

PRODUCT/SERVICE-SYSTEM DEVELOPMENT – AN EXPLORATIVE CASE STUDY IN A MANUFACTURING COMPANY

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ABSTRACT

'Product/service-systems' (PSS) are innovation strategies where instead of focusing on the value of selling physical products, one focuses on the value of the utility of products and services throughout the product's life period. This approach enables companies to provide customers with offerings that continuously deliver value and create a strong competitive advantage. PSS attempts to transcend the old industrial credo that value is embedded in products and the consideration of '*cost-quality-time*' relates to the physical artefact. While there is increasing interest in PSS, limited research has been done in the design and development aspects of PSS. The objective of this paper is to explore how a global manufacturing company is developing an offering to their customers that is focused on the utility of their products throughout their life time. The paper describes the process of how a company is shifting from selling office furniture to selling the benefit of *sustainable office workspace performance* - measured in *economic, social* and *environmental* terms. By relating the customer's business performance to the activities associated with the use of office workspace the company may enhance the value of their products. This process of re-defining the value of what the company is actually offering to its customers is seen as a key element in PSS development. PSS development is expected to expand conventional product development in new directions, such as new activities, roles and responsibilities, knowledge and competencies, and value network relationships. The implications of this are discussed in relation to the company's development approach.

Keywords: product/service-systems, innovation strategy, sustainability, workspace, value networks

1 INTRODUCTION

Increasing global competition, our post-modern society and the era of mass consumption has been putting steady pressure on manufacturing companies over the past decade. The introduction of concurrent engineering [1] has enabled organisations to differentiate their products with respect to the key competitive aspects of '*cost-quality-time*'. However, as low labour cost countries have increased their market freedom and thereafter industrial capacities, competing has proven difficult for manufacturing organisations in developed countries. New business strategies and market differentiators beyond '*cost-quality-time*' are therefore currently of particular focus for companies. Many manufacturing companies today are concerned with their future business prospect. Especially companies that have based their business on manufacturing and selling products that are technologically mature. These companies already experience difficulties in differentiating their products in the market, with respect to price, functions and design. The prospect of increasing global competition casts doubts on whether their traditional business approaches will be profitable in the future. Discouraged by strategies that only seek to decrease costs, companies are progressively more interested in ways to increase their understanding of how customers perceive the value of their offerings. Given these trends, very little research has been done in the development activities of manufacturing companies that are in the process of redefining the value of their offering. In this paper we intend to explore how a global manufacturing company is addressing these issues in a development project. This paper describes the process by which one particular company is making the move from selling office furniture to selling the benefit of *sustainable office workspace performance* - measured in *economic, social* and *environmental* terms – to their customers. By relating the customer's own

business performance to the activities associated with the use of office workspace, the company may enhance the value of their products. This approach of re-defining the value of a company's offering is akin to a *service-oriented business strategy* termed 'product/service-systems' (PSS). We will describe in particular the activities, roles and responsibilities, knowledge and competencies, and the network of actors necessary for consideration in a move to service-orientation. We will also describe how the case company intends to use the shift from product-orientation to service-orientation, in order to realise the company's goals regarding sustainability. Finally we will reflect on the observations made in our empirical research regarding the opportunities, barriers and complexities of moving from a product- to a service-strategy. These reflections will be made in particular with the activity and role of product development in mind, when carrying out the conceptualisation and development of a PSS.

2 PRODUCT/SERVICE-SYSTEMS

Product/service-system (PSS) approaches are innovation strategies where companies provide value to their customers by supporting and enhancing the utility of their products throughout their life cycle. The principle behind PSS is a shift in business perspective from product-orientation to service-orientation, where instead of the product itself, the actual activity associated with the use of the product is considered to be of more value to the customer [2]. Value is not embedded in the physical product (Figure 1) but is created by supporting the customer's activities related to the use of the product. Customers need not be concerned with the responsibility of learning how to use the product, maintain or dispose of it, but merely benefit from the effects of use. It is believed that PSS approaches will enable and motivate companies to reuse, rationalise and enhance their products and services more efficiently throughout their life phases. This is why it is important for the company to identify and align the development of both product and business strategy. To date little research has been carried out regarding the systematic design and development aspects of PSS [3].

