Product-Service System (PSS)

Product-service systems (**PSS**) are business models that provide for cohesive delivery of products and services. PSS models are emerging as a means to enable collaborative consumption of both products and services, with the aim of pro-environmental outcomes

Description

Product service systems are when a firm offers a mix of both products and services, in comparison to the traditional focus on products. As defined by van Halen, te Riele, Goedkoop "a marketable set of products and services capable of jointly fulfilling a user's needs", PSS can be realized by smart products.

The initial move to PSS was largely motivated by the need of traditional manufacturing firms to cope with changing market forces and the recognition that services in combination with products could provide higher profits than products alone. Faced with shrinking markets and increased commoditization of their products, these firms saw service provision as a new path towards profits and growth.

While not all product service systems result in the reduction of material consumption, they are more widely being recognized as an important part of a firm's environmental strategy. In fact, some researchers have redefined PSS as necessarily including improved environmental improvement. For example, Mont defines PSS as "a system of products, services, supporting networks, and infrastructure that is designed to be competitive, satisfy customers' needs, and have a lower environmental impact than traditional business models. Mont elaborates on her definition as follows: A PSS is a pre-designed system of products, services, supporting infrastructures, and necessary networks that is a so-called dematerialized solution to consumer preferences and needs. It has also been defined as a "self-learning" system, one of whose goals is continual improvement.

This view of PSS is similar to other concepts commonly seen in the environmental management literature, such as "dematerialization" and "servicizing".

PSS has been used to create value for customers beyond selling products as functions. Typically, there are four approaches to PSS design.

Function-based PSS: add new functions to increase product value in the competing market. For example, General Motors added OnStar in 1992 to product emergency services for customers. It integrated GPS with vehicle sensory system for telematics-based on-demand services.

Value-added PSS: companies added new features to increase value of a product to expand its value to customers and users. For example, Otis Elevator added Remote Elevator Maintenance (REM) system to its fleet system to monitor their elevators to reduce failures. GE Healthcare (formerly GE Medical Systems) developed InSite to remotely monitor its medical equipment in order to reduce service costs and increase users' benefits.

Evidence-based Service: companies use big data analytics to provide the actual saving and further develop a service contract for customer to pay for part of the savings.

There are many methodologies on PSS design. Dominant Innovation system uses an Innovation Matrix to identify gaps from customer's fear, not needs based on scenario-based path finding. A new value-chain ecosystem can be further developed to link these gaps between two invisible spaces. For example, John Deere developed Agric Service business based on the customers' worries on soil related issues. It integrates sensors with GPS to develop cognitive site map about soil content to optimize crop yields. Several peer-reviewed scientific articles have reviewed and give an overview of the PSS design research field.

In recent years, PSS has been further integrated with big data analytics for accelerated innovation. Other technologies such as prognostics, health management and cyber-physical systems have further created service innovation technologies for PSS. For example, Alstom has been developing Train Tracer technologies since 2006 and is implementing Health Hub system for its transport fleets.

Product Servitization

"Product Servitization" is a transaction through which value is provided by a combination of products and services in which the satisfaction of customer needs is achieved either by selling the function of the product rather than the product itself, by increasing the service component of a product offer, or by selling the output generated by the product. The concept is based on the idea that what customers want from products is not necessarily ownership, but rather the function that the product provides or the service the product can deliver. This means that the provider of "servicizing solutions" may get paid by the unit-of-service (or product function) delivered, as opposed to the (more traditional) unit-of-products sold. See service economy for more on product servitization.

Types

One type of product servitization solution is based on transactions where payment is made—not for the "product"—but for the "product-service package" (part of PSS) which has been sold to the customer. This servicized purchase extends the buying transaction from a one-time sale (product acquisition), to a long-term service relationship (such as in the case of a long-term maintenance-free service contract).

Another type of servicizing may be a strategy for providing access to services for people who cannot afford to buy products outright. For example, in the case where auto ownership is economically unfeasible, creative servicizing offers at least three possible solutions: one in which transportation can be achieved simultaneously (as in car-pooling); one in which transportation can be achieved sequentially (as in car-sharing);and one in which transportation can be achieved eventually.

Types

There are various issues in the nomenclature of the discussion of PSS, not least that services are products, and need material products in order to support delivery, however, it has been a major focus of research for several years. The research has focussed on a PSS as system comprising tangibles (the products) and intangibles (the services) in combination for fulfilling specific customer needs. The research has shown that manufacturing firms are more amenable to

producing "results", rather than solely products as specific artefacts, and that consumers are more amenable to consuming such results. This research has identified three classes of PSS:

Product Oriented PSS: This is a PSS where ownership of the tangible product is transferred to the consumer, but additional services, such as maintenance contracts, are provided.

