Chapter 9 – Service industry and PLM

This chapter examines the concept of service. The chapter will look into a theoretical definition of service and discuss more about the use of PLM principles in service business as well as the practical application PLM in service companies. The chapter also introduces a case example of a company operating in the field of IT-services which has implemented a new service product concept and a PLM system to support the operative use of the concept.

Introduction

We all have personal touch points to services. We buy or even provide them. Service business has been existing almost from the beginning of civilization and yet we are still experiencing a trend towards a more and more service oriented world. We are in the middle of a huge transition from agriculture and goods manufacturing oriented world towards a service oriented one. Current service applications range from adding service elements to industrial products to creating new service concepts that are based on today's interconnected, digital and globally networked business environment. Up to this day, many service companies have long suffered from more or less haphazard approaches to innovation, product development and product renewal. We have well-tested, scientific methods for developing, refining and managing manufactured goods, but very few companies have precise and well thought service development or innovation processes. Today, leading service companies are proving that service development can be as precise as the development of tangible products.

The challenges in applying the discipline of formal product processes to services are apparent. Because a service is intangible, often existing only in the moment of its delivery to a customer, it is difficult to make prototypes and 0-series to learn about delivery in high volumes. Since many services are customized to individual buyers at the point of purchase, therefore it may be hard to test them. As a result, experiments with new services are most useful when they are conducted with real customers engaged in real transactions. However, live tests magnify the cost of failure. An experiment that does not work or

is badly communicated to customers may harm customer relationships and even ruin a brand. Live experiments are also harder to execute, manage and measure.

Services are intangible, hard to define, design and test. Due to this most service companies have not established precise and well defined product development and product management processes.

The leading companies operating in the service business have been outsourcing their businesses to the East in order to cut costs through lower price of labor. This is not the only way to proceed. Service efficiency and quality can be increased dramatically through re-thinking services and making them more like tangible products. In this development work traditional and proven methods of the manufacturing business can be tremendously good benchmarks. Regardless of this, services need to be developed as services.

What is a service?

Before going in to details of service product lifecycle management it is good to analyze service a bit on a theoretical level. One of the challenges when defining a service on a more conceptual level is that a service is something very trivial. We all have a very personal understanding of a service, which is based on our own personal frame of reference, our personal experiences of service. One good example of the problem of defining a service is for example the experience of seeking medical treatment. A person seeking treatment might summarize the experience saying, that the service was excellent. Usually this means that the customer's personal perception or feeling of the service was good. The receptionist was nice, the nurses were nice and the doctor was nice and helpful. The next time the same customer goes to the same place for treatment, receives the same treatment with the same service level but the personnel is rude or reserved. The customer might say that the service was bad. Via this example it can be understood that in many cases the connotation of a service is the feeling and the experience out of the service rather than the actual process or the deliverables of the service. In the previous example the service product and its delivery might have been defined very carefully. All quality metrics could have indicated that the service contained all specified deliverables and its delivery was successful while the service interface was faulty.

When defining a service on a conceptual level one has to take an analytical approach to the definition and inspect the service from numerous perspectives.

According to the Oxford on-line dictionary a service is:

'the action or process of serving' or 'an act of assistance' or 'a system supplying a public need such as transport, or utilities such as water' or 'a public department or organization run by the state'.

The word service itself originates from the Latin word *servitium* which means "slavery." According to Wikipedia a service is "the non-material equivalent of a good." This is completely untrue and can be challenged from number of different angles. According to Wikipedia "Service provision has been defined as an economic activity that does not result in ownership, and this is what differentiates it from providing physical goods." "It is claimed to be a process that creates benefits by facilitating a change in customers, a change in their physical possessions, or a change in their intangible assets." "By supplying some level of skill, ingenuity, and experience, providers of a service participate in an economy without the restrictions of carrying stock (inventory) or the need to concern themselves with bulky raw materials. On the other hand, their investment in expertise does require marketing and upgrading in the face of competition which has equally few physical restrictions."

Finnish scholar and university professor Christian Grönroos defines service as follows:

A service is a process consisting of a series of a more or less intangible activities that normally, but not necessarily always, take place in interactions between the customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems.

According to James and Mona Fitzsimmons service is:

A time-perishable, intangible experience performed for customer acting in the role of co-producer.

As a summary of these definitions for a service, it can be said that service is always a compilation of different ingredients, elements, and objects. The field of services is vast and very heterogeneous, which makes it quite hard to come up with an end-to-end, all exhaustive definition of a service, which applies to all cases without any contradictory arguments. However, the same basic elements and characteristics of service are in place in most cases.

The core elements and characteristics of a service agreed generally in literature are:

1. Service is a process – a sequence of tasks that will provide an end result (standard or customized) to a customer (internal or external).

2. Services are physically intangible.

Traditional service theories state that a service always has certain basic characteristics. However, when analyzing more carefully in can argued that these characteristics are met only by some types of service and thus are not to be understood as being always typical for all services. In many cases these characteristics might be even untrue. These characteristics are:

Heterogeneity – It is a relatively difficult to standardize service outcomes to some extent. Customers have individual, subjective expectations and they evaluate the outcomes and delivery of service (against their own expectations).

Inseparability and simultaneity – Many services are produced and consumed simultaneously and the customer is often present at the moment of consumption. Service consumption begins during the service delivery.

Time perishability – The service provider's capacity to deliver a service is time-perishable. Capacity to deliver a service at a given time is wasted, not the service offering itself or the resource for the service.

Customer participation (co-production) – Customers are often active participants in the service process, e.g. giving the basic inputs needed in order to initiate a service.

Transfer of ownership – Service purchase does not result in transfer of ownership although it may result in a transfer of right to receive a service.

Labor intensity – Services almost always involve considerable human activity, rather than a precisely determined process. (This is highly dependent of the service. For example self service does not involve any labor on the supplier side.)

The mentioned service characteristics are met many times. However, when we analyze services more carefully we soon begin to realize that many services are much more than can be seen by the eye. In the following section the traditional and generic characteristics of services and their applicability are analyzed.