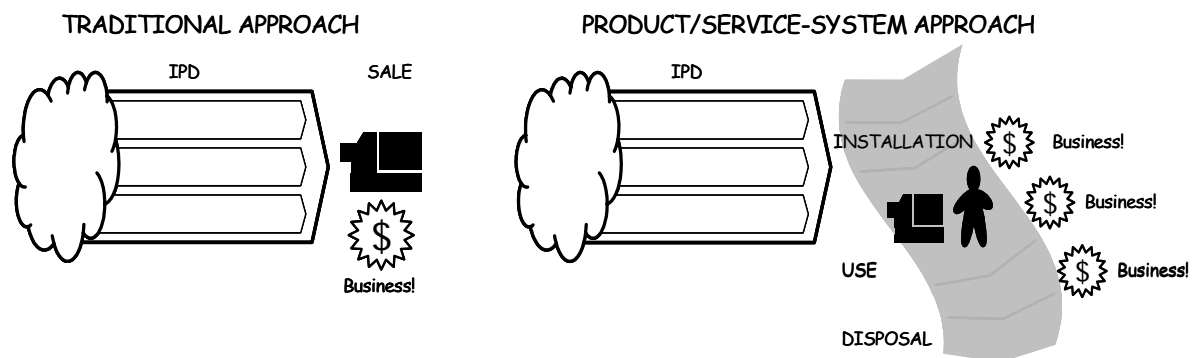


Figure 1. A traditional approach, where the value creation process ends with the sale of the product, and a PSS approach, where the value creation process continues throughout the product's life.

A PSS approach involves the conception of how products (physical artefacts and components) are integrated with services (intangible knowledge, skills and activities) to create total offerings. This usually involves reconsidering the network of actors [4] that usually operate within the business, plus a simultaneous consideration of customers' activities and product life cycle developments. Or in other words, the design of *context and (delivery) channel* together with *content* [5]. It is our hypothesis that the adoption of a PSS strategy for a company leads to a set of new opportunity parameters [6]:

- Re-invention of core business areas
- Increasing of competitive edge (customer lock-on)
- Greater control over the product throughout its lifetime
- Increased insight into the nature of the product and its use
- A path on the road to sustainability

We will apply the case study described in this paper to the above hypotheses, in order to reflect on the reality of the case in relation to the hypotheses. It is worth mentioning that the term 'PSS' is related to

and shared with other terms such as '*functional sales*' [7], '*functional (total care) products*' [8], '*servicizing*' [9], and '*service engineering*' [5]. Design research in PSS has its roots in *product life thinking* [10] and *eco-design/design for environment* methodology [11], [12]. Traditionally in a manufacturing company, product and service development are separate activities that are performed in different parts of the organisation. Therefore, PSS design research also incorporates the expansion, co-operation and integration of development activities, both internally in an organisation [1] as well in development partnerships in value networks [4].

3 RESEARCH APPROACH

The research this paper is based on is derived from participation and observation in a development project at a manufacturing company over a period of three months. The fieldwork conducted was of a descriptive and qualitative nature. The data used is based upon participation in a development project following the strategy of *participatory action research*, where the object of study was not only observed but also influenced by the researcher [13]. The researcher in this manner is not an 'objective' observer of the occurring phenomenon and therefore risks being biased in his observations, but as the aim of this research is to explore the development activities of a company, emphasis is placed on being present under the whole development process and not just in formal, periodical project meetings. This gives a deeper understanding of the project and its context in the company, as well as total access when gathering data.

The goal of the development project was to demonstrate how the company could support the move from doing business based on product sales to business based on the achievement of *sustainable office workspace performance*, related to activities in the physical work environment. The network of actors was mapped, actors interviewed and their competencies that would contribute to this new business model were considered. Parallel to this, relations between the individual design elements of a workspace and the performance of workspace activities were illustrated. The project is intended to manifest itself in the form of a tool relating value-base data from workspace planning to actual business (product and service offerings) specifications for the company.

At the time of writing, this research project is not yet completed and is still in progress; this means that the observations in this article only reflect the work performed in the concept phase from initial idea and intent to a working prototype of the tool that could be used to validate the general business case, i.e. '*proof of concept*'. The core project team was composed of 5 persons and its base in the organisation was within the company's corporate research department, but was closely tied to the company's sustainability department as well as international marketing.

