

DIFFERENT VIEWS ON THE PRODUCT LIFE CYCLE

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1. Introduction

Each company in its sphere of activity tries to achieve adequate competitiveness regardless of its form. The company must have properly configured product life cycle management to be able to flexibly and effectively react to market changes and turbulences. The reason is that a change in one part of a production or non-production chain will affect all subsequent and previous activities. The ability to react to market changes can be defined by the level and degree of using innovations in business processes. It is possible to innovate almost everything from managing units of the company, workplaces up to the final product. The use of the product life cycle and its available models in case of this innovation does not allow an omission of the relationship and linkages between an innovative component/activity in the selected phase of the product life cycle (PLC) and all other phases that are directly or indirectly linked to the innovative activity. A well managed product marketing encourages competitiveness and innovations in the PLC, because a very good product or service do not yield a profit for the company if it is not attractive for the customer.

In this paper the possibility of optimizing innovations implementation in manufacturing companies is presented. The aim is to increase their competitiveness by defining and describing the complex product life cycle. It will use the knowledge and experience of more PLCs and will appropriately complement and extend them in order to factor in not only innovations, but also marketing aspects of the product in the PLC. Innovations bring some risks, that is why some of them are introduced in this paper.

2. Innovation

Innovation can be defined in different ways and each author interprets it differently. Innovation can be defined as an introduction of a new or significantly improved product or service, process, a new marketing approach or a new organizational method in business practices, work organization or external relations.

Technical products or services that shall be innovated must be competitive, must somehow interest the customer (function, shape, price etc.) and make sure they are bought, although the customer does not actually need them. In this case marketing approaches can help to convince the customer that the product is good and useful and that s/he should buy it. Another advantage of the marketing perspective is to allow a broader view of the product or service, which can become a competitive advantage because companies are primarily focused only on development and they ignore other no less important phases of the product life cycle.

2.1 Risks

Besides evident advantages of a good innovation (such as capital gain etc.) it is necessary to mention potential risks of innovations. There are many risks and their agents can be different. However, if the company wants to be loaded in favour of innovations, it should look for mistakes especially made by itself, i. e. from the employer side to the employee. According to [Šimlová, Kroták and Edl 2012] it is possible to divide risks into five groups:

Impulses - enterprises do not give enough incentives to employees to come up with new ideas. A good incentive system is not only a one-time financial reward or recognition, but also it must motivate the employees to implement their ideas.

Empowerment - a good idea can come from anyone in the company. Employees have good ideas but do not have enough power and space to achieve them.

Sources - a good idea must be well made. Many good ideas are already extinguished in the decision-making phase because very few resources are assigned to them and it is not possible to implement them adequately.

Time - employees are snowed under with their daily work and do not have time to come up with new ideas at their discretion. 10 % time allocation on solutions and development of new ideas can have a huge impact on the future of the company. Of course, not every idea has potential, but the time allocation leads to innovations of the next generation.

Knowledge management - employees must have fast access to initiatives, be informed about the tendency of the company, be able to understand intended objectives from available resources and to identify with them.

The company as an employer must set up consistency between resources and powers so that motivation of employees and their team spirit will be ensured.

3. Innovations

Innovations are very important not only for business but also for society and today they are the worldwide topic number one. Many large companies and corporations invest considerable sums of money in research and innovations to achieve expected success. However, a big problem can be to decide what exactly will be and wants to be innovated, where the innovation will be made and to what type of innovation the available capital will be invested.

The correct choice and adjustment of the product life cycle (PLC) can help to determine at what phase of PLC it is possible to focus on more. It would not be possible to choose the right available innovative method without the exactly determining the direction and objective of the innovation.

4. PLC

To control the PLC it is necessary to choose one first. If this choice takes place in a company that does not have clearly defined regulations and directives for these issues, this choice is not so plain as it might seem. Looking into the professional literature reveals that there are a number of life cycles with completely different views of the product. In the following text some of them are introduced and evaluated in terms of innovations.

4.1 PLM

PLM (product life cycle management) deals with the product life cycle, manages, develops and supports it. To control the PLC, it is necessary to define it first. Sometimes, it is not very clear, what is hidden under the above term, because producers and product users have different views of the product life and life cycle. From the customer's perspective operation and service is important, while from the seller's perspective only the sales phase is interesting.

