

Product Lifecycle Management: Lifecycle Model, Cannibalism & Brief Description of the PLM Approaches

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Abstract- As per standardized references definition of PLM (Product Lifecycle Management) is "An integrated information driven approach comprised of people, processes/practices & technology to all aspects of products life, from its design to manufacture, deployment & maintenance- culminating in the products removal from service & final disposal." Due to the issues related to the inefficient production management in any enterprises it makes it essential to engineer & incorporate the knowledge of PLM in the production sites. Out of a wide knowledged body (PLM) some concepts are taken into consideration in our paper, like its importance, phases, product cannibalization & so on. The purpose of this paper is to provide a clear knowledge of what stages a product goes through starting from its appearance in the market, how companies are influenced in introducing updated version of their products, six-sigma & lean manufacturing methods, etc.

Index Terms- Product Lifecycle Management, PLM phases, Cannibalization, Six Sigma, Lean Manufacturing

I. INTRODUCTION

Today's global market, enterprises want more & more innovations to keep surviving. There has to be innovation in business, marketing, process, etc to improve & keep moving along with the existing competitions. In order to raise amongst the others the enterprises have to make use of their available intellectual assets in an optimized manner & this is possible only by proper implementation of "Product Life Cycle Management". In short PLM can be called a strategic approach involving reduction of costs, quality improvement, shortening time to market while innovating (open innovation), render a good customer servicing & business operations. The efficiencies of the company are thereby drastically improved in terms of,

- 1.) Cutoff in the time & cost of the product.
- 2.) Shorter product cycle & lead time.
- 3.) Reduced defective parts & reworks.
- 4.) A better design of the entity.

Delivering the right product to the market is only half the battle that today's product makers' face. Best-in-class companies make use of lean manufacturing design concepts which are further discussed. According to Stark (2004,p.2), "PLM is an activity of managing a company's products all the way across their lifecycles in the most efficient way". PLM enables the company to take control of its products. PLM implementation projects are always complex in nature. Grönvall (2009) compares

PLM implementation with a heart transplantation. He says, PLM implementations carry many dependencies & uncertainties, & therefore are projects of high risks. Manifestation of PLM actually started with Computer integrated manufacturing (CIM), that involved Engineering data management (EDM) in the early nineties & later Product data management (PDM). Companies that apply PLM systems & concepts can be found in various industries ranging from automotive & transport sector (involving aerospace & defense) to process industries, life sciences & heavy machinery industries (Burkett et al., 2002). All these industries have unique characteristics & thereby unique PLM applications. The important drivers of PLM are the need for shorter product lifecycles, urge for more complex products in terms of components & functionality, trends of globalization & outsourcing, & consequently complex supply chains, need for customization of products as a result of more demanding customers, & increasing regulations such as safety, environmental & product reliability regulations (McGrath, 1996; Cimdata, 2002; Myer et al., 2002; Ausara& Deck, 2003, Stark, 2004). For a company to successfully implement PLM it needs to develop certain methodologies & strategies, some of them are discussed later on in this paper.

II. IMPORTANCE OF PRODUCT LIFE CYCLE MANAGEMENT

A new product introduction into a market is accompanied by many steps influencing the departments of that very company. The journey behind the successful launch of the product is fully fraught with challenges. Sometimes it may also happen that if the design experts & other departments come up with an excellent product involving creativity & proper use of technology the product may not win the hearts of the public/popularize itself in the society. The authorities may not be able to grab the opportunity in marketing it well or the representatives may not have enough knowledge about the product to keep the customers satisfied with the queries. Wherever these kinds of weak bodies lie, an opportunity to invade the market & gain profits can be missed out. Thereby the company responsible for the production has to make sure that sufficient information regarding the entity they produce has to be properly circulated into the concerned departments having contributions in the company's success. This is where the Product Life Cycle Management comes into action.

It's working: The PLM cannot be simply restricted to documentary works within the company. Although those elements also hold importance, PLM is more associated with the

interacting parts including a number of actions like making, distributing & servicing the product. The main concept behind the word PLM is gathering the individual informations of the various departments into a central database, i.e. people working on a certain project are made to share their views with the co-workers belonging to the other departments thereby exchanging their knowledge. This openness of communication continues throughout the end of the life cycle of the product. New data concerned with the product gets added, companies get tend to bring in development in their products as time passes. The feedback of their old one happens to be more important in this case. If the companies are not informed about the status of their present products, the managers may make the wrong choices. Constant input & updating the feedbacks of relating to the product is imperative for the success of the company, which makes the PLM even more important.