4 THEORETICAL FRAMEWORK

PSS approaches represent challenges for companies as the tasks and abilities of providing integrated products and services are different from a traditional product-oriented approach. We will in this chapter attempt to outline what these differences are, so that implications of PSS approaches to the development and design in companies may be made clear [14].

4.1 New activities

Traditionally manufacturing companies have not considered their customer's activities as part of their value creation process, but merely as value extracting processes [15]. In development projects that are product-oriented the process ends with a full product description or the realisation of production and sales. With PSS approaches we expand the development task in time so that it also encompasses the use phase to ensure continuous development that is aligned with the customer's actual activities. In order to employ customers and external stakeholders as resources in the development process, the company must establish value co-creation activities in which they are encouraged to participate in.

4.2 New roles and responsibilities

A key difference with the PSS approach to business creation, when compared to the traditional product-oriented approaches, is that the company plays a key part throughout the product's life. The company takes on the responsibility of the physical products during its use, maintenance and disposal phases. Exactly how and to what extent this involvement with the customer is, needs to be defined.

Herein lies the possibility for companies to take upon responsibility of the total social and environmental impacts of their own products. It is central that the role and responsibilities of customers in PSS should be determined by the company. Likewise responsibilities in relation to partnering companies and their role in the process must be carefully considered. Here the research around 'Solution-oriented partnerships' gives some good insights into the way in which companies orchestrating PSS offerings manage these new roles and responsibilities [4].

4.3 New knowledge and competencies

The shift of perspective from a product-oriented view to a service-oriented view represents a gap in knowledge for many manufacturing companies [16]. The knowledge and competencies in manufacturing companies are typically directed at embedding knowledge into a physical artefact. With PSS approaches, knowledge and competencies can be aimed directly at the customer's activities, e.g. through the education and training of the customer. Value is attained through this close interaction with the customer during a product's use phase, as new insights about the product and a better understanding of customer value may be gained. If captured and integrated into the providing company's organisation, these insights can be a vital source of competitive advantage.

4.4 New relations

Typically a company's development activities are derived (top-down) from the company's overall corporate strategies in relation to its position on the marketplace. This assumes that industry structures are relatively stable [17] and is well suited to manufacturing industries, where products can easily be compared on specific parameters, (e.g. price, size, functionality, etc.). PSS approaches attempt to uncover new relationships and rearrange the value network of actors. The markets in which PSS companies operate on are not as stable in comparison, as they will rapidly follow emerging opportunities. Often the determining competitive advantage will be based on the forming and orchestration of new networks that can provide unique value to the customer [4].

5 INDUSTRIAL CASE STUDY

5.1 Introduction to the company

The case study in this paper derives from a research project performed in collaboration with Steelcase, a global leader in office furniture. Steelcase's mission is "*to provide a better work experience*" which they try to accomplish by offering a multitude of products and services that surround the office workplace environment [18]. The company believes that the physical office workspace environment is a strategic asset (on the same level that *people, technology* and *business processes* are) that can leverage their client's strategies and help them achieve their business goals.

Steelcase operates mainly on the business-to-business market and has a strong global presence supported by independent dealers throughout the world, but their market position is strongest in North America. The company is usually associated with high quality durable products that take environmental issues seriously. Steelcase positions itself as a company that understands and is knowledgeable about the way people work in offices as well as the social aspects of the activities associated with work. This allows them to provide customers know-how about workspace layout planning.

Steelcase has grown immensely since it was founded in 1912. The corporate portfolio has now spread to also include subsidiaries that offer upholstery textiles and fabrics, lighting solutions, IT network cabling, visual communication products and even complete turnkey office buildings. They have also expanded their customer base to include educational and health care institutions. Manufacturing and the sale of physical products still constitute the majority of the company's activities, but Steelcase does provide a variety of service offerings such as workspace planning, leasing, sales through the internet, reselling of furniture, asset management, ergonomic training, reparations, refurbishment, inventorying, handling moves as well as strategic workspace consulting.

5.2 The market for office furniture

The office work environment has changed drastically in the past few decades. Work is increasingly information and knowledge intensive, traditional organisational hierarchies have given way to flat, decentralised structures where work is based on projects, teams and networks, and the emergence of information and mobile communication technologies has drastically changed the way people may communicate with each other. This has resulted in 'work' no longer being confined to a particular time or place, but can be performed at any time, any where. People today can work from other locations, such as their homes, and flexible working hours allow employees to decide when they want to work. In addition globalisation has increased the rate that companies establish and relocate their offices.

