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Tittle: Product Development/Design Using Rapid Prototype Technique

ABSTRACT

The competitive environment is stressing the manufacturing industries to introduce the effective strategies to acquaint the viable techniques, recheck the route through which the item is to be presented in the market and to improve the method of manufacturing the item. The manufacturing processes are improving, and usage of information technology in these tools/ processes/fields facilitates a rationalization of expenditure on assets and time. To adapt to the highly aggressive market, it is essential to receive the exceptional framework knowledge with innovation, advanced instruments, viable methods, and technologies. The additive manufacturing is being used in many ways, and it provides lots of advantages over the other existing technologies. It can be easily used for the critical study of existing design and then to incorporate the desired improvements. New design model for any product (or anything, say a building) can be developed by combining this technology with other technologies, the results can be improved, and this can speed up the entire process. For example, three dimensional (3D) scanners can be used to create and obtain the point cloud data of any existing structure, after which this data can be used to study and improve that existing data with the help of any software, and after the analysis the modified data, part can be manufactured with 3D printers as per the design. The use of AM is not limited to the complexity of design and shape as it can print almost all the possible shapes and sizes. The visualization of any design makes it easier to study and understand the possible faults in the design and hence, it is being used successfully to verify and improve the designs. The combination of rapid product and process development (RPPD) technologies across the company culture is a robust strategy for gaining an edge for corporate development in worldwide competition. Joining of virtual prototyping/ rapid prototyping/ rapid tooling/ reverse engineering/ rapid manufacturing (VP/ RP/ RT/ RE/ RM) innovations enhance the capabilities of devices to accomplish the desired goals. To comprehend the significance of any innovation, it is

desirable to understand the practical viability and complications of its application. The 3D printers have lots of potentials and appropriate analysis, based on their impact on the society, environment, industries, etc., was needed to be done. So different case studies were used through which it was endeavored to comprehend the scanning and printing process. The feasibility analyses of rapid prototyping in product development, reverse engineering, and manufacturing, etc. were also needed to be done to evaluate all the possibilities. As there are numerous rapid prototyping machines which have different advantages and limitations, and all of them were needed to be kept in mind while selecting and working with them, so machine selection was also done using analytical hierarchy process (AHP) and Analytical Network Process (ANP) approach.

Additionally, through this contextual analysis, it was tried to see how to utilize the rapid prototyping techniques in product design and development process. This work also helps to contemplate and comprehend the process of the reverse engineering through different contextual investigations (case studies). The concept of reverse engineering was used to collect the exact data of the existing models with the help of a 3D scanner and then to draft, modeling and assembly of various components (case studies) were done using SOLIDWORKS, ProE and UNIGRAPHICS software. The final assembly was investigated for different boundary conditions (end conditions) in ANSYS. The designs were also modified in the design software to explore/examine new conceivable outcomes in the shape of components. The structural examination/analysis was utilized to decide/calculate displacements and stresses under different loads. At last, by comparing the displacement and stress results, the suitable materials and shapes were chosen for different components.

Keywords: Additive Manufacturing (AM), ANSYS, Analytic Hierarchy Process (AHP), Analytic Network Process (ANP), CATIA, COLIN 3D, Product Development, Poly-jet Printing, Product Design, Rapid Manufacturing (RM), Rapid Product and Process Development (RPPD), Rapid Product Development (RPD), SOLIDWORKS, SUPERDECISION, UNIGRAPHICS, Virtual Prototyping (VP), 3D Printing, 3D Scanning.