

A Brief Description of Reverse Engineering As A Valuable Technique for Product Redesigning

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Abstract- Reverse engineering is recreation of product by breaking it down into various set of processes in opposite order. Reverse engineering in products designing is done to enhance features of products and make them cost effective for customers as well as manufacturers. A general model of reverse engineering and redesign methodology with special reference to products designing has been explained in this paper. This understanding will cultivate talent in product manufacturers and engineers so as to enable them to stay ahead in competitive market.

Keywords- Reverse engineering, product redesigning, cost effective.

I. INTRODUCTION

Companies have to consistently design new products to stay ahead in competitive market. New product development consists of various stages that begin with idea generation and end with product launch. For this purpose engineers should have thorough understanding of product development and application of product development methods and tools.

Reverse engineering can be termed as the processes of extracting knowledge and/or design information from a pre-existing well engineered product. It can also be termed as a feature of engineering to produce the design of all sorts of products. After obtaining the design the product is redesigned.

II. PURPOSE

- 1) To design a new, robust and cost effective product that would meet or exceed customer requirements and gain competitive advantage.
- 2) Product development time is reduced which increases the operational efficiency of the product
- 3) To repair worn out part or fix defects.
- 4) Reverse engineering holds importance when original design is missing or out of business. It has to be noted that in case of software engineering the original design is the source code

- 5) Analysis of the functions and risks associated with a product can be done for research or academic purpose.
- 6) Rapid Re-iterations of various versions of the prototype of the product that would meet customer requirements.
- 7) To reduce Negative environmental impacts caused by a product
- 8) To detect malware, viruses etc..
- 9) To estimate all the costs associated with the product.

III. Research Design

This Research explains the various steps and application areas of reverse engineering. Literature review was done extensively.

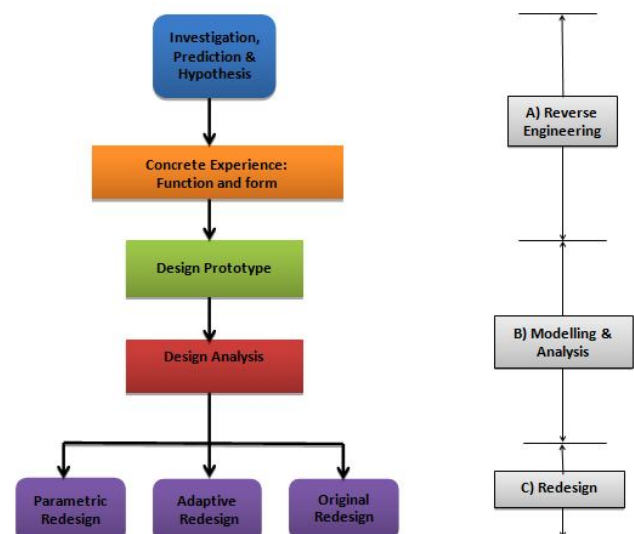


Fig 1: General reverse engineering and Redesign Methodology

IV. STEPS

A general reverse engineering steps have been discussed here-

4.1 Reverse engineering

- **Idea generation and Investigation-** Idea Generation is very crucial step in reverse engineering. This requires the collective knowledge, expertise and

consensus of all the team members. A well engineered product from the portfolio is selected for applying reverse engineering. Investigation is done to identify customer needs and market situation. Acquisition of the relevant data is done and all the dimensions and properties of product are collected. This information would contribute for thorough understanding of the product.

- **Product tear down or disassembling** - This step involves taking apart a product to understand the engineering manifested within it. Functions of each and every component are analyzed to extract information. Subtract and operate procedure is a method for product tear down.
- **Measurement and test**- This step gives information about quality of the product .It is done to analyze the performance of the product and obtain accurate information. Also the negative impact(s) or harmful effect(s) of the components of the product is (are) thoroughly checked.
- **Specifications for a new product**- Specifications includes features that new product must have. Specific set of needs from customers and other sources along with constraints are identified from the previous phases Extracted requirements are documented for the redesign of the product

4.2 Modelling and analysis

- **Prototyping**- Prototype is a model of final product. It provides scope to test the feasibility of the product to be produced. These days instead of manual modelling, computer modeling is being used for prototyping. Engineering sciences such as electrical engineering, Mechanical engineering, Electrical engineering, Electronics engineering computer science engineering etc use Different prototypes and platform for prototype for different fields may be varied. Analysis of the prototype is done in order to test its effectiveness and implications.