Intangibility

Usually services are claimed to be physically intangible, i.e. non-physical, incapable of being perceived by the senses. This is also true what comes to many products, there are numerous products that are completely intangible. In practice this means that a service cannot be "the non-material equivalent of a good" as defined in Wikipedia.

However, many services produce tangible outcomes or require tangibles, facilitating physical goods in the service process or contribute to products tangible or

intangible. Many products are at least on a conceptual level as intangible as services. In some cases, the traditional proof of the intangibility of service has been that customers have difficulties comparing services due to their nature. Services definitely can be sampled before purchase at least to some extent and customers can have difficulties in evaluating or comparing even goods before purchase.

Heterogeneity

An other common claim in the service industry has been that it is relatively difficult to standardize service outcomes or processes (variability in individual units of service production). Customers (this is more common in the consumer customer segment) have individual, subjective expectations and each customer subjectively evaluates the outcomes and the delivery of the service against their expectations. Similar, consistent, well defined and standardized service performances may result in differing evaluations from customer to customer – or even from the same customer's service encounters. Customers expect to be treated fairly and receive the same service as others receive. However, this is only a question on the external quality of the service. The same applies equally to purchasing goods. Consumers and companies simply expect the goods to match their expectation and experience.

In many fields of business there are even industry practices and standards to manage and measure the repeatability and homogeneity of service. A good example of this is IT and telecoms industry where service levels have been defined to manage customer expectation of service.

Inseparability and simultaneity

Services are produced and consumed simultaneously and they cannot be stored. Services are consumed at the place of production, i.e. the customer is often present and consumes the service during delivery. It is true that in many cases the main part of the service delivery process cannot begin until after customer inputs have been presented by the customer. However, many services are produced completely separately from customer, at least partly, e.g. freight transport, routine cleaning and production equipment maintenance.

Services are perishable

Service provider's capacity to deliver a service is time-perishable. A movie theater seat or consultant time cannot be resold and is wasted if not utilized. In practice, this means that the capacity or opportunity to deliver a service at a given time is wasted. The set of actual service activities or the resources for the service are not wasted. However time perishability applies also to many goods: printed publications become invalid, fashion

products get out of fashion, etc. It can be said that the service capacity is the inventory of services and does not perish although it may be left unused at times.

Services (or rather the capacity to produce them) can be inventoried prior to purchase and production – but services can not be inventoried after production. Productive capacity is perishable in both goods and services and wasted if not utilized in full.

Categorizing services

Services can be categorized to different groups by the nature of service. The characteristics discussed in the previous chapter are typical to some of these service categories. However, it is hard to group services based purely on the characteristics of a service and thus in most cases the grouping is based on service supply. The following categories are used most often when talking about service categorization:

1. Industrial services (maintenance, operation, optimization, etc., in industrial production processes)
2. Transportation services (airlines, ferries, goods transportation, couriers)
3. Hospitality services (hotels, restaurants)
4. Health care services (hospitals, clinics, dentist)
5. Government services (police, fire, mail)
6. Financial services (banking, insurance, investments)
7. Entertainment services (movies, concerts)
8. Professional Services (consulting, accounting, legal, design, project management)
9. Telecommunications services (fixed network access, mobile communication, attendant services)
10. IT Services (application hosting, workstation management)

Service: a type of product

It is important to be able to define goods, intangible products and services. Goods are physical, tangible products that can be owned, traded, and distributed to different places at different times without changing their identity. Nevertheless, a product can also be something very intangible such as a piece of software, a piece of music or an algorithm or a formula. In practice this means that a service is not the only type of non-physical or intangible products.

Often customer inputs have been mentioned as the distinguishing factor between a tangible product and a service. According the Unified Service Theory (UST – by Scott E. Sampson): “With service processes, the customer provides significant inputs into the production process.” The presence of customer inputs

is a necessary condition to define a production process as a service process. This might be true regarding, e.g. some highly tailored high touch* services. In the manufacturing business customers might contribute ideas or requirements to the design of the product, but individual customer's roles are limited to the selection and consumption of the outputs, not the contribution of inputs specific to production for that particular customer. This also applies to a large number of high volume services in the telecommunications or IT-services business for example such as a broadband connection or a managed workplace (e.g. PC workstation).

(* High Touch is a term introduced by John Naisbitt (1999). The term refers to having to deal with or interact with a human being as opposed to having to deal with computers (i.e. High Tech) and that High Touch will continue to remain a vital component of the High Tech age. Naisbitt pointed out the fallacy of automating every business transaction without human interaction at some point. There is no substitute for "the personal touch." When talking about services High Touch is used to highlight the difference between a service provided by a human being, e.g. a doctor and a service produced by a technology system f. ex. a telecom network or an IT-system without any human aspect at all.)

Products in general can be divided into three different product types with slightly different basic characteristics:

Goods, physical, tangible products

Goods are physical things that can be owned, traded, and distributed to different places at different times.

Intangible products

(A) Services

Service products are in many cases processes with specific output and value to customer.

(B) Non-physical products (not services)

Non-physical products are products that can be owned, traded, and distributed to different places at different times. But they cannot be touched. In many cases the most significant characteristic for non-physical products is that they can be distributed and multiplied through electronic channels very easily. Examples of such products are:

- A piece of software
- A piece of music
- An algorithm
- A Process recipe (e.g. for paint)

Why should services be made more like tangible products?

Service production and delivery is becoming more and more industrialized. The global megatrend towards a service society and the ever growing demand for services in the market, especially in the European and American economies, puts pressure to develop new services, produce and deliver the services more efficiently and with lower cost. In addition to the growing need of service volume, the need to customize service for the individual customer remains.

Is the tradition, the only reason why service industry in general is still lacking so much behind the manufacturing industry what comes to service production efficiency, automation, repeatability and quality? Often the reason is very simple and pragmatic – the creation of a service delivery processes has always been so much cheaper than for example setting up a manufacturing line for a car or cell phone. Therefore there has been no need to set up the processes as efficient as in discrete manufacturing. The service producers have not been so keen to develop products and design them for delivery while also making the service delivery smooth and efficient.

If the only real reason is tradition, what could be learned from the manufacturing business about designing service products, making services more defined, making service processes more efficient; to yield better services, with higher quality, and larger volumes.

