

THE EXTENDED PRODUCTS PARADIGM, AN INTRODUCTION

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Abstract: This paper explains and illustrates the extended product paradigm. The main dimensions to extend a product to be considered are the product life cycle, the range of product related information and the resources requested to provide extended (i.e. enterprise networks) on the market. The paper is based on work done in the European Information Society Technologies (IST) project Extended Products in Dynamic Enterprises - EXPIDE. The project objective is to bring together research projects, stakeholders (such as suppliers, manufacturers, consultants, service and technology providers, etc.) involved and interested in the provision of extended products, etc. The project EXPIDE aims to identify future value creation potentials as well as future needs related to the extended product paradigm. The Intelligent Manufacturing Systems (IMS) Global Engineering and Manufacturing in Enterprise Networks - GLOBEMEN project contributes to the specification of the Extended Product. The GLOBEMEN project results, especially in the sales and service life cycle phases, illustrate in practice the extended product paradigm. This paper delivers examples from the GLOBEMEN project.

Key words: Extended Product, Value adding, Service

1. INTRODUCTION

The arising new digital society does radically change the way industrial enterprises deliver goods and services. Digital business is one of the forces behind emerging new concepts for products, new approaches for production and in fact a promising way of new value creating processes for the future.

Due to the open markets and an increased competition producers are facing a tremendous pressure. To keep the worldwide leadership in product quality, manufacturers have to further develop their products in terms of new customer value creating concepts. Today for all kind of industries the key challenge is to come up with new integrated product approaches, which must allow new quality products, organisational innovation and the efficient management of information and its transformation into new value adding services, Figure 1. However, new integrated product approaches are needed which fits to the paradigm and the technologies of today's information and knowledge society.

Accordingly, compared to the past, providing a single (tangible) product is not sufficient anymore to be competitive on a global market. Today customers are requesting for services, benefits or even requesting a guaranteed success when buying a product. Accordingly the customer focus has moved on from the ownership of a physical product or systems towards guaranteed benefits based on a provided offering. Therefore the so-called core product needs to be extended or packaged up with different kinds of value adding services, based on new and ICT. These intangible product assets, which are very often information and knowledge intensive, can consist of engineering, software, maintenance, customer support services and many others. The extended product paradigm represents such an integrated approach.

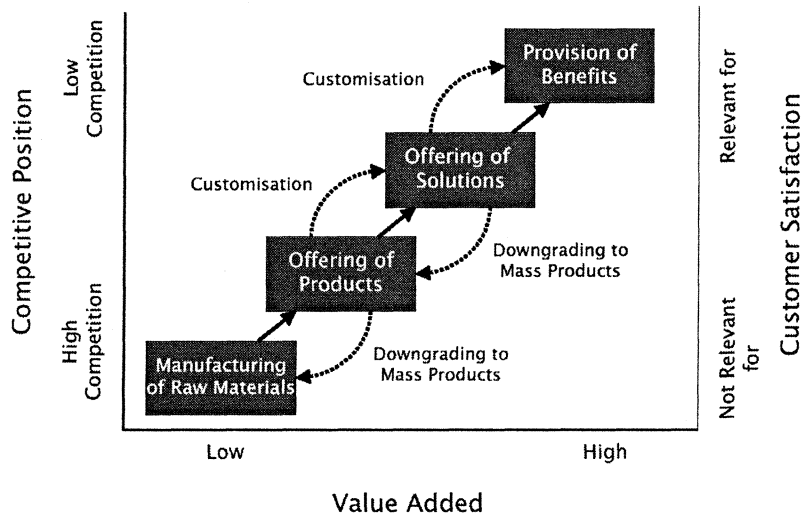


Figure 1. The Progress of Competitive Advantage (elaborated from Pine, 1999)

2. EXTENDED PRODUCT – DEVELOPING THE TERM

According to literature there are various views on how to “extend” a product:

- Extended Product Responsibility is an emerging principle for a new generation of pollution prevention policies that focus on product systems instead of production facilities. Although supportive, out of the scope.
- The terms of Extended Product Life intensified product use and extending product lifetime should emphasise concepts of a closed-cycle industry. The terms point out that the value given to a product in manufacturing should be used as intensely as possible and maintained as long as possible.
- Extended Product Support is a term used by some software providers e.g. help desks open 24 h/day and 7 days/week. This approach could easily be adapted to other types of products.
- This term Extended Product Information is used for pharmaceutical and natural product content description

However, the EXPIDE project has focused on elaborating a specification for the term Extended Product which is related to manufacturing. According to EXPIDE the term includes the following elements:

- A combination of a physical product and associated services / enhancements that improve marketability.
- Intelligent, highly customised, user-friendly tangible product assets such as embedded features like maintenance.
- Intangible product assets, which are information and knowledge intensive
- Customer focus is on a value-added service or guaranteed success and not anymore the physical product.