The global tendency that an increasing amount of the workforce is employed in the service industries also implies that the global demand for office furniture will also increase. The competitive market situation varies - in North America 5 leading companies share approximately 60% of the market [18] whereas in Europe the top 10 companies share 30%. The market competes mainly on product design, quality and durability, price, on-time delivery, and service and technical support, but with many competitors delivering comparable designs, quality levels and product features, the market is very price sensitive [19]. Companies typically view office furniture and the physical work environment as necessities that represent costs, which at best only contribute marginally to their business performance. Office furniture is seen as something companies must have, but not an investment that pays back over time. Steelcase usually sells to facility managers and purchasers in companies. These employees are typically measured on how good they are at minimising costs while maintaining the same quality level. The effects of the physical workspace environment and how it is planned is usually not valued. Steelcase argues that in office workspaces employee salaries are by far the greatest cost to companies and the physical workspace is just a tenth of the total costs [20], but the impacts of the physical workspace on work, account for a considerable amount of the companies' everyday business performance.

5.3 The development project

This research is performed mainly with Steelcase's team for future workspace trends. The team is an executive function to the company's strategic team, and its objective is to carry out early research and application development. Its focus is on understanding users and changing work patterns, as well as the impact of emerging technologies in the workplace [18].

Following their commitment to the environment Steelcase has since 2001 worked intensively with *Eco-design/Design for Environment* and *Life Cycle Assessment (LCA)* methods [11],[12] – to such an extent that they issue comprehensive Environmental Product Declarations on all their products. In order to continue to live up to their commitment to protect the environment they have recently asked themselves, "what should be the next steps?" Steelcase acknowledges that their focus on office furniture (chairs, desks, storage units, etc.) is not sufficient enough to achieve substantial global environmental improvements. They have to consider the whole office environment and relate this directly to the users of the workspace. Although furniture typically has the greatest environmental impact in its material and production phases, compared to lighting, computers, heat and ventilation; the total environmental impact of furniture is just a fraction of the whole workspace environment. In collaboration with École Centrale Paris and the French Environment and Energy Management Agency (ADEME) Steelcase has initiated a project "to develop a computer based information system linking workspace design with business results and sustainability performance (in economic, environmental and social terms) to support decision making when planning office workspace"[21]. The ultimate objective of the project is to demonstrate and actively engage Steelcase's clients to show that the physical office workspace has economic, environmental and social impacts vital to their clients' strategy and business performance (Figure 2). The idea is to position Steelcase as an expert on all activities related to the physical workspace and not just an office furniture manufacturer.

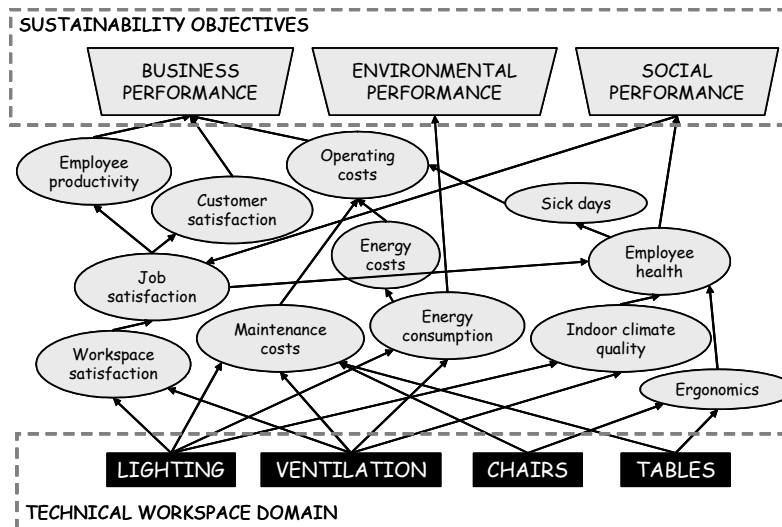


Figure 2. The general principle (only limited correlations shown) behind the computer based information system tool, showing correlations between technical elements in workspace design in relation to sustainable performance.

5.4 Researcher involvement, project activities and timing

The investigating author's involvement in the project began at a time, when the principal technical foundations of the project had been determined, and where Steelcase had the need to move the project from a conceptual research-oriented project (which it had been in for a year) to a project with clear operational value to the organisation. The activities agreed with the project's steering committee and conducted by the investigating authors can be seen in Table 1.