The precise and unambiguous definition of PLC from the perspective of PLM is not defined. A possible shape of the product life cycle is shown in Figure 1.



Figure 1. Product Life Cycle according to PLM [DesignTech 2013]

4.2 Marketing

Marketing perception of the product life cycle is the best known and the most frequently used. In this approach, the life cycle is divided into several phases, into phases of research and development, placing on the market, sales growth, maturity and decline in sales (see Figure 2.). It is a model that is derived from the development of the product sales in time. Generally, the marketing product life cycle takes into account only 4 phases (see Figure 3.). The phase of research and development is omitted and the product life cycle begins with the phase of placing on the market. The disadvantage of both mentioned life cycles is that they completely ignore the planning phase of new products and services and assume that the product has already well-defined requirements and criteria on itself at the beginning of this life cycle.

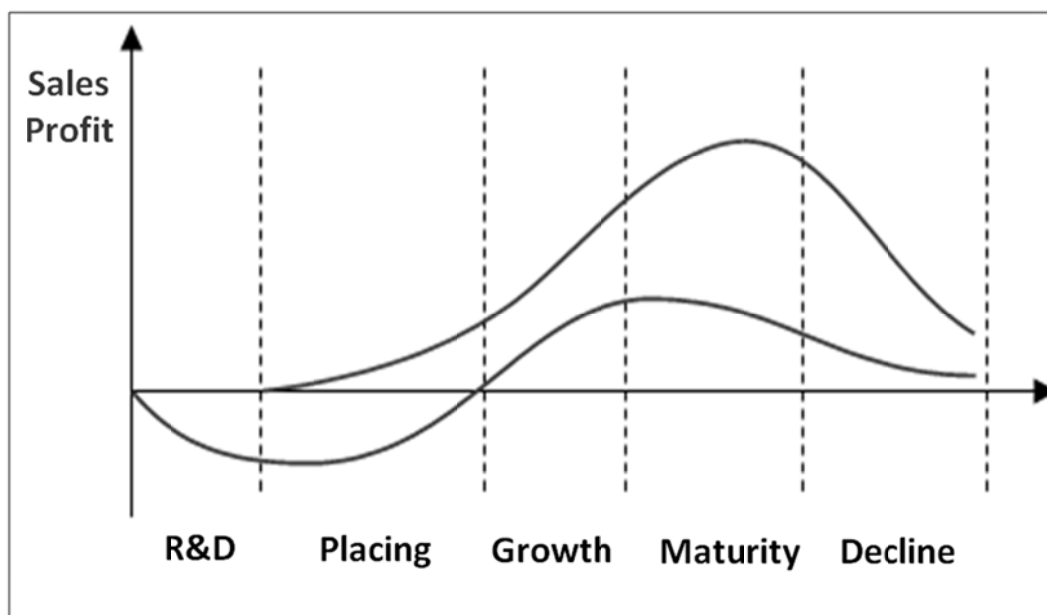


Figure 2. Product Life Cycle from a marketing perspective (5 phases) [Marketingové noviny 2013]