Production activities are normally caused by the needs of potential customers. Extended products can even help to define or identify new customer needs. Servicing the customer means also supporting the customer in deriving new business ideas. Consequently product suppliers have to extend their offerings in a dramatic way. Suppliers have to offer everything, which might support the customer in achieving the goals of the new business ideas.

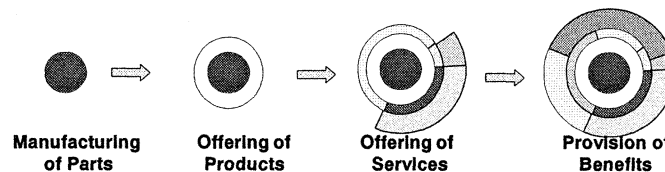


Figure 2. Changing the focus: From manufacturing of parts to provision of benefits

3. EXTENDED PRODUCTS CHARACTERISTICS

Figure 3 shows the three main dimensions to be considered when characterising extended products. The “perfect” extended product contains complex information (incl. embedded systems, knowledge, etc.), is produced by dynamic, complex enterprise networks (incl. concepts like the extended enterprise, the virtual enterprise, etc.) providing services over several phases of the life-cycle. The following chapter briefly discusses the three dimensions illustrated in figure 3.

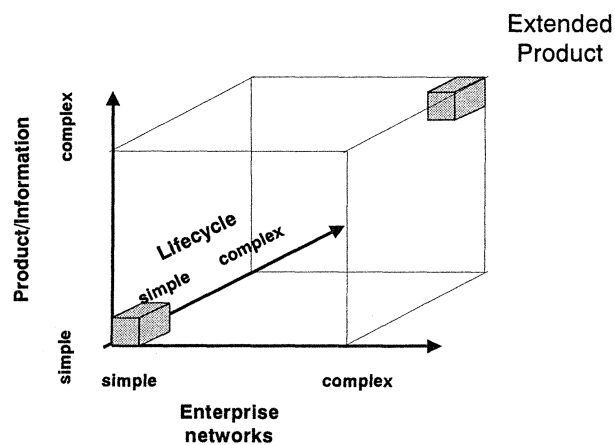


Figure 3. Characteristics of extended products

3.1 Increased Product/Information Complexity

In Figure 4 a layered model has been developed in order to structure the extended product approach. The three rings can be described as follows:

- There is a core product which is closely related to the core function (s) of a product. As an example the core function of a car, which is the ability to move objects from location A to location B is enabled by parts like the engine, wheels, etc
- The second ring describes the “packaging” of the core functions, the features that makes the product attractive to the customer. In the car example this could be a nice design, a nice colour painting, air conditioning etc. From a functional point of view these features are not really necessary. However, these features are the drivers for marketability of the product.

- The third ring summarises all the intangible assets of the product. Intangible assets surrounds the tangible product. In the car example this could be an efficient 24h/7day service network. To increase the competitiveness by offering added value for the customer nowadays OEMs have to provide ever more intangible product assets.

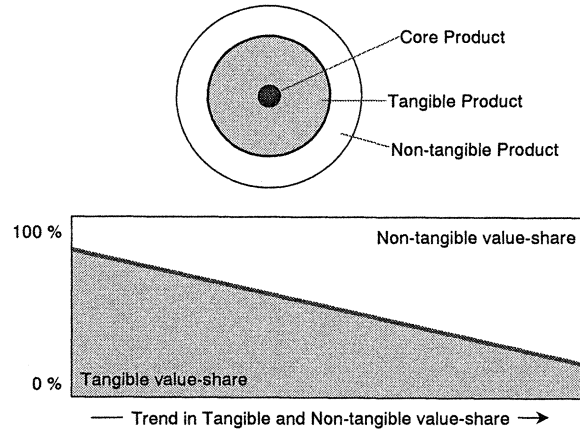


Figure 4. Concept of the three rings

The lower graph in figure 4 illustrates how the intangible value-share volume of the product is expected to increase over time. In addition the information content grows as product gets complex. For example in a modern paper machine the share of automation systems and software will soon correspond to more the half of the costs.

3.2 Life-cycle information of the extended product

Today the lifecycle of a complex product includes phases like: Marketing & Sales, Design, Implement, Operate & Service, and Demolish. However the life cycles of large one-of-a-kind products can be much more complex. The operational phase by far is the longest phase and it may include everything ranging from small modifications and repair work to large modernisation and redesign works. Even the purpose or main functions may be changed. For example in a chemical plant the main product can be changed.

In future a successful management of a product along its entire life-cycle must be based on extensive information and communication management. Thus the product continuously needs to be accompanied with life-cycle history, status and usage information. The cumulated life-cycle information

can also be used to improve delivery and the functionality in future related products and their life-cycle phases.