One very obvious solution is to re-think the product. Start building carefully defined, modular, configurable and easily repeatable *service products*, i.e. productizing and modularizing services further, making them more product like or "tangible." This is absolutely necessary in order to get closer to the efficiency, quality and volume levels seen in the tangible product industry. In practice this means that service industry must start adapting the well thought information model definitions, processes, practices and product definition tools that have been used for some time in the industries that make tangible products.

Rational for building service products

Usually there are one or more reasons to make services more advanced and more like tangible products. The reasons and basic requirements are:

Repeatability

- A standardized service definition makes it possible to repeat the service multiple times exactly as defined.

Volume

- Use of clear, precise and standard product and information models in service design and production makes it possible to use IT-based support systems and automation in service management and delivery in order to multiply the production and delivery of the service products.

Quality

- A standard service definition gives ability to deliver the service with the same level of quality each time.
- A standard service definition gives ability to measure and steer the service quality in production and delivery.
- A standard service definition gives ability to steer the customer's quality expectation and agree (e.g. SLA – service level agreement) upon the quality to be delivered to the customer.

Efficiency

- More efficient use of resources in service production is possible through streamlined service delivery processes and well defined services.
- More efficient use of resources and reduced time to market is possible through reutilization of product definition information when designing new service products.

Load balancing

- Load balancing in service production is easier due to knowledge and task transfer based on a standard way of defining a service and through service definitions.

Analytical development

- Each service has to be defined and documented precisely using standard methodology for all products in order to be able to develop the service further using analytical development methods.

Customization and modularity

- Each service has to be defined based on common and standardized information and product models in order to be able to build and deliver customizable and modular services.

Communication

- Standard service definition makes it possible to communicate the service deliverables and required customer inputs precisely to markets and customers.

When is further productization of services useful?

The spectrum of various service products is extremely vast. It is quite obvious that if the volume of service delivery is small and the variation of the service content is large regarding a certain service, it is not feasible to put huge effort in creating very comprehensive service definitions and making a standard and automated service delivery process.

The first step towards more productized services should be creating a comprehensive service concept definition. For example, a service concept model by Edvardsson and Olsson can be used when defining a service more carefully and productizing services further (figure 40). This concept is a good and simple tool to define the basic elements, the customer needs and the service function meeting the need, of a service on a high level. The service concept consists of two elements:

1. The needs of a customer:
(a) Core needs
(b) Secondary needs

2. How customer needs are met by the service

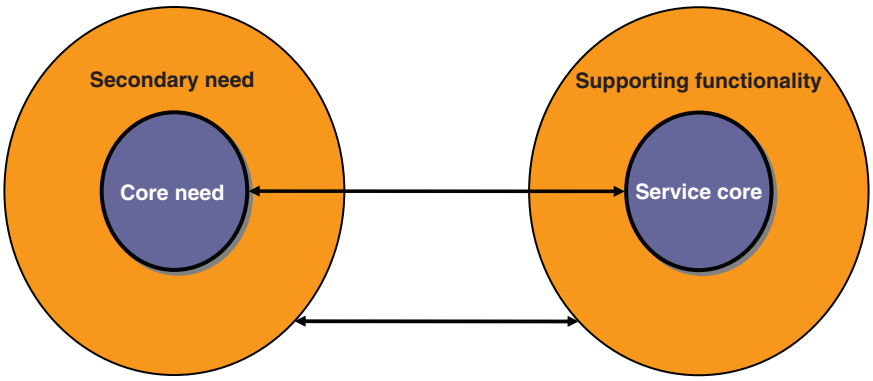

Figure 40. Service concept by Edvardsson and Olsson (1996).

A service concept includes always a definition on a high level of the basic principles of services to be delivered:

- A definition of possible service content and the variation of different contents
- A definition of basic service process (definition of the service delivery)
- A definition of service deliverables on a high level

How do service products match the needs of a customer?

- Basic/core needs – core functions: a customer expects that these functions are part of the product. The lack of these functions leads directly to dissatisfaction. These functions also usually determine the purchasing logic of the customer.

Secondary needs:

- Performance needs – the capability to meet these needs are most often evaluated in customer satisfaction surveys. Inability to meet these needs impacts customer satisfaction.
- Excitement needs – if these needs are matched, the customer experience exceeds the customer expectations.

In time the excitement needs become requirements and requirements become basic needs. A customer expects continuous development in service content and performance.

As the second step, when defining services carefully and productizing them further, a thorough consideration of targeted productization benefits should be made. The benefit potential of productizing services is directly linked to the service transaction volume and service repeatability and the service content variation and service process complexity.

In figure 41 service products have been divided into five different groups based on the repeatability of the service (i.e. does the service appear (repeatability) in the customer interface in the same way). Figure 41 also analyzes the variation of the service content and service process complexity (competence needs). Table 5 explains the basic characteristics of each group presented in figure 41 in more detail.

It is definitely worthwhile to productize services in all of the groups presented. However, in group 1 – it might be good to stay on a headline level what comes to defining a service product, due to the reason that the service appears very seldom in the same way towards the customers on a detail level. Service products

