Product design argumentative essay

Profession

A product development life cycle typically consists of idea generation, concept development, manufacturing along with various stages of testing, the final deployment of product in the market along with providing service support to safe environmental disposal. As a product moves along the development lifecycle, work done in the preceding stages assume importance and begin to have an effect on the subsequent stages of the product development.

A product developer should therefore consider how the design phase has ramifications on all the other stages of development because each stage is affected by the previous stage and in turn affects the subsequent stage of development. A good designer should take into consideration not only the product functionality, but also evaluate it vis-a-vis ease of manufacturability, sustainability and recyclability of various components of the product. To optimise all the stages of development, the design of a product must consider every aspect of the lifecycle in a holistic sense and not view each of them in an isolated manner.

Explanation The conception of an idea begins with an understanding of the consumer's needs. By defining a generic process flow, the product developer gets an idea of the steps for creating the product. The conception of design is essentially an intellectual process where the needs of customers are transformed into the developer's vision for how the product should be like. Every part of the product cycle consists of various phases. These include but are not limited to development of concept, design at system level, specific design, testing and evaluation and implementation.

Each and every phase of different aspects of a product design is a concurrent activity and the corresponding phase in the design part subsequently affects the same phases in manufacturing and marketing part of the product lifecycle. Through the dependencies between each phase, the importance of design on other parts of product lifecycle can easily be observed. The analysis activity which precedes the product design takes into account the customer's needs and identifies the market segment for it. Target markets are identified and alternative product designs are evaluated at this stage.

A comparative analysis and the economic justification of the product development project are undertaken for the same. The rough design consists of breaking the larger system into smaller sub-systems for ease of analysis and further design. The final assembly of these sub-systems to form the complete product is often decided upon in this phase. The result of this phase is a process flow for the creation of different sub-systems of the product. The detailed design phase takes into the specific details of each subsystem listing the exact components required for the making of each sub-system.

A functional understanding of each component is understood here. Before implementing the design, the testing and modification phase review all other phases by creating a prototype of the product. These are then tested for functionality and satisfying customer's needs. The implementation phase begins then where all the plans are put into action and the actual manufacturing of products starts. Before releasing the product, it goes through stringent tests and quality checks which were decided upon during

design phase. Another prototype is released first to a select market to identify any flaw before it is launched in the market.

Next is the stage of maintenance where support to the launched product is provided. Feedback from the customers about the product are then taken into consideration and used to improve upon the design in the future with better products. Product Life Cycle Depleting resources and rising environmentalpollutionhas caused strict rules to be formulated for the recycling of products and waste disposal. A product design should not only satisfy the functional utility and meet the business constraints but it should also beenvironmentfriendly.

The “ producerresponsibility” principle that is employed on these rule makes it incumbent on the product manufacturers to take responsibility for the waste disposal and minimise the environmental hazard. This places a constraint on the selection of raw materials for the product design so as to increase recyclability of waste components and hence reduce the effects of any waste on the environment. Like a biological life cycle, a product goes through the decay process and it is thus the responsibility of manufacturers to effectively dispose the wastes resulting from their products.

Hazardous materials such as metallic coatings, emission causing non-biodegradable substances have been banned by many countries to eliminate the harmful effects on the environment. While these regulations limit the availability of materials for selection, the effect of finding reusability has improved the profitability of manufacturers. The reuse of components used in the products reduces wastes and it also economises the value derived from the components used.

Products and the components used in them have an operating life after which they begin to degrade in performance. An important concept withrespectto recycling, servicing or disposal is the product's take-back time so that it is possible to recycle or reuse the components by servicing them instead of disposing them when they have become completely defunct. A product designer thus needs to consider the component reusability and effective waste disposal not only to meet these regulations but also to maximise resource utilization from the wastes.

Incorporating in the design the components that needs to be re-used, recycled or disposed is thus an activity that a product developer must consider for effective resource utilization. The table on the previous page shows how each phase of the design of product lifecycle affects the subsequent phases in manufacturing process and the marketing of the product development lifecycle. The concurrent activities in the different stages of product lifecycle derive from the design stage and hence the developer must consider all the stages of product life cycle.