III. DESCRIPTION OF PRODUCT LIFE CYCLE MODEL

Usually five steps / phases are involved in the life cycle of a product : Initially Product development, followed by Product introduction, Product growth, Product maturity and finally Product decline. These five phases are common in all kinds of goods & services produced / rendered. Sometimes these phases are divided into small ones depending on the product type & are again considered when new ones enter the marketing world.

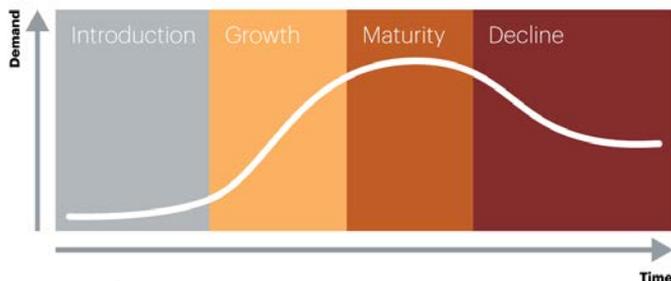


Fig. 1: Product Life Cycle Graph

Source: A.T.Kearney Analysis

- 1. Product Development Phase:** The development phase of the company comes into action as the company gets & develops new product ideas & innovations. It involves gathering of information from various sources and implementing them in the formation of new products. During this process the product is made to undergo through various changes involving a lot of money & time during the initial development, i.e before it is made to target the customers via test markets. Those products that make their place in the test market are then introduced into a real market and the introduction phase of the product begins. During this phase, sales are zero and revenues are negative. It is the time of spending with absolute no return. This phase does not come into action in the graph as its curve is below the zero line.
- 2. The Introduction Phase:** Introduction phase of a product includes the launch of the product in such a

way so that it will have maximum impact at the moment of sale. The best examples for such a kind is the advertisement of iphone6 & 6+ of the Apple company. This period can be described as a money sinkhole when compared with the maturity phase of a product. Large amount of money is spent on the promotion and advertising, and also quick but costly service requirements are introduced. The finance of the company has to be planned in such way that a lot of money has to be sanctioned for the purpose, not expecting a high return. Having this product in all the counters of marketing is very important. In order to avoid this stress some of the companies pass on these responsibilities to external contractors. Setting of a price is another thing the company needs to decide during this phase, which is accompanied by several structural strategies. Early customers will pay a lot for something new introduced and this will help a bit to compensate that sinkhole that was mentioned earlier. Later the pricing policy should be made more aggressive such that it becomes competitive. Another strategy is that of a pre-set price believed to be the right one to maximize sales. This however demands a very good knowledge of the market and of what a customer is willing to pay for a newly introduced product. A customer can tell a company about the features he desires on the product & what characteristics should appear on it. So in this way a company will have an idea about the expectations of the customers.

- 3. Growth Phase:** In this phase we get to see the product take off in the market place, & is the time to focus on increasing the market sale. If the product has been introduced first into the market, then it is in a position to gain market share relatively easily. A new growing market alerts the competition's attention. The company must open show about product giving a detailed description about it.. A frequent modification of the product is done to gain attention & discourage the competitors, reduce other enterprises copying or offering similar kind of products. Other barriers are licenses and copyrights. Promotion & advertising of the product still continues, but not to that extent in which it was in the introductory phase. It is advertised to keep it competitive in the market here. External contractors may also be used for the purpose. This period is the time to develop efficiencies and improve product availability and service. Cost efficiency and time-to-market and pricing and discount policy are major factors in gaining customer confidence. A company should know its capacities & capabilities. It does not make any sense in increasing the production due to rise in demand without an arrangement for that capacity of production. A company must not make the mistake of over committing. This may result in losing of the customers & lower the company's prestige due to alternations in the characteristics.

4. Maturity Phase: When the market becomes saturated with variations of the basic product, and all competitors are represented in terms of an alternative product, the maturity phase arrives. This period is the period of the highest returns from the product. A company that has achieved its goals enjoys the profitable period whereas the one that has experienced failure reconsiders its position in the marketing site. During this period new brands are introduced even when they compete with the company's existing product and model changes are more frequent. Pricing and discount policies are often changed in accordance to the competitions & policies, i.e. it keeps moving up & down (wavering). Promotion and advertising further helps in getting wide number of customers popularizing the product even more. A good

example of this is "Tide" washing powder, which has grown old, and it is still growing.