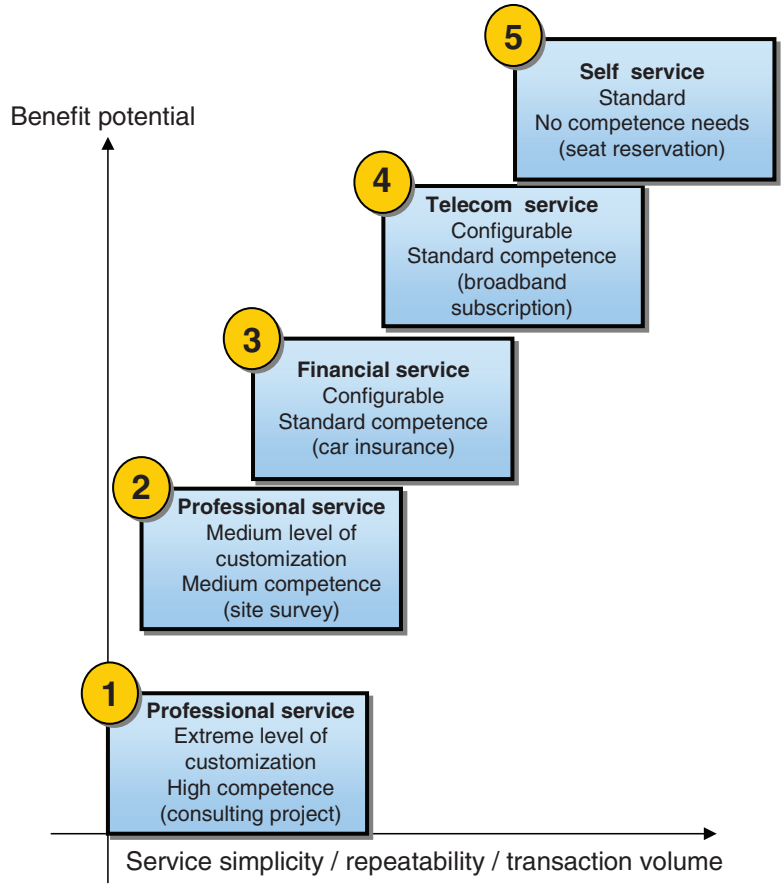

Figure 41. Scaled examples of the possible benefit potential out of service productization regarding different types of service.

in group 2 are definitely worth productizing in a detailed level while keeping in mind that there should be room for customer specific variation to some extent. The products in groups 3, 4 and 5 are such products that they must be productized in order to be able to sell and deliver them in an efficient way with adequate quality level in large volumes.

How to make a service more like a tangible product?

Today service companies are clearly lacking a company wide and standardized definition of what is a service product in our company? This kind of definition is requirement for the following:

Table 5. Service definition grouping.

#	Group	Characteristics of the service group
1	*Definable*	• It is possible to define a service on a high level (deliverables, high level service process, etc.). However, the service itself is not delivered in the same way in each case, nor is the contents of the service the same with every customer • Customer inputs are usually very important and the service is customized according to customer needs • Competence needs (the service content and delivery) in the service process are very high, i.e. expert knowledge on an individual level is needed to carry out the service delivery • e.g. a consulting project
2	*Repeatable*	• It is possible to define the service precisely and repeat it in the same way every time • However, customer inputs alter the contents of the service usually to some extent even if the service process remains the same • The competence needs (the service content and delivery) in the service process are medium • e.g. a site survey or an audit for a specific substance area such as WLAN or IP-network
3	*Configurable*	• A service is defined to be standard with some level of configurability and customer specific parameters • Customer inputs alter the contents of the service within well defined limits • The service process is fixed • Competence needs (the service content and delivery) in the service process are standard (i.e. the service definition documentation will contain all necessary information regarding the service content or delivery. For example all steps in the service process have detailed work instructions and expert knowledge is not needed) • e.g. home insurance
4	*Partly automatable*	• A service is defined to be standard with minor configurability • Customer inputs alter the contents of the service within pre defined choices • The service process is fixed

(continued)

Table 5. (continued)

		• Some parts of the service process can be automated with the help of IT-systems (e.g. mobile subscription provisioning) • Competence needs (the service content and delivery) in the service process are standard (i.e. the service definition documentation will contain all necessary information regarding the service content or delivery) • e.g. mobile or broadband subscription
5	*Automatable*	• Service is defined to be standard (in some cases with very minor configurability) • Customer inputs have no (or have very minor) impact on the contents of the service (e.g. selection of a seat location in a movie theatre) • The service process is fixed • The service can be fully automated end to end or made to be self service • e.g. movie in a movie theatre

- Being able to build any kind of *standardized* service products
- Being able to modularize service products
- Being able to define the service levels
- Being able to manage products in a company's product portfolio similarly
- Being able to compare performance of delivery processes
- Being able to integrate processes end-to-end
- Being able to standardize the delivery of service products
- Being able to bundle a number of products together easily
- Being able to use standard IT-systems to support the delivery of the entire service portfolio

The manufacturing industry has realized long ago, that efficient and IT-enabled management of products across the entire product portfolio is not possible without a common and standard definition of what is a product and from what entities and objects it is built from. The manufacturing industry has used product models and product information models to define their products carefully in all respects and from all necessary views needed to be able to modularize, outsource, and repeat the production of one single product or one certain part of a product.

In order to start utilizing the possibilities brought by information technology and automation, a standard definition for a service-product within a company is needed. In addition to this a comprehensive "service"-product concept definition must be created in order to realize practical benefits of smooth and efficient definition, creation, and delivery of service products.

An other practice that should be adapted from the manufacturing business by the service industry is the logic and relationship of product design and delivery. In manufacturing business there is a clear distinction between product design and development and product delivery. In the service business the product development and design should be done as it is done in the manufacturing business, using careful and precise methods gradually putting the product design together, testing the result, making a prototype or beta test, and then launching the product after careful design and through trials. The end result of the service product development should be a list of documents describing the actual service, the service deliverables, the service process, quality, etc. In figure 42 there is a illustration of a service product design process, the end results of a the process and the relationship of the delivery process and the design process.

When defining service products in a generic level the following definition can be used:

A service product is a product that has been designed through a carefully defined product design process and fulfils the following criteria:
In practice this means that:

- Information and product models exist (a service product is a part of the information and product models), i.e. it is possible to define a service product as tangible products are defined, based on a common model.
- A service definition exists and it includes the following issues:

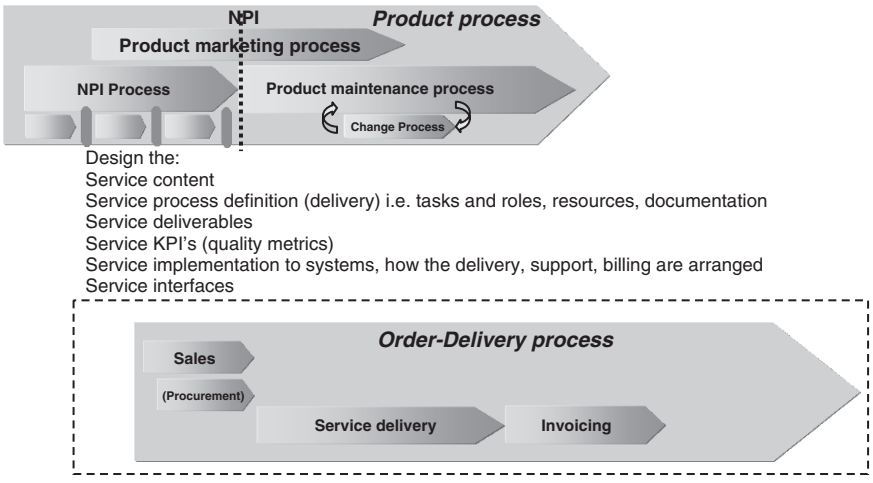

Figure 42. Service product development, the design documents or design data and the service process (order-delivery process).