Use Oriented PSS: This is a PSS where ownership of the tangible product is retained by the service provider, who sells the functions of the product, via modified distribution and payment systems, such as sharing, pooling, and leasing.

Result Oriented PSS: This is a PSS where products are replaced by services, such as, for example, voicemail replacing answering machines.

This typology has been criticized for failing to capture the complexity of PSS examples found in practice. Aas et al. for example proposed a typology with eight categories relevant in the digital era, whereas Van Ostaeyen et al. proposed an alternative that categorizes PSS types according to two distinguishing features: the performance orientation of the dominant revenue mechanism and the degree of integration between product and service elements. According to the first distinguishing feature, a PSS can be designated as input-based (IB), availability-based (AB), usage-based (UB) or performance-based (PB). The performance-based type can be further subdivided into three subtypes:

Solution oriented (PB-SO) PSS: (e.g. selling a promised level of heat transfer efficiency instead of selling radiators)

Effect oriented (PB-EO) PSS: (e.g. selling a promised temperature level in a building instead of selling radiators)

Demand-fulfillment oriented (PB-DO) PSS: (e.g. selling a promised level of thermal comfort for building occupants instead of selling radiators)

According to the second distinguishing feature, a PSS can be designated as segregated, semi-integrated, and integrated, depending on to what extent the product and service elements (e.g. maintenance service, spare parts) are combined into a single offering.

Examples

The following existing offerings illustrate the PSS concept:

Xerox' pay-per-copy model for selling office equipment

Atlas Copco's Contract Air service, whereby air compressors are sold per m3 of compressed air delivered

Philips' pay-per-lux model for selling lighting equipment, whereby customers pay for a promised level of illuminance in a building

Michelin's fleet management solution whereby truck sold per kilometer driven

Impact

Several authors assert that product service systems will improve eco-efficiency by what is termed "factor 4", i.e. an improvement by a factor of 4 times or more, by enabling new and radical ways of transforming what they call the "product-service mix" that satisfy consumer demands while also improving the effects upon the environment.

van Halen et al. state that the knowledge of PSS enables both governments to formulate policy with respect to sustainable production and consumption patterns, and companies to discover directions for business growth, innovation, diversification, and renewal.

Tietze and Hansen discuss the impact of PSS on firms' innovation behavior identifying three determinants. First, product ownership is not transferred to the customers, but remains with the PSS operating firm. Second, the purpose of a product is different if it is used within PSS solutions than compared to the purpose of products in classical transaction based business models. When offering PSS, products are used as a means for offering a service. Third, the profit function of PSS operating firms differs substantially from profit functions of firms that develop, manufacture and sell their products.

From a manufacturer's perspective, the business potential of a PSS is determined by an interplay of four mechanisms: cost reduction, increased customer value, changes to the company's competitive environment and an expansion of the customer base.

Project Support Team (PST)

Definition and Examples

Problem-solving strategies and tools can help you make better business decisions and handle challenging scenarios. These tools focus on how to identify the relevant variables in a difficult situation and create a diagram of potential solutions for you and your colleagues to consider. Learning about the different tools to help you solve problems at work can increase your chances of deriving an effective solution and teach you how to apply a wide range of strategies for different situations.

What are problem-solving tools?

Problem-solving tools refer to strategies that can help determine the cause of a problem and identify the best solutions available. The first step in addressing an issue at work is to outline your objectives. Once you establish the cause, you can isolate variables that can help contribute to a potential solution. For example, if a customer calls you to explain the product they purchased isn't working, you might ask them about the product, how they used it, or whether it worked initially to outline important starting variables.

The next steps often involve you and your colleagues discussing potential solutions. Most tools you might use include a collaborative brainstorming element, which can help you come up with potential solutions more quickly. Once you decide on the most viable solution, you can start addressing each element of the problem in steps. Make sure you evaluate the success of the solution by following up with a customer or monitoring the problem-solving procedure. This method can help you determine how effective the solution was so you can decide on when it would be appropriate to use in the future.
Types of problem-solving tools
Here's a list of tools you can use to problem-solve in the workplace to increase customer satisfaction and become more efficient:

Linear thinking

Linear thinking refers to the process of defining the cause of the problem and finding a solution by asking a series of questions. You can start by identifying the problem and writing it down. To diagnose the cause of the problem, you can ask questions relevant to when the problem started, what products or services were involved, what methods were used to troubleshoot the issue, and if the issue has ever occurred before.