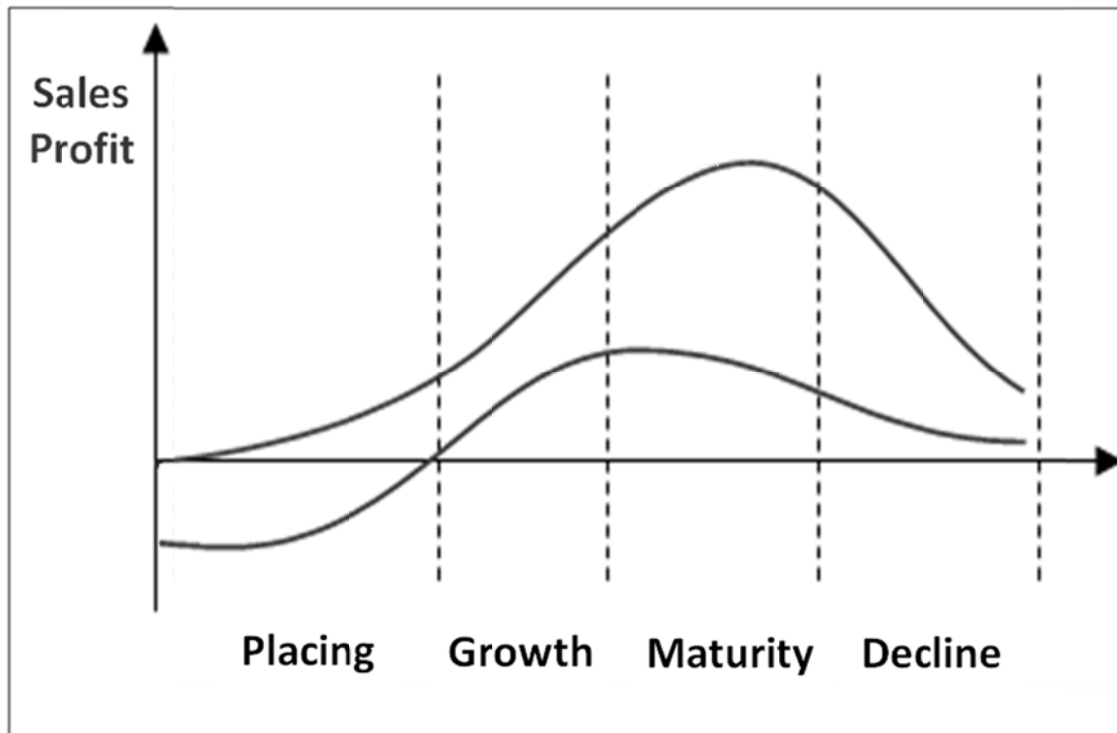


Figure 3. Product Life Cycle from a marketing perspective (4 phases)

Marketing tools are used. They are a part of the so-called marketing mix (4P). Marketing tools change in various phases of the product life cycle depending on the customer response, market and competition. The 4P Marketing mix includes product, price, place and promotion from the perspective of a company. This approach determines how to sell what is produced, not how to produce what is desired. Currently, this view is gradually being replaced by a new view, by the view from the customers' eyes. This view is called 4C. (Customer solution - the solution of customer needs, Customer cost - costs incurred by the client, Convenience - availability of solution, Communication). Under this approach, marketing deals with what the customer wants, so with individual needs of each customer and with performance of products or services that match his or her needs [Marketingové noviny 2013].

The duration of each phase for various products is different. This model does not hold for all products and services [Marketingové noviny 2013]. Some examples might be food, housing, energy, so products and services of life needs, and also irreplaceable or unique products, which are products in medicine, engineering, etc. The theory of product life cycle works effectively with cars, cell phones, computers, cameras and so on.

4.2.1 Research

The phase of research and development is very important, takes along time and is very expensive. Some products will never get from this phase to placing on the market (such as automotive studies). The reason may be lack of funds or change in market conditions (competition, crisis, legislation, etc.). It is better for the company to stop product development, if new market conditions arise. The loss will be then less than if the project is stopped later. But sometimes companies start to promote their product already in the phase of its development so that they can ensure huge success [Marketingové noviny 2013].

4.2.2 Placing

The phase begins with zero revenue like the phase of research and development. In this phase it is necessary to establish sales channels, adjust the marketing mix, solve logistics, etc. There are two ways of placing the product on the market. The first one is that the company creates a great product

promotion, under which high demand develops. The second way is the slow growth and spread of product awareness among consumers [Marketingové noviny 2013].

4.2.3 Sales

For the growth phase it is typical that the product begins to be profitable. The company should start to innovate in time or develop other products because the competition never sleeps. The company must constantly study the competition and what customers want. The point is that when competition enters the market with its product, the company must announce a new version, a facelift or an expansion of existing products. It is necessary to re-invest in development [Marketingové noviny 2013].

4.2.4 Maturity

The product is introduced, the demand and sales are steady. The awareness of the product is on top. The phase of maturity can be of various lengths and its duration can be extended in various ways (automobiles - facelift, phone manufacturers - to update the operating system, to penetrate new or foreign markets) [Marketingové noviny 2013].

4.2.5 Decline

A decline in sales and revenues is characteristic for this phase. The company must decide when and how to stop selling the product [Marketingové noviny 2013].

4.3 Place

Another perception of the product life cycle allows the division of the product into various phases, for example according to the place of the realization (see Figure 4).

The life cycle begins with the planning phase of a new product in the management department. After finishing this phase the product passes step by step to other departments and workplaces such as technical preparation of the product and production, production etc. and ends in the phase of liquidation.