1. There is a standard definition of the service (the service content, deliverables, etc.) which is based on a corporate wide information and product model.

2. There is a standard definition of the service delivery (the process or sequence of tasks, roles, activities, support systems, etc.) that shall produce the service.

→ ***This means that it is possible to repeat the service as defined multiple times with expected and defined service quality, in defined time without depending solely on one individual person***.

  - Service content definition
  - Service process definition (delivery) including tasks and roles, resources, documentation for the process
  - Service deliverables from the customer perspective
  - Service KPIs (quality metrics)

  - Service implementation definition regarding, e.g. business support systems in delivery, support, billing, etc.
  - Service interfaces
- A service description (document for internal and external purposes) exists.
- External communication materials exist.

Usually all these basic definitions are covered in a service-product-concept definition, which is a general blue print for practical service product management in daily business at corporate level in a particular business or product area. It is a compilation of business rules, methods, processes and information models as well as instructions on how to apply the rules in practice (see chapter 2 – the definition of the product management concept).

PLM in service business

PLM challenges in service business

One of the greatest challenges in the service business regarding PLM is, the lack of logical, semantic and coherent definitions of what a service product is and what are the preferred ways to define a product. There is no product information model available which could be used to define a product. Service functions or

features are not itemized, i.e. it is not possible to make a BOM (bill of material) like presentation of what the service consists of, in a structured way. Usually in service business, the product definition mixes up the actual product definition and the service delivery, i.e. the service process definition. This is understandable due to the reason that often the service process is the most important and evident part of the product. A product information model is a necessity to be able to overcome these challenges. Precise understanding of the service product on a conceptual level is needed. In addition service functions or features must be carefully itemized. Making these changes enable efficient product creation, management and delivery as is done f. ex. in the manufacturing businesses.

For example the telecommunications industry has already made their first initiatives in the area of PLM to define their products better in order to increase the efficiency of their business and quality of their operations. The eTOM framework by the Telemanagement forum gives an excellent framework for a number of other service industries as well (figure 43). The fundamental idea behind the eTOM framework is to make a clear distinction between a definition of a service and its fulfillment. First of all, the product and its delivery are defined in the definition domain (SIP – Strategy, infrastructure and product) possibly using modular product definitions and PLM systems and then it is implemented in to the fulfillment domain (OPS – Operations) to be able to deliver the product to customers.

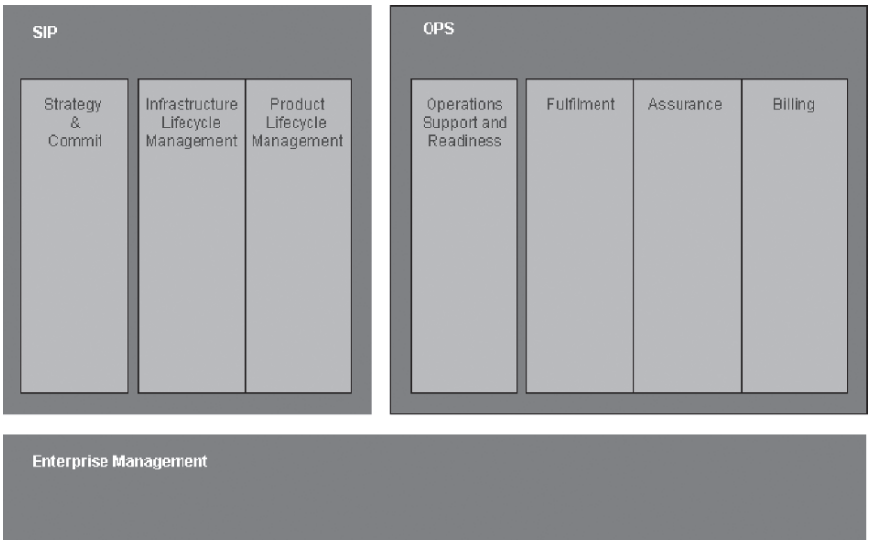

Figure 43. eTOM framework by Telemanagement forum (The Enhanced Telecom Operations Map® eTOM).

In the manufacturing business, products their design and delivery functions are managed, supervised and executed by the help of modern IT-technology based on standard business applications. One cannot argue that this is not also the case in service industry. However, service companies usually create service delivery support systems for each product separately! Often a service company has as many product management and delivery systems as they have products and no product design or definition systems at all.

A standardized product definition is vital in order to be able to:

- Modularize service products
- Define service levels
- Manage products in the product portfolio in the same way
- Compare performance of various processes
- Integrate processes end-to-end
- Standardize delivery of service products
- Bundle a number of products together easily
- And especially to use standard IT-systems to support the delivery of the entire service portfolio

The significance of building a product information concept like this lies in the need to set common business rules for the entire corporation and its business and product areas. A carefully specified concept makes it possible to achieve synergies between businesses, processes, and products. A common product information concept allows for the smooth and speedy implementation of PLM-related processes and practices, because the most crucial areas of information have been agreed on at both common and conceptual levels.

How can be services modularized?

One might ask – what benefits can modularity bring in service business? Well, the answer is as simple as in the tangibles businesses. A modular product design enables more efficient product development, product management and product delivery. Already existing modules can be used to design new products and the same modules can be used when delivering new products. Savings are many fold as well as the potential for new business opportunities. Modularity makes it also possible to use mass customization in service business.