Table 1 - Research activities performed for Steelcase during the period of the case study.

<p>WORKSPACE KNOWLEDGE</p> <ul style="list-style-type: none"> • Investigating suitable metrics and indices for workspace performance. • Scanning for similar or related information systems that already exist. • Scanning for workspace research and knowledge outside of Steelcase.
<p>STAKEHOLDERS AND ACTORS</p> <ul style="list-style-type: none"> • Understanding the company's customer relationship cycle. • Involving and understanding internal stakeholders from: <ul style="list-style-type: none"> – Strategic workspace consultants – The service organization – International marketing – Corporate sustainability issues – Regional sales representatives – Brand and customer experience • Identifying target users, audiences and use cases for the information system. • Relating the information system to Steelcase's business process and stakeholders. • Involving and understanding external stakeholders: <ul style="list-style-type: none"> – A lighting solution company – A company specialized in acoustic ceiling solutions for the office
<p>DEVELOPMENT</p> <ul style="list-style-type: none"> • Developing a mock-up, 'looks like/feels like' model of the information system that would reconfirm the project's business viability and technical feasibility.

By being actively involved in the project in the manner described above, access was gained to the company’s internal stakeholders, external partners in the value chain, and even some of the company’s customers. This insight into the company’s network gave rise to the following observations.

5.5 Observations during the development of the project

In this section we will attempt to hold the observations made during a three month period of the development project against the theoretical framework presented in chapter 4.

5.5.1 Activities

As the result of the project is expected to be a computer-based information system used with Steelcase customers to support their decision making process regarding office workspace design, it was perceived in the organisation as a sales consultancy tool. When representatives from Steelcase’s service organisation were asked how the tool would fit into their dealings with customers, they were interested in knowing if the tool could actually support not just the planning of office workspace, but all the customer activities associated with the physical workspace. Inspired from research in marketing [22, 23] the relationship between customer’s activities and Steelcase’s activities were mapped (Figure 3). This gave a good overview of where and how Steelcase could support their customers best. Although not common in product-orientated part of the company, it was later discovered in the project that Steelcase’s brand and customer experience department used similar mapping techniques.

Another observation made was that if the information system was used not only to support planning of workspace but could also support workspace performance measurement before and after implementation of a new workspace, then Steelcase could, with time, also ‘learn’ about the impacts of the physical workspace to sustainable business performance. This systematic gathering of knowledge was considered valuable to the company.

When studying an existing tool that structured customers’ inputs to a new office building and let them simulate the effects of their decisions straight away, it became apparent that the use of the tool could lead to an engaging activity that in itself be of value to customers, as well as allowing the company to gain deep insight to their customers’ needs.

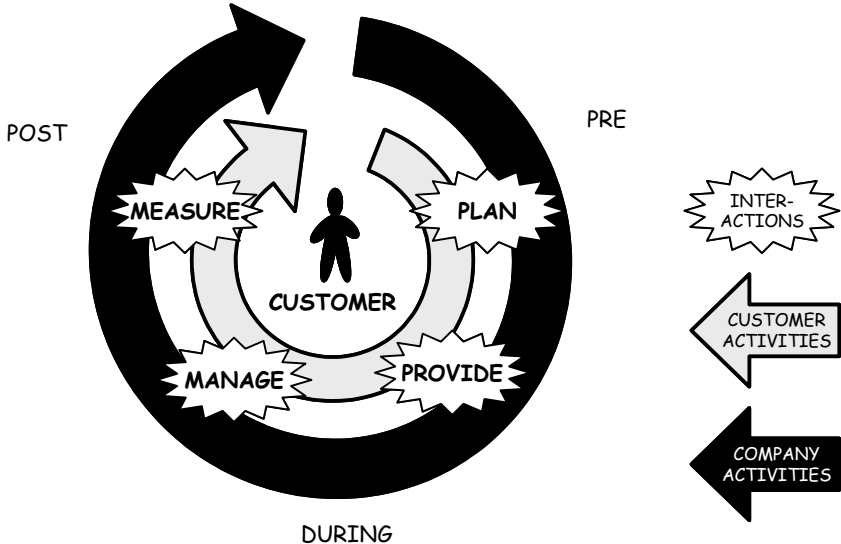


Figure 3. A simplified Customer Activity Cycle [22] – Mapping the customer life cycle activities and interactions in relation to the company’s activities and offerings.