4.3 Redesign

- **Design**- A thorough analysis of the design is done and then the knowledge gained from previous phases is formulated to form the final design. Design is mainly of 3 types namely parametric design, original design, adaptive design. A good Design is necessary for producing a robust product.

V. APPLICATIONS

5.1 Chemical industry

Reverse engineering is used for substances or products in order to actually know how a product was physically & chemically designed. Analytical chemists apply principles of Reverse engineering to know the chemical composition of substances and understand the performance of various constituent elements.

5.2 Software industry

A Software is a set of programs. Reverse engineering is applied in software industry in order to get source code, fix bugs, study the operations performed by programs , detect malicious content, software development etc.

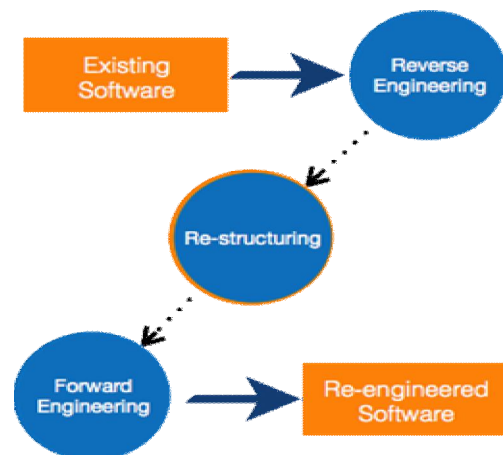


Fig 2: Reverse engineering in software industry.

5.3 Manufacturing industry

Manufacturing means formulation of raw material into final product. Products formed in manufacturing industries are used in many industries. Reverse engineering is important in manufacturing in order to modify the product for market competition, Identification of material composition, determination of manufacturing parameters and understanding manufacturing process. With the advent of technology, Reverse engineering is also done by CAD . Modified product after redesigning is more enhanced and cost effective.

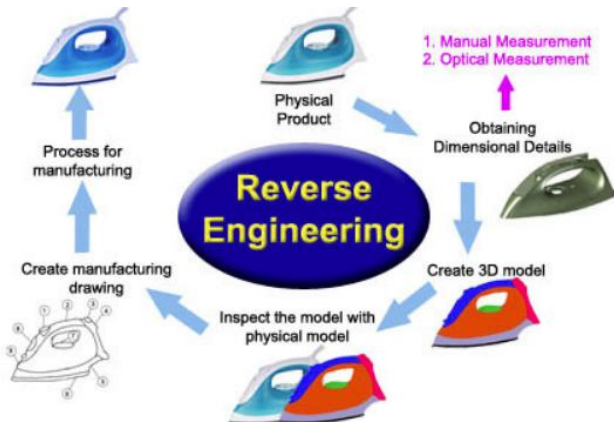


Fig 3: Reverse engineering process in manufacturing industry.

5.4 Medical industry

Reverse engineering in medical and healthcare industry helps to save Human life, cost and time. It is applied to produce Bones, teeth , surgical implants, prosthetics, surgical equipments etc and to get information about the formation process and constituents of medicine. Medicines can be developed and their harmful effects can be reduced by application of Reverse engineering.



Fig 4a : Reverse engineering of a prosthetic feet.

Fig 4b: Computer model from actual bone.

VI. CONCLUSION

Reverse engineering helps to make innovative and cost effective products Also, this technique is highly useful for humans as well as environment. This research can be starting point for further research and was mainly done to contribute ideas for academics and productions. All the fundamental steps have been given and for real they can be altered depending upon the requirements of the product.

REFERENCES

- [1] Kevin Otto, Kristin Wood(2011), Product Design-Techniques in Reverse engineering &New product development ,Pearson.
- [2] Ling sha, The innovation design of product based on Reverse engineering(2011), International conference on Computer science and Information Technology.
- [3] Wego wang, Application of Reverse engineering in Manufacturing industry, Department of engineering Technology University of Massachusetts Lowell, MA USA.
- [4] Vinesh Raja, Introduction To Reverse engineering, University of Warwick, UK.
- [5] Alexandru C. telea(2012), Reverse engineering-Recent advances and applications, ISBN 978-953-51-0158-1.
- [6] Robert W. Gomulkiewicz and Mary L.Williamson(1996), The Problem of Reverse engineering.
- [7] R.Racasan D Popescu C Neamtu(2010), Integrating the concept of reverse engineering in medical applications, Automation Quality and Testing Robotics, IEEE International conference.