IT-services, insurance services, banking services, telecommunications services, etc., are good examples of pure services that are easy to modularize. In figure 44 a simplified example of a modular service product is presented, (see figure 44) by combining service module 1 and 2 with module 3 for example a new service is created quickly with all necessary definitions to sell, deliver, and invoice the

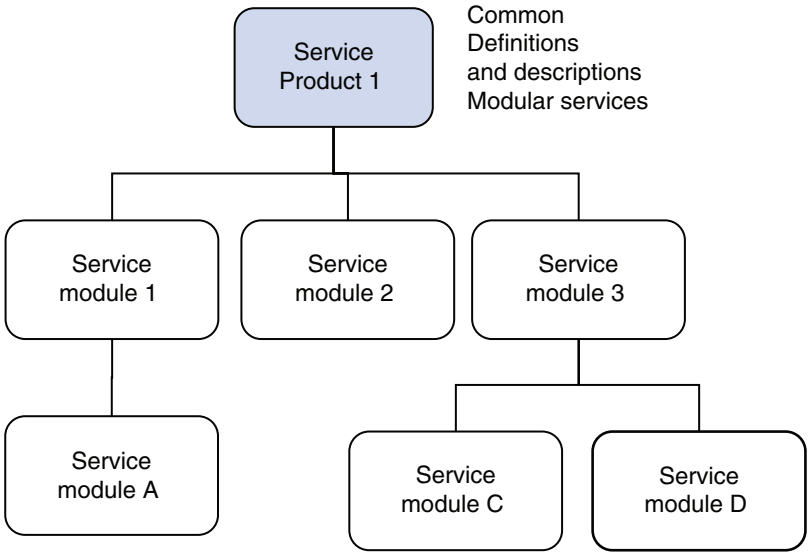

Figure 44. Product structure for a modular service product definition.

service. Naturally this is based on the assumption that all basic requirements for modular product definition and architecture are in place.

To make a service modular, a certain baseline and set of basic requirements for modular product design must be in place. These requirements are for example:

- A product information model, including definitions for product and module and their relationships must be defined.
- A product management concept must set the limits and requirements for the product and module design and documentation so that it is possible to form products out of modules.
- The product functions (the functions the customer will get) need to be itemized.
- Naturally the products must be such that it is possible to create them out of modules.

The path towards modular service products is explained in the following task list. This list of activities is based on the assumption that the above mentioned basic requirements are defined and handled.

1. Itemize

(a) Make items out of product functions (see next chapter: Making items out of product functions)

(b) Define a piece of service to be a module
(c) Document the module based on principles set in the product management concept
(d) Define if the piece of service, the module/item can be reused as a common module in other products as well

2. Structurize, i.e. make a product structure out of the modules (resembling hierarchical BOM – bill of materials)
    - Build a hierarchal structure out of the itemized pieces
3. Build configuration rules
    - Set rules on how the itemized pieces of service function together in the structure, i.e. if some model is mandatory or optional in the structure
4. Finalize the product definition
    - Finalize the service "product" definition using necessary description and specification documents to capture and document all remaining product definition information (e.g. product implementation)

Making items out of product functions

As already explained in the chapter Items (page 14) an item is: "*a systematic and standard way to identify, encode and name a product, a product element or module, a component, a material or a service. Items are also used to identify documents*." – "*From the viewpoint of product lifecycle management, it is essential that items and their classification should be uniform within each company. It is essential also that items form separate classes, subclasses and groups at a suitable level of coarseness according to the company's own or, alternatively, wider international standards. In the electronics industry, for example, diodes might form a component class, with Zener diodes as a subclass. The clear and logical grouping of items into different classes eases the management and retrieval of individual items*."

These, principles should be applied in the service industry. When comparing a service in this sense to a tangible product, it might be hard to understand what an item in a service could be. Usually a service item on a leaf or atom level – the level of detail that cannot be broken down to any smaller pieces – is one service function. These functions or features should be transformed into items. In figure 45 there is an example of one service item. The service function the customer will see is a site survey study and it has been transformed into an item called Site Survey, with a specific item code. This item is then described in more detail in a document which has been linked to the item.

When all the functions of a service have been transformed into items, one should make out of the items a hierarchical tree like presentation – the product

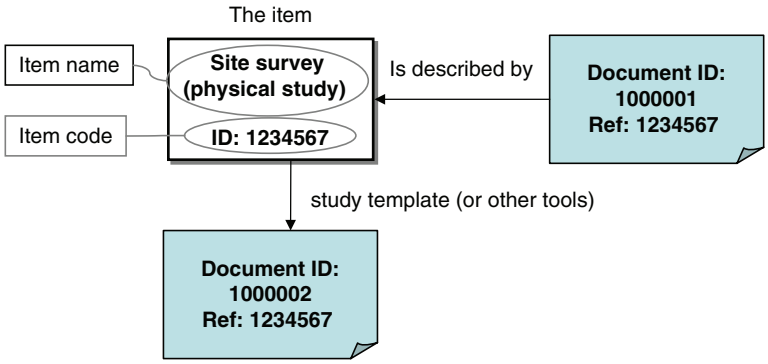

Figure 45. An example of a service item and its naming and coding.

structure, containing all functions that the service product will provide. The tree like product structure should map the individual functions together so that it is possible to understand the composition of the functions, i.e. a function consists of certain sub functions.

Case 4: An IT-service (managed services) provider and a customer-specifically variable product

The PLM experiences of a managed services provider – in the IT-sector – that provides mass-customized IT-service products for various industries are studied in this section. The turnover of the company is about 160 million Euros per year. In this company, an end-to-end product lifecycle management concept was created in 2004 and a PLM system was brought into use during year 2005. The company began systematically to develop its product lifecycle management in 2003. In the background was the strong organic growth of the business after year 2000 and couple of acquired smaller companies. The volume of business had grown 500% in less than four years and it was no longer manageable using old methods. The company had no common understanding on their product portfolio and there was no shared understanding on what was the service product they delivered to their customers. The entire company was a mixture of something old, something new and something acquired. The main part of the operational work focused mainly on trying to survive with the service level agreements with the existing customers and setting up new customer instances. The operative work was mostly fixing errors made during the customer setup process and version migrations. This meant that the organization created a huge work load themselves for themselves.