5.5.2 Roles and responsibilities

When presenting the project internally to a (product) sales representative (BF), he pointed out two aspects with the project that he perceived as challenging. The aim of the tool was to encourage Steelcase’s customers to realise the social and environmental impacts of their workspace. According to

BF, although customers did have an increasing interest for the social and environmental impact of office furniture, they considered these obligatory properties without economic value. Any additional efforts by Steelcase regarding sustainability would not be considered to have much value on the market. The other aspect that BF thought would be challenging to the organisation was that as Steelcase attempted to re-position themselves as providers of productive workspaces they would find themselves competing against consulting firms (such as Accenture and PricewaterhouseCoopers). BF questioned what claim an office furniture manufacturer could have in such a business dealing with customer’s strategic issues.

Opposing this point of view was individual customer comments picked up from other parts of the organisation which indicated growing awareness of sustainable issues, and caused them to think about their own office’s social and environmental impact. Traditionally only a concern of manufacturing companies, it seemed that white-collar and office real estate companies were interested in learning more about sustainability – and that they saw Steelcase with its long-standing efforts with environmental issues, as an appropriate partner.

5.5.3 Knowledge and competencies

As mentioned earlier Steelcase acknowledged that their traditional focus on office furniture alone would not be credible enough to customers when positioning themselves as “*sustainable workspace performance providers*”. Knowledge of the correlation of all the technical elements in the office to workspace performance had to be uncovered and accessed (Figure 4).

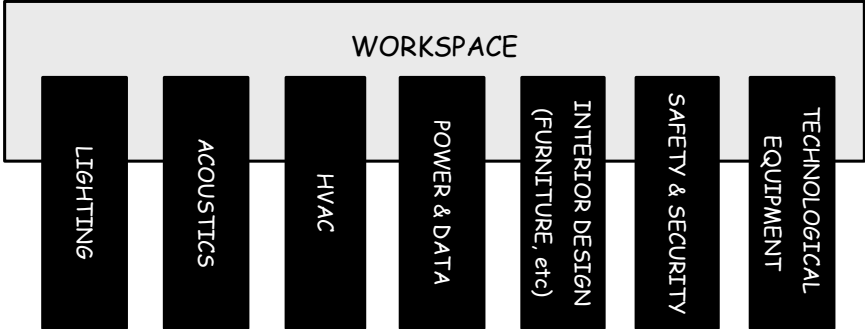


Figure 4. Workspace planning integrates 7 technical domains of the physical office environment. Steelcase is only a supplier of some of the components of a workspace.

As the project progressed it also became apparent that the person using the information system would have to have a certain understanding of and ability to discuss strategic workspace issues with customers. Besides the few strategic workspace consultants already in the organisation, the competencies of the average sales representatives were not deemed sufficient. The tool would either have to be more simplified or staff had to be trained specifically.

5.5.4 Relations to actors

In order to access knowledge about the technical elements of the office that was not part of Steelcase’s portfolio, Steelcase would have to partner up with companies that supplied these other elements. Two companies (a lighting and acoustic ceiling solution company) were contacted and even though on some accounts the companies’ product portfolios overlapped, both companies expressed interest in participating in the project. An observation made in discussions with these potential partnering companies was that one of the motivations for the other companies to collaborate was that Steelcase was seen as the workspace supplier closest to the end user of their products. In many rented office buildings the lighting and ceilings are decided upon by real estate developers long time before the actually occupiers of the workspace is known (Figure 5). This meant that often the qualities of the lighting and ceiling solutions were not really given proper value, as those deciding what to put into the workspace, usually did not know how this would affect the end-user. The potential partners were interested in getting closer to their end users and being able to influence decisions about workspace design.