5. Decline Phase: As the name suggests it is the phase relating to the end of the product. The decision for withdrawing a product seems to be a complex task and there a lot of issues to be resolved prior to dislodging it off the market. Dilemmas such as maintenance, spare part availability, service competitions reaction in filling the market gap are some issues that increase the complexity of the decision process to withdraw a product from the market. Sometimes it is difficult for a company to decline a product. Usually a product decline is accompanied with an end of market sales. Other big products coming from the maturity phase pose a challenge to these products.

STRATEGIES FOR EACH PHASE ARE MENTIONED IN THE BELOW TABLE:

	DEVELOPMENT PHASE	INTRODUCTION PHASE	GROWTH PHASE	MATURITY PHASE	DECLINE PHASE
STRATEGIC GOAL	Publicity of the product, conduct a test for a period	Capture a strong market position	Maintain the market position & try to improve	Defend your position from the other competitors	"Milk" all remaining profits
COMPETITION	Almost NIL	Early entry of aggressive competitors into market	Pressure on the price & distribution tasks	Competitive environment establishment	Some competitors withdraw from the market
PRODUCT	Limited variations	Introduction of product variations	Upgrading of products	Decrease of price	Variation that do bring profits are withdrawn
PRICE GOAL	High sales to the middle men	Aggressive price policy (decrease) for sales increase	Re-estimation of the price policy	Defensive price policy	Maintain level of prices for small profits
PROMOTION GOAL	Public-market production awareness	Reinforcement of product awareness	Reinforcement of middle men	Being loyal to middle men	Gradual decrease
DISTRIBUTION GOAL	Exclusive distribution through selected channels, creation of high profit margins to middle men	General & reinforced distribution through channels	General & reinforced distribution with good supply to middle men considering low margin profits from them	General & reinforced distribution with good supply to middle men considering low margin profits from them	Withdrawal from many distribution channels except from those used in the development phase

SOURCE: Avlonitis G

IV. PRODUCT CANNIBALISM

"If you don't cannibalize yourself, someone else will" said STEVE JOBS.

Cannibalism of a product is something that happens when the enterprise decides to replace their existing product with another (the existing products position has nothing to do with the replacement). This replacing is commonly due to the upgrading/new technologies that the enterprises have come up with, in association with the existing one. Sometimes it also

happens that a new one is introduced even the existing product starts to grow in the market. There always has to be proper knowledge of when & why to implement cannibalism as late implementation or early one may lead to heavy losses to the enterprise. Some of the strategies of cannibalism include- Gaining Global share in the market, Increasing Customer Loyalty & Increasing the margin of profit.



Pictorial presentation for a better understanding
 Source: LinkedIn (Isaiah Adams)

Cases wherein Cannibalization doesn't work: At times when a product is replaced by another without any market survey done (especially when the product has got a huge fan base), cannibalism can be disastrous to the company.

When to cannibalize? As mentioned earlier it has to be done only after market surveys (tests) & results say that the new product could bring profit to the entire production line/company.

Illustration on how Cannibalization is profitable: Lets say we have product X, product X sells 100 units at a profit of \$50. This makes a total profit of \$5000.

Further on, product Y gets introduced. There will be 50 units sale in the product at a profit of \$75, which makes \$3750 profit. However by introducing product Y, product X sales will be dropped by 25 units.

The profit calculations go like this,

$$75 \times \$50 = \$3750 \text{ for product X}$$

$$50 \times \$75 = \$3750 \text{ for product Y}$$

New profit of the company now is \$7500!

V. LEAN MANUFACTURING & SIX SIGMA IN PLM

Lean manufacturing/lean production is a waste ("Muda"-futility, uselessness) elimination technique incorporated in a manufacturing process developed by Japanese engineers between 1948 & 1975. Overburdened waste ("Muri") & uneven workload wastes ("Mura"). "VALUE" happens to be an action/process that a customer will be interested in paying for, & this technique of lean manufacturing happens to add values by reducing everything else. It can be said to be a continuous improvement philosophy in association with TOYOTA PRODUCTION SYSTEM or the KAIZEN. Toyota systems happen to be the major precursors of the Lean manufacturing methodology. Implementation of lean manufacturing is associated with a number of steps like the establishment of plans/actions, Lean training, Implementation of 5s, waste elimination, standardized work, Kanban, Levelized production, just-in-time production. A detailed description of the steps involved are readily available in standardizes references.