The service products delivered to customers varied a lot. It was impossible to say what was; the product sold, delivered, and maintained for each customer. The only definition of the service and its delivery could be found in brief customer agreements.

Products were not specified carefully and the existing product information was scattered in different IT-systems. The best place to find out – the full functionality of certain service – was a platform specification or software code in the platform. It was so difficult to find product information that employees simply continued to develop personal information saving and retrieval methods. The situation was getting worse and heading in the wrong direction. For some time, the company had been following the development of ITIL, eTOM, Product lifecycle management and PLM systems. The time was ripe for the company to launch a turn-around project focusing on full and complete redesign of the product architecture, product portfolio, the principles of product management, and to implement a PLM system. The management team chose holistic development of PLM as the strategic success factor of the future. Before the actual development program was launched, the management made a quick and focused update to the business strategy of the company focusing on product and portfolio related issues. After revising the business and product strategy, a set up and target definition for the program was created. The set up and target definition contained the following issues:

Creation of:

- New product architecture definition containing a common product information model and common product model
- A common product portfolio definition, portfolio management methodology, and procedures
- A common PLM concept containing all necessary definitions for comprehensive product lifecycle management
- Product related revenue and cost allocation model

Implementation of:

- The newly created models and procedures
- Structural product definitions supporting mass customization according to defined product architecture
- A PLM system to support the operative product management according to PLM concept

The goals of the development being:

- That the company has implemented a common and shared definition of structural product information

- That all products (in the new portfolio) are mass customizable and defined according to the new product architecture
- That all products (in the new portfolio) are comparable with each other regarding cost and revenue allocation
- That a common and shared understanding of product profitability based on the newly created models exists
- That all product information is created directly to electronic format and stored into a PLM system
- That product elements are reused across products
- That time-to-market is measured and developed to match the market needs

The company launched a three-stage program to reach the targets defined in the set-up letter. The first stage was designed to focus purely on the creation of new product management models. The second stage was planned to make a limited implementation of the new models, starting with a short proof of concept and pilot phase. The third stage of the program was designed to enhance and revise the concept definitions and make the implementation complete and full scale.

During the first stage different alternative PLM systems were studied and carefully considered. Reference and demonstration visits were made to other companies in the service sector to search for the right approach and to learn from their experiences. As PLM in the service sector is new, a lot of weight was put into finding a system that could support the way service products are defined and managed. One key factor in the system evaluation was to design and find out how to define a service product in a structural way and how the definition could be managed with a PLM system. After a couple of trials and errors, a good and suitable way was found. The most crucial factor in the process of making a product structure for a service product was to find a standardized way to itemize the individual functions of the service, so that the functions represent the product accurately.

One of the decision principles when choosing the PLM system was that no tailoring would be done to the PLM application, even though in practice all existing PLM systems are more or less made to manage tangible products rather than service kind of products. This proved to be a good decision.

Stage number one

Usually PLM development turns into a large program, which must be carefully designed and divided into smaller projects and subprojects. This case was no exception as the base for starting the PLM development was so poor. The level of maturity in this particular case was clearly – Unstructured – (level 1) in the PLM maturity model defined in table 2 page 72.

All in all – the starting point of the development work was highly unstructured but on the other hand, it was in a way good not to have bad methods to learn out from. The work needed to create a PLM concept and other required definitions was carried out in a project lasting for six months. The project group consisted of three internal experts in the field of product development and management as well as customers and production and two external consultants having lot of experience in developing PLM in the service industry. The first stage of the PLM development program also included making a small test on the concept in addition to making a short pre-study on the capabilities of the existing commercial PLM systems ability to manage service products as defined in the PLM concept. During stage 1 of the PLM development program all required definitions were finished as planned and experience on the existing PLM systems and their utilization was gathered. The company was ready to move to the second stage.

The second stage

The case company was ready to start the second stage in three months after the closure of the first stage. The three months in between were mostly spent choosing a PLM system, negotiating a deal with the system supplier and making a limited out-of-the-box system installation for a proof of the concept and for a pilot. The second stage of the program was targeted to last for six months. It was launched with the same project team added with necessary system specialists form the supplier's side and two selected product managers responsible of the first products to be defined according to the new principles. The first months of the second phase focused purely on defining the products according to the new methodology and polishing the concept and making proof of its usability. Using the expertise of the product managers the first products were defined according to the new model and then fed into the PLM system. Small adjustments were made to the concept and to the PLM system set-up based on the experience of the trials. Some instructions were written to capture and document a way in which a product should be modeled, defined, and fed into the system. After this, the second stage of the development program was ready to start piloting the concept and the PLM system.

The pilot focused on finding the right set up for larger scale use of the concept and the PLM system. The most crucial focus in the pilot implementation was finding the right responsibilities within the organization regarding product modeling and product documentation and product changes. This definition would answer who in the organization would be responsible for describing and specifying the products according to the PLM concept. One key issue to be solved was the responsibility of the reusable product elements that should be reused in a number of products. After a couple of discussions and definitions a solution was

found: Each product manager was to be responsible for his own product regarding modeling and documenting the product according to the PLM concept. In addition a product element manager was to be appointed to be responsible for the elements that are used in a number of products simultaneously. In practice this meant that all product managers should be trained very thoroughly to be able to model products in a standard way and master the PLM system in order to be able to document the products into the system. It was also agreed that there would be a support organization consisting of two part time resources to support the product modeling and documentation work.

The actual pilot was conducted with a limited set of products and people. A couple of lessons were learned from the pilot. One example of a lesson learned is the right set up for the product documentation – What things to document on separate documents and what to document directly to the system as attributes, etc. The second stage of the PLM development was closed eight months after the launch date, i.e. two months behind the initial schedule. The most time consuming issues were not anymore related to the actual concept or the PLM system. Most time was spent making decisions on responsibilities regarding the product definition and documentation work and regarding the decision making on product lifecycle.

The third and final stage of the implementation

In the beginning of the third stage of the planned PLM development roadmap, a quick analysis of the progress, deviations, and targets so far was conducted. It was time to look at the initial targets of the development work and check what had changed in the surrounding environment during the past 15 months. The analysis showed that the most important drivers behind the PLM development were still the same and there were no significant changes in the business or strategy of the company. Therefore stage three of the development could be started as soon as possible with the initial goals and targets.