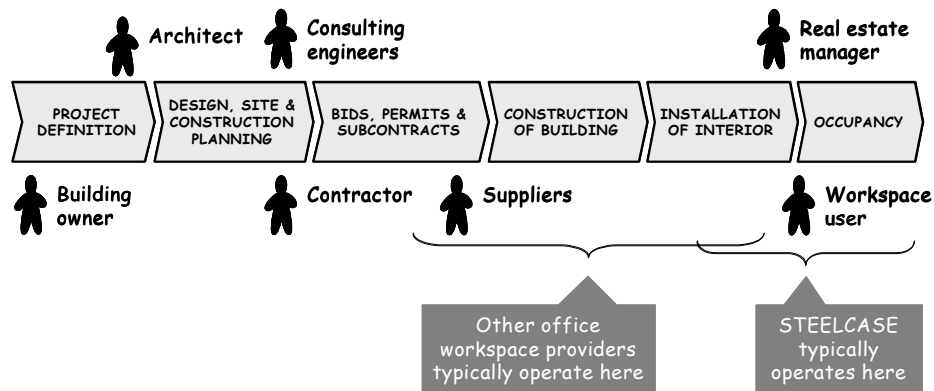


Figure 5. The process of building an office workspace in relation to actors. Steelcase is the workspace provider closest to the end-user. The suppliers of the other technical components are usually involved much earlier in the construction process.

A clear objective of the tool was to attract interest from business leaders of client companies. As mentioned earlier facility managers and purchasers in client companies are typically responsible for the physical workspace. Steelcase wanted to draw attention to the strategic aspects of the physical workspace and thereby initiate a dialogue with key decision makers such as business leaders that would then see Steelcase as a strategic partner to their business activities. This would ensure Steelcase a strong position on the market.

6 DISCUSSION AND PERSPECTIVES

6.1. Is the case study representative of a step towards PSS?

Before we discuss what PSS opportunities and challenges we believe to have identified in the Steelcase project, we should first determine whether the industrial case presented in this paper can actually be seen as part of a PSS approach.

Although the project was not formally formulated as a PSS development project, Steelcase is familiar with the concept of PSS and is aware of the increasing challenges of being a furniture manufacturer in the future. The project is viewed as something that will be able to transform the company's manner of working with clients and doing business. As Senior Vice President and leader of the future workspace team, MG mentioned in relation to the project, *"We have to move up the food chain. Profits are slim in manufacturing. We have to move in to services!"* The project originally rose from environmental efforts based in the product-oriented part of the organisation, but as the project progressed more service-oriented aspects were included in its development and now it appears to cater more for the service/customer relationship-oriented part of the organisation.

Finally the fact that Steelcase chose to collaborate specifically with the researching authors of this article, leads us to believe that the company's general intentions and basic principles of PSS approaches were aligned. The researching authors of this article have specific competencies in product development, *eco-design*, LCA and PSS research. Now that we believe that we have established the PSS correlation in the industry case study, let's look at the opportunities and challenges identified in this PSS case study.

6.1 PSS opportunities and challenges

A major part of PSS research points to the many opportunities that become visible, when following a PSS approach. In this section we will reflect upon the opportunity parameters presented in chapter 2 in relation to the case study.

When it comes to redefining what value Steelcase is actually bringing to their clients, Steelcase is already well aware that the true value of their offerings does not lie within their desks and chairs, but is much more related to how the settings of the physical work environment in combination with particular behaviours, affect workspace performance. One could say that Steelcase is already mentally prepared to deliver their clients real needs – most clients don't want to worry about their furniture and

facility operation, they just want to concentrate on their own business objectives. The challenge is really that the people (i.e. facility managers and purchasers) that regularly do business with Steelcase are not holistic strategic thinkers. Steelcase needs to target their client's business leaders to influence the right workspace decisions. It would seem traditional organisational responsibilities and economic structures need be to decomposed and rearranged with PSS development. Thus PSS approaches tend to redefine a company's core business and compel developers to design a system that supports the new business best. Often the new business paradigm (e.g. sell 'more efficient use of furniture') will oppose the existing operational organisation's business logic (e.g. sell 'more of the furniture on stock') – as we have seen in the product-oriented sales organisation – and therefore might be deployed in a separate organisation.

Steelcase understands that if they want to offer their clients a total product and service offering for the work environment they will need to create (horizontal) partnerships with other companies. It is not sufficient to optimise the vertical value-chain in PSS, but instead create value networks. The major task here is the on-going management of the many external relations and how to coordinate the development and operational activities. How these networks will actually function is not known at the moment, but the proposed computer-based information system may serve as a backbone information infrastructure that keeps the network linked together. Today Product Lifecycle Management (PLM) systems administer product specific data and information throughout its entire lifecycle, but as companies are rarely responsible for the use and disposal phases of their products, the gathering and processing of information here is rather poor. On the other hand Customer Relationship Management (CRM) systems capture, store and analyse customer information, but again not much information is obtained from the activities where the product is actually in use. From a product development point of view, a systematic gathering of information of product use would be extremely valuable to the development of new products and services. If this was possible, companies would have a dynamic user-orientated development system that was continuously aligned with their user needs and behaviour. But for now the management, accessibility and relevance of knowledge to product development and designers is still not well established.

