf. [37]). The analyzed data were finally summarized into a matrix comprising FP business model elements and their attributes that may have impact on the planning, design, sales and provision of FP. For reasons of confidentiality, only an anonymous view of the analysis is presented (implying that it is not possible to link the individual companies to the details and respective attributions of their FP business model elements). Thus, in section 5 the companies will not be identifiable in the resulting table or text outlined.

3. Functional Products and their business model elements


Further, Lindström et al. [10] state that the management of the risk level can be seen as an integrator for the FP business model. In addition, interaction with customers is highlighted as a success criterion and includes understanding of the customer needs and wants as well as how the value is created in the customers’ value chains. Thus, the concept of co-creation of value is key in the FP context.

The elements #3, 4, 5 and 7 can be regarded as FP specific, i.e. reflecting the unique properties of FP. However, other result- or availability-oriented business models may partly overlap the FP specifics. The elements #1, 2, 3, 4, 6 and 7 are considered as creative or capturing of value, whereas #5, 8 and 9 are regarded as supporting the others in the value creation or capturing [10].

Concerning related business models and their elements, some examples are brought up and discussed briefly. Regarding IPS2, Meier et al. [6] propose the following business model elements: customer value, architecture of value creation, network partners, product model and turn over model. Further, pertaining to PSS, Schuh et al. [38] assert that marketing, value proposition, development/production process and the profit mechanism are the business model elements. In addition, for product-centric companies adding services, Kindström and Kowalkowski suggest that the service business model may comprise the following elements: strategy, structure, offering, revenue model, development process, sales process, delivery process, customer relationships, value network, and culture. Further, the latter eight, i.e. from offering-culture, share common resources and capabilities. Thus, comparing the FP business model [10] and the other business models outlined above reveals commonalities although the wording differs somewhat. Further, Kindström and Kowalkowski’s [39] view on having common resources and capabilities is well aligned with the perception that FP offers are based on the business model and its commonalities. However, Kindström and Kowalkowski have as their third element the offering, which contrasts the FP business model proposed in [10] and the view that the offering are based on the business model. Finally, Johnson et al. [40] posit, that while reinventing your business model, the following four business model elements are key and interlocking in order to create and deliver value: customer value proposition, profit formula, key resources and key processes.

4. The Hill framework and its three categories

Hill outlines a framework [32] proposing three categories to use during strategic business analytics and considerations: order-winners (‘Ow’ will be used in Table 1 below), qualifiers (‘Q’ will be used in Table 1 below) and order-losers (‘Ol’ will be used in Table 1 below). Order-winners and order-losers are what may win or lose orders if not present. A qualifier needs to be present or part of an offer for the customer to consider it (e.g., baseline requirements for safety, security or work environment, or ISO-certifications regarding quality or environment). Hill asserts that these should be mapped out and analyzed in terms of how they are relevant for a specific business. The mapping and analysis are both market- and time-specific, which means that the tasks may need to be done on a regular basis for the outcome to stay up-to-date. Some researchers have expressed criticism towards Hill’s framework, e.g., [41] claiming it to be useful in broad strategic discussions but be less useful for measurement and analysis in empirical research. Another criticism is that it makes a company pre-occupied with the past and present, missing the most important consideration – the future – and what should be done to stay competitive. However, keeping the critical views in mind as well as considering the future, the Hill categories are considered purposeful/adequate for our mapping and analysis (see Findings in section 5) in order to understand the importance of the FP business model elements, as well as why they are important. Other categorizations are, of course, possible to use, depending on purpose, context and theoretical underpinning.

5. Findings

The findings are listed in Table 1 below, where each of the five companies’ business model elements are mapped to the
Hill categories. To distinguish if a category has a large or small significance or impact, the respondents in all companies proposed that ‘Q’, ‘Ow’ and ‘Ol’ would correspond to large and ‘q’, ‘ow’ and ‘ol’ to small. One company also considered two business model elements to become significant in the future or change in the future, and this is attributed to ‘(future x)’ where the ‘x’ is the Hill category in question. If ‘−x’ is attributed, it means that the business model element was not applicable or yet considered by the company.