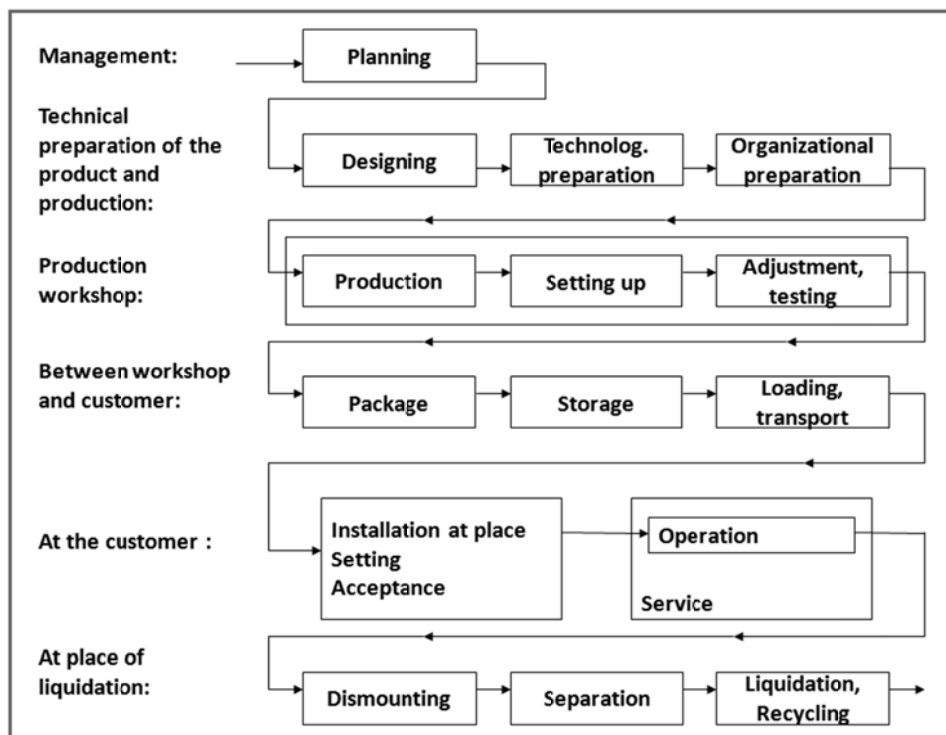


Figure 4. Product life cycle according to the place of realization [Eder and Hosnedl 2010]

4.4 EDS

Besides the above mentioned options of LC perception an opportunity to divide the product by key life transformation processes (TrfP) is still opening up. This view is especially suitable in terms of design and is further developed in the science discipline Engineering Design Science (EDS). Individual transformation processes correspond with transformation systems (TrfS) that allow e. g. to simply include many important aspects (e. g. individual TrfS requirements on properties of TS) in the specification of requirements on the technical system (TS) or in the evaluation of TS etc. [Eder and Hosnedl 2010].

In all the phases of LC it is necessary to observe and adjust basic “summary” requirements related to individual operators which are not mentioned in the phases because of simplification.. For example safety, hygiene, ergonomics, environment-friendliness, economy, compliance with regulations and laws, patents, licenses etc. It may also include the different expected quality of individual operators (especially human and technical means) in each phase of LC (e. g. in production or operation phase, etc.). So as not to omit all mentioned aspects it is advantageous to design the product with the help of systematic Specification of requirements on properties TS [Kroták and Šimlová 2011].

The so-called ‘map of knowledge’ (systematically organized knowledge of the theory and practice for research, teaching and design practice) is the content of EDS. EDS provides a systematic overview of objects, processes and relations that influence the designing process. EDS allows us to know rational connections and relationships between objects, processes, to systematically organize knowledge of design process and to analyze and prepare for potential risks [Kroták and Šimlová 2011].

The purpose of EDS is the identification (recognition and description), generalization, verification, systematic processing and explanation of the findings because of rational designing of technical products that are seen as technical systems (TS). The purpose and function of EDS consists in increasing the productivity of designing and in the quality of designed technical products so that the level of knowledge support of the design process will increase [Kroták and Šimlová 2011].

The EDS life cycle is according to [Eder and Hosnedl 2010] divided into seven phases. It is necessary at various phases to respect not only processes but also the existence and effects of the operators (Figure 5.) that are the source of desired effects. Each phase has five identical operators - human, technical system, active and reactive environment, information and management system.