The same core project group with three internal resources and the same two consultants made small alterations to the PLM concept based on the feedback and findings of the proof-of-the-concept and the pilot. In addition some modifications to the PLM system were required, being mainly small changes to the product documentation and product change workflows. Further instructions were written regarding the operative management of products and product related information.

The core focus of the last stage of the PLM development roadmap was set on the large scale roll-out of the concept and the PLM system. This meant some changes

to the project team. A couple of new resources were nominated from the internal organization to execute the training of the product development and product management organizations and some parts of the IT, sales and production organizations. The external consultants would support the newly trained people in modeling the products according to the PLM concept and feeding the products into the system.

Perhaps the most distinctive features of the PLM system in this case were the management of the product structure and product related documents. These two together formed a full and complete definition of a service product, i.e. what are the functions that the product provides to the customer and how the functions are specified, implemented, etc. At the beginning of the development work, the product development and management personnel did not fully understand the power of product structures and the full possibilities brought by the reuse of existing product elements. This was very obvious and understandable due to the reason that the organization was used to a completely different way of working what comes to defining and developing service products. Currently, a product object serves as one cornerstone of the product management. About 50 products have their own product identities for which the standardized documentation related to the product in question has been established and connected to the relevant level of the product structure. The other core object is a product element object (see figure 46). There can be two different types of product elements: reusable product elements that can be used in number of products and product specific elements

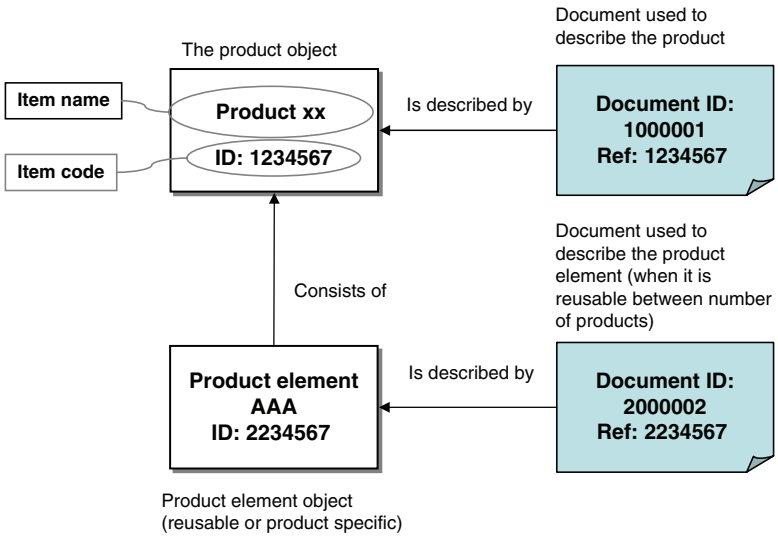

Figure 46. Definition of a service product of the case company using product structure in conjunction with product documents.

that are specific for only one product. A product is defined and described using these product elements like parts are used to compose an assembly in the tangibles business. In addition to this, a set of documents describing the actual information objects further (product and product elements) are used.

In the PLM system used by the case company there are no CAD drawings, assembly pictures or Gerber files. The products are defined using the product information objects (product elements) in the product structure (itemized product features and functions) and relevant Word- or Excel documents are used to describe the information objects further.

In the end of the third stage of the PLM development roadmap there were approximately 50 products in the PLM system, defined according to the new model, roughly 2,000 product elements, out of which 30 (top level product elements) were reusable (used in more than one product, e.g. SQL database or information storage (hard drive)) and 300 product or product element related documents.

The aftermath

Organizations as well as the product development and management models have been conveniently changed in the company simultaneously with the deployment of the PLM concept and the PLM system over 21 months. During both changes business unit or departmental limits have been exceeded and accustomed modes of action have been changed. The core business processes of the company concerning product development and product management and the responsibilities of organizations have been changed. Product architecture has been created, the whole logic of defining and utilizing products has been changed. A modern IT-system has been implemented to support the daily work of people responsible for developing and managing products.

The speed of change and the fact that everything is supposed to happen in a moment are characteristic to the modern world. True enough, speed can indeed often be measured in money, and it is an important element in the competitive ability of companies. To accelerate processes, companies develop new ways of doing their business and they implement new systems, such as product lifecycle management systems. When making a change of this multitude, the core issue is always the new way or the concept of doing business and implementing it in to practice, not any individual IT-system. Even if a PLM system could indeed be set up technically in a few weeks, changing the culture and modes of action within the company is a challenge that will not necessarily be overcome in a few months. In this particular case one of the most fortunate things and most important success factors was the support of the management of the company. They had a vision to which direction to develop the product management, and they also held their

vision long enough to make it happen in the organization. When the big wheel has at last been made to turn, it seems that the changes are bigger than anyone would have guessed and that they are not at all restricted to product development or production. In order for change to occur in a controlled fashion, the project group will still have a lot of work to do even when the system is technically functioning.

What next?

There is no end to the PLM roadmap, even after all initial three stages of the development work has been done. Companies live from their products and their services, and new things must be developed all the time in order to hold position in the markets. Today, it can be said that the case company has a solid baseline to develop their business further. They have solid product architecture, the definition of their product portfolio, solid methods to manage the portfolio, all products in the portfolio are defined using the same standard methodology and thus comparable, the company has a way to manage and steer the product lifecycle and allocate costs and revenues in a standard way. The products are well managed and there is system support for the daily product management work.

This baseline provides the necessary foundation for the next step which will be implementing a sales configurator for speeding up new sales and making sure that the sales organization will sell only allowed functions with better gross margins. One of the core problems in the business of the case company has been making unnecessary customer specific tailoring to their products. The sales personnel have promised the customer something to close the deal without having a thorough enough understanding on the end-to-end cost of the tailored function. This has caused problems in the production, support and deviation handling and decreased dramatically the profitability of the products.

Summary

- Service is one type of product. However, service products have specific characteristics that differ from tangible products.
- Services can be productized to the level of tangible products.
- When productizing services the goal of productization and the desired benefits must be considered at an early stage.
- Services can be modularized and can be managed as tangible products.