Record your answers to each question until you arrive at a list of potential solutions. With these answers, you can go through the same process of asking questions step by step until you identify the most appropriate solution.

Flowchart

A flow chart is a diagram you can use to represent the divisions of a problem or the steps of a business process. To create a flowchart, write the title of the problem in the middle of the page or whiteboard and draw a circle around it. Outline the various processes, such as the purchasing of the product, payment method, customer complaint, errors associated with the product, and results of a quality check. Outlining the processes using a flowchart can help you visualize the cause of the problem and in which process it occurred.

Benchmarking

Benchmarking refers to comparing various business processes and outcomes with other successful companies to see how each measure compares. Benchmarking can typically contrast specific processes or outcomes, such as customer satisfaction, product quality, sales, profit margin, and return on investment. Different types of benchmarks can show how your processes compare with other leading companies.

Performance benchmarking can also help you identify strengths and weaknesses in key performance indicators (KPIs). Each comparison metric for KPIs can highlight areas in your processes or in individual performances so you can improve and address techniques for improving.

Five Whys

The five whys strategy involves asking why five times in succession to produce a potential solution to a problem. For example, if product quality assurance checks are finding more frequent production errors, you start by asking why and recording the answer. If you notice one piece of equipment required service maintenance recently, write this as one of your answers. Once you have a list of potential solutions, you ask the same question again for each answer you gave in the previous section. Continue this process five times in succession or until you determine an effective countermeasure to implement.

Goals grid

A goals grid is a diagram with four quadrants where you can record your answers to a series of questions. Typically, questions relate to what you want but don't have, what you have and want to preserve, what you don't have and don't want, and what you have but don't want. You can create a list of bullet points for each question.

For example, in the section where you outline what you want but don't have, you might write about launching new international products or services. In the second quadrant, you might write about incurring excess marketing costs and late customer payments for things you don't have and want to continue avoiding. For the problem-solving process, your four quadrants might represent values such as what a potential solution might include, what processes the problem involves, and how you can avoid this problem in the future.

Mind map

A mind map is a diagram that starts with a central concept or idea that you can derive ideas from and visualize the various components to make connections. The goal of a mind map is to create a visual representation of the aspects of a problem so you can highlight important elements so you brainstorm more solutions.

Start by writing your concept in the middle of the page and drawing a circle around it. Then, draw a line connecting the central idea with an aspect or subcategory of what you want to explore, and continue this process until you outline each relevant component. You may also

derive new branches from subheadings if you want to elaborate further on the idea or feature.
Related: How to Make a Bar Graph in Excel (Plus Tips and Benefits)
Nominal group technique

The nominal group technique is a tool similar to brainstorming where you collaborate with colleagues to determine ideas for a project or to describe solutions to a problem. This tool can work effectively for large groups who might have conflicting ideas or when a solution is best made using a democratic approach.

To use this technique, start by stating the initial problem or question. Next, each participant compiles a list of solutions by themselves and presents their best solution for everyone else to discuss and consider. Based on how each individual votes on other solutions, everyone collectively decides on which one to implement.

Check sheet

A check sheet is a table representing the frequency values of unique events. You can adapt a check sheet for a variety of functions, including customer concerns, product purchases, payment processing, equipment maintenance, product quality, and product features. For your check sheet, define the data you want to observe and the problem you want to solve.

At the top of each column, you can label the sections for the day of the week. On the side of the table, you can enter the data values. For example, if you wanted to study the frequency of customer concerns about a specific product, you could label these data values according to the type of complaint. During the week, you can write a tally under each value to determine the frequency of specific customer inquiries. Once you compile the data, you can use it to determine the scope of the problem and work towards a solution.

Run chart

A run chart is a graphic representation a professional can use to detect trends or patterns in data over time. This type of diagram is a great tool for solving problems because you can track the flow and direction of important metrics, such as sales and other performance indicators. To create a run chart, start by deciding on the data you want to measure.

For example, your X-axis can represent the month, and the Y-axis can represent the profit increase. Gather and compile the data and plot it in a graph. It's important to have a large enough sample size to draw relevant conclusions about your population choice. Once you plot the data, draw a line connecting each point. You can calculate the mean by adding each Y value and then diving it by the number of values in your sample. You can use your graph to detect different processing or performance issues, which you can use to brainstorm potential solutions.