The business model elements in Table 1 are referenced according to #1-9 in section 3 above. Further, the anonymity of the companies has been maintained in order to ensure confidentiality.

Table 1. Five industrial cases and their business model elements mapping to Hill categories

<table>
<thead>
<tr>
<th>Bus model element #</th>
<th>Comp A</th>
<th>Comp B</th>
<th>Comp C</th>
<th>Comp D</th>
<th>Comp E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ow</td>
<td>Ol</td>
<td>Ow</td>
<td>Q</td>
<td>Ow</td>
</tr>
<tr>
<td>2</td>
<td>Q</td>
<td>−</td>
<td>Ow</td>
<td>Q</td>
<td>Q/ow</td>
</tr>
<tr>
<td>3</td>
<td>Ol</td>
<td>−</td>
<td>(future q)</td>
<td>Ow</td>
<td>Q</td>
</tr>
<tr>
<td>4</td>
<td>Q/Ow</td>
<td>−</td>
<td>Q</td>
<td>Ow</td>
<td>Q</td>
</tr>
<tr>
<td>5</td>
<td>Ow/Ol</td>
<td>Ol</td>
<td>Q (future ow)</td>
<td>Ow</td>
<td>Q</td>
</tr>
<tr>
<td>6</td>
<td>Q</td>
<td>Ow</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
</tr>
<tr>
<td>7</td>
<td>Ol</td>
<td>Q</td>
<td>Ow</td>
<td>Ow</td>
<td>Q</td>
</tr>
<tr>
<td>8</td>
<td>−</td>
<td>Q</td>
<td>Ow</td>
<td>Q</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Q</td>
<td>q</td>
<td>Q</td>
<td>q/ol</td>
<td>Q</td>
</tr>
</tbody>
</table>

5.1 Analysis

From eye-balling [37] Table 1 it is clear there are no obvious general mapping patterns between the companies, except perhaps for elements #9 and #8. In addition, some companies attributed two Hill categories to one element, indicating that it can be both in various business situations. Thus, a company interested in, or doing, FP business needs to analyze its own potential FP business and its logic in order to understand which business model elements are important and why. Using Hill’s framework this will indicate whether the elements are: order-winners, qualifiers or order-losers, as well as how this affects the planning, design, sales and provision of the FP in question. Further, as the five companies investigated are not competitors and provide competitive FP – it is likely that the set-ups of their business logic, which is reflected in the business model and its elements, are not the same or even similar. Thus, if the companies had been close competitors the columns in Table 1 may have been similar.

Comparing the results in the light of Johnson et al.‘s [40] view that value proposition and profit formula are key when reinventing your business model, it is interesting that Table 1 (see business model elements #6 and #9) indicates that these in an FP context are considered more or less as qualifiers. Further, regarding the Johnson et al.‘s view on the key resources and processes, there is a better match regarding the importance as the FP “key resources” (see business model elements #1, 2, 3, 7 and partly 4) and “key processes” (see #5 and partly 4) are attributed in a large extent to the order-winner or order-loser categories. However, the FP business model elements #1, 2, 3, 4, 6 and 7 are in [10] considered as creative or capturing of value, and thus also implicitly considered as key – which is rather aligned with Johnson et al.’s view.

A closer look at Table 1 reveals a few outliers that should be given closer consideration; for instance, if there are many ‘Q’, ‘Ow’ or ‘Ol’ that imply something. Company E attributed many ‘Q’ or ‘q’ as well as only ‘ow’ and no ‘Ol’/’ol’. This can be explained by having a different customer base (including businesses, public organizations and private consumers) than the other companies, where the relationship to the dealer/distributor partners, brand, value-chain position, and competency/know-how, plus having adequate information for decision making, are deemed as important for the business logic involved. Companies C and D have many ‘Ow’. There is no apparent similarity between the companies, except for having mainly professional end customers/operators. However, company D has less need for high-quality external relations and brand, etc. due to a different way of doing business with low exposure to external partners in the value-chain. Companies A and B have a few ‘Ol’ among the business model elements. Company B relies more on partners/distributors/agents than company A, and both companies A and B need to have customer involvement and commitment.