Traditional product-orientated development approaches have been derogatively called '*hit-and-run*' techniques: typically developers identified user needs, designed products accordingly and got them out to the market as fast as possible, but then simply neglected to consider what actually happened to the product after it was sold, because by then they were on to the next development project. PSS attempt to encourage interactions with the user throughout the product's life. The rationale is that these interactions are sources of valuable insight and re-enforces the customer-company relationship which turns it into a strong competitive advantage.

The current state of the world has recently spurred a tremendous awareness of global climate changes and how the emissions of greenhouse gasses could be reduced. Traditionally environmental efforts have focussed on the impacts from production (within the company's domain) and to a lesser degree the impacts from consumption (within the user's domain). As we nowadays constantly surround ourselves with energy-using-products it is widely acknowledged that we have to address the use activity of products. The issues here are that users are often oblivious to the optimal use of products (as they do not have the proper knowledge) or alternative (environmentally friendly) products, or they simply have die hard personal or social habits. Companies utilising PSS approaches have the potential to influence the efficient use of their products and the system they are part of. Although this does not necessarily result in environmental improvements, leaving users to figure out on their own account to reduce their environmental impact has not proven to be adequate either. Legislation tends to be directed towards extending company responsibility rather than putting restrictions on users (who happen to be the same people as voters...). Seen in this light PSS approaches should still be considered as a possible path to sustainable development.

Conclusively, if we were to take a step back and look at PSS approaches, one could speculative – what is the relevance of PSS to the practical product design and development activities in companies? Aren't PSS approaches more appropriate as a theme for business development (e.g. 'redefining core business') and marketing (e.g. 'developing customer relations')? In the Steelcase case study presented

in this paper, no obvious linkages to the product development of furniture have been identified. The case study is limited to the stages before traditional product development projects are initiated, and relate more to strategic issues within Steelcase than with their actual office furniture products. Nonetheless, the participating researcher in this paper found that the basic systematic, methodological engineering approach to design, involving analysis, synthesis and evaluation, proved very effective to achieving results in the project.

7 CONCLUSION

This paper describes a project that maybe seen as the initial development steps for a manufacturing company towards a product/service-system (PSS) approach. Observations were made throughout a three month period of active participation in a development project, and have been presented in relation to a theoretical framework of the expected managerial and organisational implications of PSS approaches. The framework takes into consideration new activities, roles and responsibilities, knowledge and competencies, and value network relationships that the company will have to deal with. A significant insight is that the definition of value is core to PSS approaches. Viewing products alone are not appropriate to determine value – instead the focus should be on the effects from customer activities. The development project described in the case study appears to have characteristics that are common to PSS approaches:

- the uncovering of customer activities that could be supported by the company,
- the move from selling products to selling knowledge intensive content,
- the expansion of technical and business-related knowledge and competencies,
- and the orchestration of a new value network collaborating with new business partners and reaching different target groups.

During the project we have observed how new challenges and different considerations must be made when developing a new service offering rather than ‘just’ a product. In this explorative case study we have attempted to shed some light on some of the issues manufacturing firms will face when developing PSS. The implications identified in this case study of a premature PSS approach are:

- to consider what has to be done to reach the (new) intended target clients of the PSS offering, while still satisfying the usual stakeholders,
- to determine whether the suggested PSS approach can co-exist with the established operational organisation, or it needs to be developed in a separate organisation,
- to form partnerships and create a new unique value network that collaboratively can provide the total customer offering,
- to establish a development approach for the concurrent consideration of context, content and delivery channel,
- to establish an information infrastructure that can manage both product data, as well as information of the user and use activities,
- to design value-added activities and engaging interactions with the customer,
- and to create structures and incentives that encourage sustainable behaviour amongst users.

Finally, even though no linkages to conventional product development activities were identified in this particular case, the relevance of design and development approaches to PSS was emphasised.

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