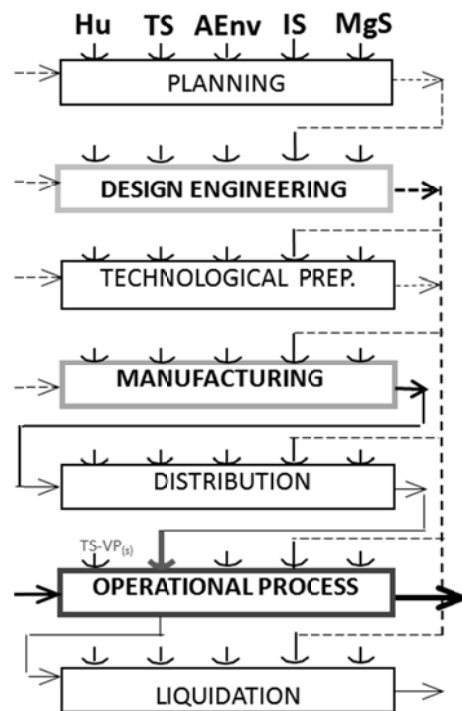


Figure 5. Life cycle of TS - series of TrfP (with TrfS) in main life phases [Eder and Hosnedl 2010]

4.4.1 Planning

There is a precise reflection of time requirements, allocation of human, technological, material and other resources to individual processes and their operations. It is necessary to specify continuous costs and cash flow and to consider how the quality classification of the final implemented TS will run. The planning process is based on the scheme shown in Figure 6. which shows six basic questions that need to be specified during planning.

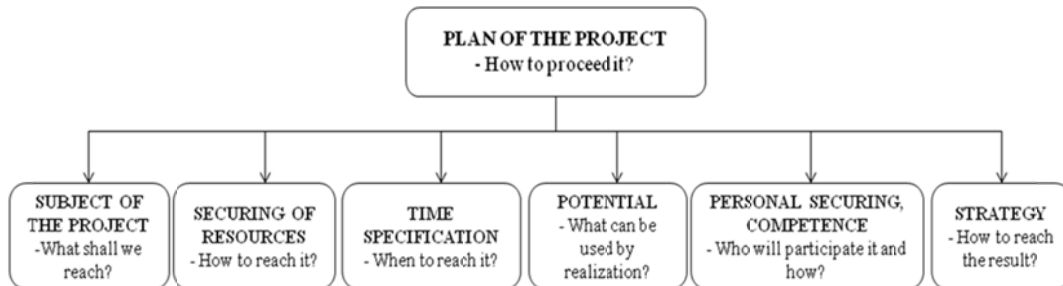


Figure 6. Scheme of project planning [Kroták and Šimlová 2011]

Eventual risks that may arise during the project realization should be thought of at this phase. It is necessary to predict the risks already in the project plan and to create time and cost reserves for their solution because these risks will demand a suitable intervention (matching solution) that will demand specific time.