Regarding the contract (see business model element #8), it is currently not considered as an “Ow” or “Ol” by all companies. However, this is something that likely will change later on the FP lifecycles when important and crucial contractual matters are discovered and necessary to be dealt with.

In addition, company C proposed a new element “Delivery system”…which would be a ‘q’ in company C’s context. This will be noted and considered in future research on the FP business model elements.

The Hill categories indicate how much effort, resources and money should be spent on a particular business model element. In particular, order-winners should be kept sharp and up-to-date. Thus, to keep it sharp and up-to-date may require planning, effort, resources and a number of activities in the planning, design, sales and provision of FP, as many or all of these are part of the business logic reflected upon the business model element. Thus, companies C and D may need to carefully consider this. Further, less planning, effort, resources and activities may be spent on qualifiers, as these need to be adequate and meet the standard of the competitors. Thus, the competitors’ offers need to be benchmarked on a regular basis in order to stay competitive. Company E should consider that.

Prior to the interviews it was presumed that the business model elements would only be attributed one Hill category. However, the data show that attributing some of the business model elements to discrete categories is hard or not possible when addressing multiple industrial cases. Interestingly, the study in [20], concerned with FP customer values, came up with a similar conclusion regarding attributing to discrete categories. As indicated, some of the business model elements were attributed more than one Hill category by three of the companies.
6. Conclusions and Discussion

The paper is based on an empirical study involving five manufacturing companies. The main result is that a company involved in FP business needs to investigate which business model elements are important and why, for instance, using Hill’s order-winners, qualifiers or order-losers, in order to understand what impact they have on the planning, design, sales and provision of the FP. If the investigated companies had been close competitors and provided similar FP offers, Table 1 may have shown greater similarity in terms of the attribution of Hill categories.

The paper makes a contribution to theory by applying Hill’s framework and categories on business model elements and also attributes small or large significance, or impact, for each of Hills categories. Of interest is that there is a potential discrepancy between theory and practice in terms of which FP business model elements that “should be key”, and this needs to be further investigated. Further, some of the findings may also be applicable in contexts involving the closely related business models or concepts of PSS/IPS, TES and FS.

Further, the paper makes a contribution to practice and management by validating Hill’s [32] framework as a means of identifying and structuring different elements i.e., business model elements of FP, and by identifying the contribution of these elements and why they are important, enabling management to focus the spending of effort, resources and money during the planning, design, sales, and provision of FP offers.

Having many order-winners among the elements of a business model likely requires more effort, resources and money than for business models mainly comprising qualifiers and order-losers. Thus, in order to pursue such a business model, or an expensive (and complex) business model, a company should get a wanted return-on-investment which should be higher than for a business model comprising more qualifiers or order-losers. Having many order-winners may reduce the business risk, although invoking a higher financial risk, as fewer competitors may be interested in, and capable of, offering an FP offer based on a similar business model and business logic. This is one way to stay ahead of the competition, create a stronger win-win situation with customers and increase revenue. However, if a competitor can offer a competitive FP offer based on a cheaper (and less complex) business model, the order-winners may need to be sharpened even further or qualifiers turned into order-winners in order to keep the competitive edge and win (most of) the business.

Regarding future research, the FP business model elements will, in a context with both FP providers and customers, be revisited and also investigated if and why some of the elements differ in importance compared to other proposed business model outlines such as [4-6, 38-40].

A reflection is that the FP business model elements, like the FP business model, are of a dynamic nature and not static. Thus, the elements and their weight and importance in the overall business model may change over time as the underlying and reflected business logic change in order to stay competitive. Hence, it is necessary to adapt the FP business model to changes in the surrounding business environment/climate.

Finally, pursuing an expensive business model or a cheap one should be a conscious decision and the company should be aware of the risks. There are advantages and benefits with both, and the choice of which way to go may be enabled or restricted by a company’s vision, management, stakeholders, business climate, customer expectations, financial situation, capabilities and innovativeness. Thus, an active strategic choice and planning are necessary to stay profitable and competitive in an FP business context (or context with similar offers and challenges) over time.

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References