3.3 Network

Extended products tend to be complex and therefore difficult to produce by a single enterprise. Extension to products will often, as mentioned, constitute physical products as well as associated services or accessories. The increasing complexity of products, the consideration of the full life-cycle and the concentration on core competencies (incl. the availability of appropriate ICT) make it difficult to produce extended products by a single company. Thus, depending on the core competencies required to supply associated as well as appropriate services, infrastructures, etc., several business partners are required to collaborate very closely towards a common goal: the delivery of the extended product. For example, the service of a process plant can be provided by a service virtual enterprise -- see case Bühler below.

4. EXTENDED PRODUCTS IN THE IMS GLOBEMEN PROJECT

The IMS Globemen project focuses on issues related to global manufacturing in enterprise networks. Globemen is an international project with partners from several IMS regions: EU, Australia, Japan and Switzerland. The approach of Globemen is to address three main aspects of manufacturing: sales and services, inter-enterprise management and distributed engineering. Based on industrial requirements specifications the work will be co-ordinated and integrated into a Virtual Enterprise Reference Architecture and Methodology, VERAM.

The extended product paradigm is not explicitly in the focus of Globemen, however the industrial case studies conducted within the project give proof of the concept. The Globemen case studies are explained in more detail in other related papers and presentations during the DIISM 2002 conference. The Japanese region case studies have a major role in DIISM 2002. Accordingly this chapter will only highlight the extended product features of three European cases.

4.1 E-service extension

Bühler AG Switzerland is a global developer, manufacturer, and supplier of machines, installations, and systems in the food processing industry. It is

increasingly important for producers of one-of-a-kind machinery or plants to offer after-sales services, which provide the best possible support to customers across the globe in the use of their machines and plants. If production problems or breakdowns occur, it is imperative that the producer respond rapidly and offer suitable help measures.

In those cases where the customer is located far from the producer, it will in future no longer always be possible for the producer to offer the assistance of its own company service technician, for costs in time and money are too high. One possible solution consists in providing the customer or local service partners sufficient support that they themselves can execute service tasks under the direction of the producer through the aid of modern ICT. Applications like Video Conferencing combined with Application Sharing, Wearable Computing, and interactive Internet applications (trouble shooting guides and animated manuals, for example) can conceivably be put to use.

These services offered by Bühler is good example of intangible extension existing products. The operational users of the product can highly benefit from additional services offered. (Hartel)

4.2 A knowledge creation environment to supporting the tendering phase of Extended Products

Fortum Engineering (FE) is part of Fortum Group Finland, a diversified group of companies concentrating on the energy industry and focusing on countries around the Baltic Sea. FE acts as an engineering, procurement, and construction provider for power plants.

In such investment projects the investor, constructor and operator are the principal players. They also own and produce the information that is most helpful during the inception of a new project. FE has developed a knowledge creation environment with the objective to increase competitiveness by connecting the tacit knowledge of investors and operators with FE's own experience and offering FE possibilities to develop new features for its power plants. The effective use of modern ICT is a method by which FE expects to create a specific knowledge to support the client during the inception of the investment and, thus, pave the way for successful tenders.

This is a good case example of how knowledge related to a complex product over several of its life-cycle phases can be used in subsequent product deliveries. The service provided to the customer already in the tender phase is the ability to offer improved products based on cumulated experience from previous deliveries. The knowledge can of course in addition be used throughout the delivery project.

4.3 Product models as a mean to provide life cycle support for extended products

The YIT Group Finland provides total service for construction, industry and telecommunication networks. The company offers residential, property, infrastructure and industrial investment and maintenance services. The YIT Group's service chain spans the entire life cycle of the investment, from design and implementation to continuous maintenance and operation.

In construction project the company uses product models throughout the delivery process from architectural design, cost estimation, distributed detail design, scheduling, and procurement to installation. The comprehensive product model is based on international standards. The model is constantly kept up to date and the level of detail is increased by model merging from different partners.

The complete intangible product model is thus an extension to the actual physical product, which can be used for a variety of maintenance functions by the customer or the service branches in the YIT Group.

5. CONCLUSION

The evident and ongoing trend in the one-of-a-kind business environment is to develop value adding services to product. The objectives of suppliers are to offer these services over the product life-cycle. The idea is not only to provide benefits for the customer, but also to learn and acquire knowledge also for the own company and business partners. The paper has presented the concept of extended product and the associated layer model. The three dimensions network, information and life-cycle that make up and extended product are explained. The paper also explains how the extended product can be seen in three industrial cases. The practical cases show that the extended product concept is a useful approach for creating value adding e-business services.

Further approaches, methods and tools are needed to make to most of the concept e.g. to design the features of extended products, to design enabling infrastructures for the provision of extended products and to compose enterprise networks for the provision of extended products.

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