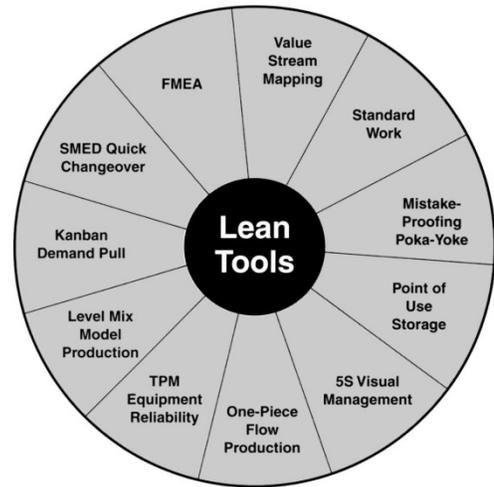
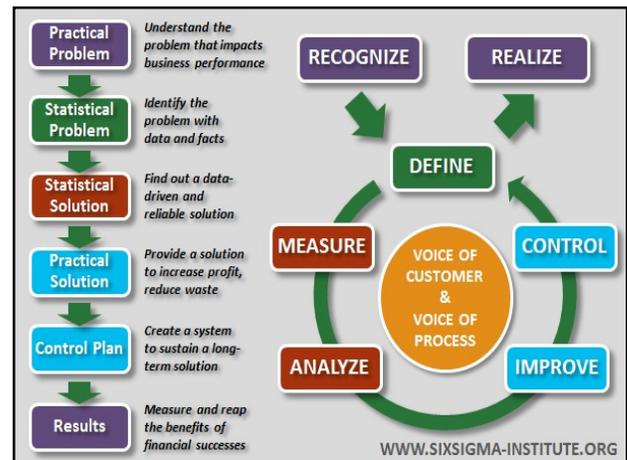


Fig: Basic Lean Tools (Source: bexcellence.org)

On the other hand **Six Sigma** is a set of tools & techniques for the process improvement. Being introduced by an engineer named Bill Smith (working at Motorola, 1968), today it is majorly practiced in a lot of industry sectors. Its main purpose happens to be the improvement of the quality of the output by identifying the defects & their causes minimizing the variations in the manufacturing process. This method when carried out within an organization follows a sequence of steps having certain value targets like reducing cycle time, reduce pollution, increase profits & customer satisfaction, etc. Motorola sets six sigma methodology for all its operations, & this became the prime technique for the management & engineering practices involved in their manufacturing.



Source: www.sixsigma-institute.org

VI. CONCLUSION

Although it happens to be a latest introduced method, PLM (Product Lifecycle Management) has proven itself to be the best till date within an organization in all possible angles. Outsourcing has lead to a scenario wherein there are long design & supply chains because of which manufacturing, development & other support activities are spread over different organizations. Managing them over extended organizations used to be a very difficult task. PLM has coordinated the things making it a

simpler process. In this paper, we believe that attention is given to PLM's importance, its phases, lean manufacturing & six sigma methods, cannibalization which make only a part of the wide concept of PLM. It is also understood from the paper that PLM is ultimately about even more than getting better products to the marketplace faster, i.e. it can provide revenue generating & cost management as well. With the PLM implementing guidelines conduction of schematic studies on the execution of PLM is possible. Comparisons with other cases are necessary to provide evidences whether those guideline lead to a better outcome or not. Aim is to obtain results of such kinds of comparisons in the near future. PLM leads to better productivity, which leads to growth & further profitability.

REFERENCES

- [1] Paper on PLM by Ioannis Komninos (www.urenio.org)
- [2] PLM: Sustainable & knowledge management as keys in a complex system of product development by Maria Giovanna Trotta
- [3] www.wikipedia.org/wiki/market_cannibalism
- [4] www.mcngmarketing.com
- [5] Aaker D. Strategic Market Management, Willey, 1995.
- [6] Avlonitis G. Strategic Industrial Marketing, Stanoulis, 2001.

- [7] Genesis Strategies "Product Life Cycle Management", on-line <<http://www.genesisstrategies.com>>
- [8] Jensch J. "Strategic Marketing and the Product Life Cycle", 1999, on-line <<http://www.questteam.com>>
- [9] Lightfoot W. "Product Life Cycle Stages", on-line <<http://www.marketinginc.com>> McGrath M. Product Strategy of High-Technology Companies, McGraw-Hill, 2000.
- [10] Norman D. "The life cycle of a technology: Why it is so difficult for large companies to innovate", 1998, on-line <<http://www.jnd.org>>
- [11] <<http://www.faculty.washington.edu/krumme/systems/pcycle.html>>
- [12] Smith J. C. "Product Life Cycle", on-line <<http://www.accessnorthga.com>> Twiss B. C. "Forecasting Market Size and Market Growth Rates for New Products",
- [13] wikipedia.org/wiki/lean_manufacturing
- [14] wikipedia.org/wiki/Six_Sigma

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