The phases of activity shown for each stage of the product life cycle above is just a symbolic representation for analysis purpose and there may be additional phases involved or one or more of these may be missing in actual life cycle of a given product. Although the relationship between the concurrent activities in only design, manufacturing and marketing have been listed above for the sake of simplicity of analysis, other stages of life cycle specific to a given product and their interacting dynamics should also be taken into consideration.

Furthermore, the order of activity may be different depending upon whether a product is pushed on to the market to create a niche segment or whether a product is being designed to address an already existing segment with several competitors. The planning and development of concept phases may then be shifted in order depending upon the case as it may be. In the planning phase, while evaluating the opportunity for products and identifying the target consumers, the design part of the product life cycle involves assessing different product structures.

Now this directly affects the manufacturing part in terms of constraints each structure produces on the manufacturability. When industrial designs are being formulated in the design part, concurrently one needs to consider it’s feasibility in terms of manufacturing. At the system level design again, the design of subsystems creates a dynamic relation in terms of identifying manufacturers for the parts of these different sub-systems. This affects the marketing part in terms of evaluating the approximate target price.

When detailed design is taken, each subsystem is defined in detail, complete industrial design and control procedures formulated. Concurrently, production of each part, raw materials procurement and evaluation of control strategies at manufacturing part of the life cycle are evaluated. When testing techniques are being taken into consideration at the design part, simultaneously their implementation at the manufacturing level should also be evaluated. The need for product upgrades or the decision of providing support and maintenance to the product is also based on the determination of the operating life cycle of the components used.

The factors that need to be considered here are whether the component needs to be serviced, replaced and recycled or replaced and disposed off. Here, a trade off between the cost, quality, product durability and environmental impact needs to be considered. A timely maintenance or servicing schedule not only enhances the product performance but it also reduces wastage of components malfunction. The timing of these schedules is dependent on the design phase which determines the components that will be present in the products.

These considerations in the design phase reduce the risks of earlyfailurerate of products and hence product withdrawal. A product life cycle is essentially a closed loop activity and the stringent regulations to minimise wastes and effective resource utilisation has forced the product developers to incorporate product take-back planning in the product design procedure. Models are thus developed in the design stage to evaluate reuse, recyclability and an environment friendly disposal of the components of the products.

A decision model that takes into consideration the aspects of component reuse, remanufacture and disposal is thus required at the design phase because these impact the not only the cost, durability and reliability of the product but also pose issues of environmental hazards. Conclusion The different stages of product development are essentially holistic and depend upon one another. A developer must take into consideration how the changes in design propagate to manufacturing and other parts of the product lifecycle.

So many product designs often fail because these interactions were ignored and the design phase carried out in isolation without considering its implications on the other stages. From idea generation and concept development to different parts of the product life cycle, several changes need to be introduced because some aspect of one or other stages of the life cycle was not considered during the design phase. While a complete determination of effects on other stages is not possible during the design phase, yet keeping in mind the dynamics of different stages is a practise to be encouraged.

A design that takes into account these interacting dynamics between the different stages of product development lifecycle has lesser probability of encountering a roadblock and being subjected to redesign. It is thus clear that each phase of the different stages of a product lifecycle has some or the other concurrent activities that are affected by the design phase. A systems approach to the design of product thus should consider all these stages in a holistic sense and a product developer must integrate the different stages of the product life cycle. References Baxter, Mike.

, Product design: a practical guide to systematic methods of new product development. CRC Press, 1995. pp 213-214. Ulrich, Karl T. , Eppinger, Steven D. , Product Design and Development. McGraw-Hill, 1995. pp 9-41. Roozenburg, N. F. M. , Eekels, J. , Product design: fundamentals and methods. Wiley Publications, 1995. pp 9-19. Mangun, Donna. , Thurston, Deborah L. , “ Incorporating Component Reuse, Remanufacture, and Recycle Into Product Portfolio Design. ” IEEE Transactions on Engineering

Management , Vol. 49, No. 4, November 2002. Product design for the environment, http://www. productdesignenvironment. info/concepts3. htm