4.4.2 Design

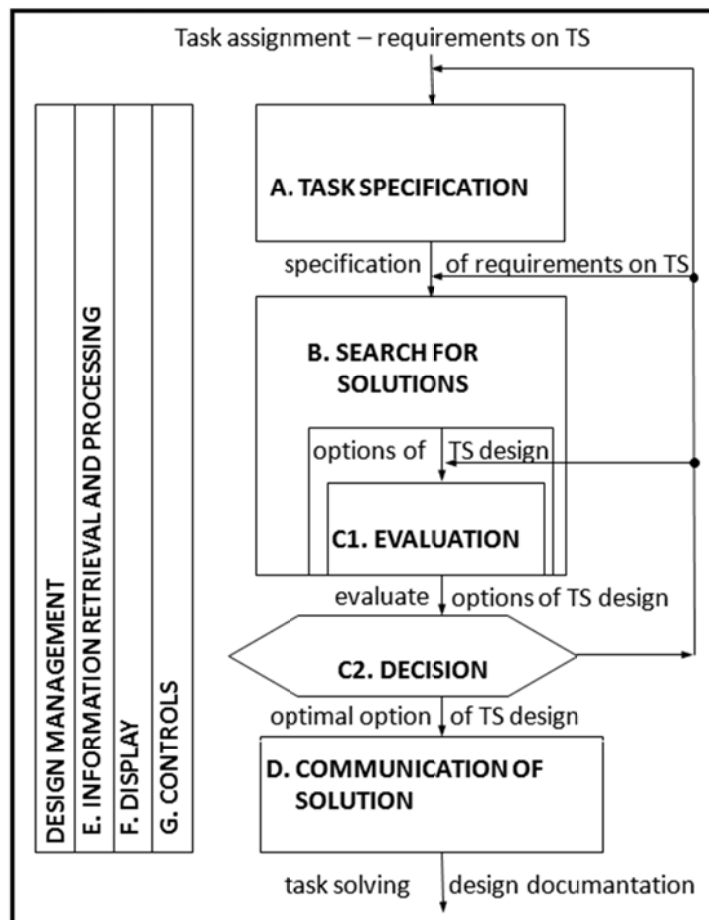


Figure 7. General design process of the product [Eder and Hosnedl 2010]

The second LC phase can be depicted as a problem solving process which is shown in Figure 7. This is a general process of designing a product that is theoretically based of EDS knowledge. The aim of this designing process is a rational design of TS with a purposive procedure based on the methodology working on the EDS “map of knowledge”. This consists in sequences of individual transformations that lead to the desired transformation of the input into the desired output and in the system of knowledge that is the basis of this methodology.

4.4.3 Preparation

The third phase of the product LC includes a set of technical (specific constructional, technological, organizational and economical) works and activities for assuring production and other processes in the product LC (size, characteristics, demanded material etc.) including technological processes and their accessories (machines, facilities, tools, instruments etc.) and a suitable filling of information systems (labour-consumption, costs etc.).

4.4.4 Production

Production is a process of transformation of the input operand to the output status (product) so that desired properties would be implemented into the transformed semi-finished product. It can be the production of the technical system itself or production of supporting technical and technological means of production, distribution, maintenance etc. of this TS.

4.4.5 Distribution

It is necessary to include distribution during the design and the planning. We can not produce a product which will be impossible to freight (for example we forget to make an eye for a crane), to guarantee against wear or mechanical damage by distribution, or it will not be possible to import it to the place of operation.

4.4.6 Operation

In this phase the required aims of the project are realised. This phase is the most important from the customer point of view because the customer is mostly interested only in the function and effectiveness of the product. Within this phase, planning and design engineering, we must not forget about supporting processes (maintenance, service etc.).

4.4.7 Liquidation

This phase deals with not only the liquidation of the final product (output) but also with all tools and means that do not have other uses. It also deals with shredding and liquidation of unnecessary documentation either directly after the accomplishment or after the predetermined time of storage.

5. Evaluation

As was already mentioned, the PLC scheme from the marketing perspective is not suitable for all products and mostly deals with only 4 phases of the product life cycle. It completely ignores pre-production phases which, taking into account life cycle according to EDS, can be defined as the phase of planning, design engineering and preparation of production, and also does not include production. It includes only post-production phases only in terms of sales and the product's position on the market. It offers the possibility to extend this model of PLC from the perspective of EDS, which includes and defines 7 phases of the product life cycle. The PLC according to EDS also takes into account the effects of the operators in all phases of the life cycle. Unification scheme of marketing PLC with view by EDS is shown in Figure 8.

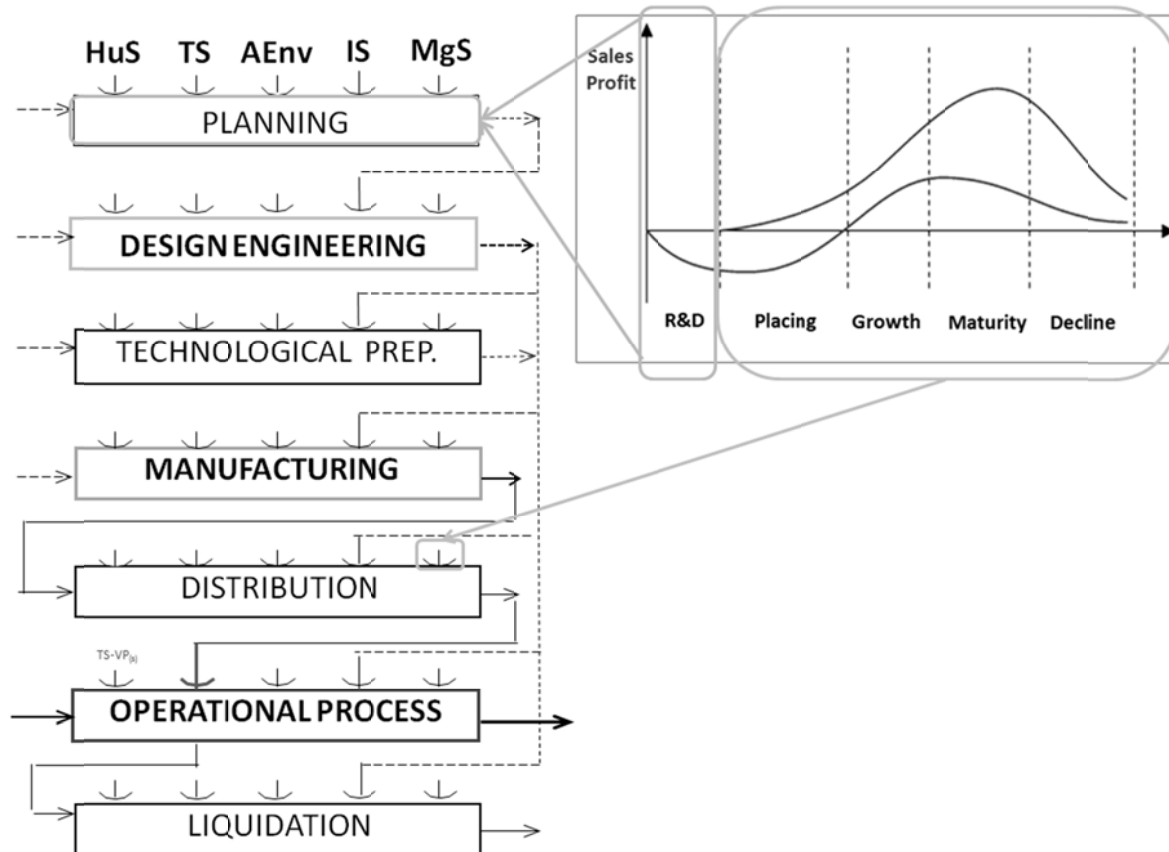


Figure 8. Integration of marketing LC and LC according to EDS

If we combine both life cycles, the phase of development from a marketing perspective can be represented in the phase of planning according to EDS product life cycle. The life cycle according to EDS offers some advantages. These include the fact that the planning phase is followed by another 3 phases that the marketing PLC does not include, and therefore does not deal with them. The marketing LC has only the same planning phase, and then deals with the sale of the product. While EDS is focused on all phases that should be considered in the design process of the product, the marketing PLC is used only for purposes of determining the condition of the product on the market, but this is not a bad thing. It is possible to combine the advantages of both life cycles, as shown in Figure 8. The phases (excepting the development phase) of the marketing PLC are linked to manager (control) information in the distributional phase by EDS.

This designed LC is advantageous in terms of innovations and not just in them, because in addition to the standard and well-known phases of the LC according to EDS this life cycle is enriched with the marketing approach that has so far been missing. LC according to EDS completely omits introduction of the product on the market and its maintenance on the market with subsequent decline. All this passes without a fuss and is followed by the next phase. If the company wants to be successful, it must be able to innovate and then manage all phases of the LC including phases that are occupied with advertising the new or innovated product. It is clear that without the right propagation and advertising even the best product will not be successful on the market and customers will not want to buy it. The definition of innovation follows that it is possible to find suitable tools for almost each one of the introduced phases of the “innovated” LC. It always depends on which phase the executives and representatives of the company focus on and which one they will innovative in order to achieve the desired determined market success and competitiveness.

6. Conclusion

Innovation is the topic number one for many companies in the twenty-first century. If the modern company wants to be successful at what it does, and also if the company does not have a large

scientific and research base, it must appropriately and with clear rules react to changes and turbulence in the market and deliver only what the customers demand. It is also possible that companies can interest the customer in something new, which the customer does not know, but which awakens his interest in buying. Innovations can rely on large amounts of information and materials that are differently divided and each author presents different best practices and breakdown of the steps of innovation.

The effort of this paper is to base the innovation process on the product life cycle and then enrich it with approaches from the marketing perspective because without the market analysis it is not possible to find out what the customers need and want. Without the right advertising and promotion not even the best product is saleable. It is possible to find expedient tools for almost every phase of the proposed LC. The degree and success of innovation always depends on executives and representatives of the company, on which phase they focus and which one they will innovate in order to achieve the desired determined market success and competitiveness.

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