Integrated cad and design for six sigma system (dfss) for product design essay

Business, Management

Revenue and market share are closely linked to how successful an organization manage its new product development process. An early launching and better management of quality could bring significant value to organization and customers. Defining, understanding and fulfilling customer requirements are key elements to ensuring a successful product. Six Sigma as a business improvement methodology (DMAIC – Define, Measure, Analyse, Improve, Control) has the objectives to deliver high performance, reliability and value to the end customer.

It has wide popularity as an important element of many Total Quality Management (TQM) initiatives. Six Sigma is a registered service mark and trademark of Motorola, Inc. which has reported over US$17 billion in savings from Six Sigma as of 2006. Other companies benefited from Six Sigma methodologies adoption include Honeywell International (previously known as Allied Signal), Raytheon, General Electric and Samsung. Recent Six Sigma trends lie in the advancement of the methodology with integrating to inventive problem solving and product design in new product development. Design for Six Sigma (DFSS) is an emerging discipline related to Six Sigma quality processes. It provides a proactive, systematic and stepwise method to build critical customer requirements (some terms it as Critical to Quality, CTQ or Critical Parameter Management, CPM) into all related aspects of the product development process that can be Define, Measure, Analyse, Design, Optimise and Verify (DMADOV).

Some also define the process as DCCDI – Define, Customer, Concept, Design, Implementation; IDOV – Identify, Design, Optimise, Validate; DMEDI – Define,

Measure, Explore, Develop, Implement. All these methodologies basically have the same contents but with different stepwise approach. Various tools such as FMEA, Cause and Effect diagrams, Quality Function Deployment, Design of Experiment, etc. are incorporated to analyse and solve problems.

However, unlike the Six Sigma DMAIC methodology, the phases, processes and steps of DFSS are not universally recognized or defined, almost every company or training organization will define DFSS differently. Some common efinitions include DMADV, DMADOV, DCCDI, IDOV, DMEDI, where Design, Optimisation, Verification are the key elements. A company will implement DFSS to suit their business processes; other will implement the version of DFSS used by the consulting company assisting in the deployment. These unstructured and unstandardised processes, methodology and practices making integration and sharing of parameters and variables (KPIV, KPOV, CTQ, CPM) critical to customers requirement difficult to be accessed, shared and conveyed among teams in product development. Computer Aided Design (CAD) / Computer Aided Engineering (CAE) / Product Data Managment (PDM) systems are powerful tool used in conceptual and detailing design; analysis and optimisation; processes and workflows definitions; of products and components in product development.

CAD/CAE simulation and optimization techniques can provide Design for Six Sigma (DFSS) practitioners with reduced reliance on physical prototypes, rapid time-to-market, minimal defects and post design rework. CAD/CAE/PDM geometrical data, product attributes, analysis results, workflow definitions are generated in CAD/CAE/PDM based on customer requirements and

designer inputs. How well various players in the product development team design/model, analyse and defining the workflows for the components are based mainly on how well the captured and accessibility of customer requirements data and information define in the Design, Measure, Analyse processes.

If the customer requirements are properly translated and handily available, then iterative design and effort of optimization will be reduced, thus ensuring earlier market introduction and quality compliance. However, current CAD/CAE/PDM systems data are stand alone, unstructured and proprietary to individual CAD/CAE/PDM providers, this impedes data and information integration within upstream and downstream processes in product development. Customer requirements are captured at DFSS steps but existing practices do not facilitate communication and integration at the CAD/CAE/PDM design/analysis/workflow stages. Taking and complying customer requirements and quality issues into consideration at the early stage of product development prevents costly design rework at the later stage.

To date, the mechanism on how the customer definition and analysis results have been successfully cascaded down the entire product development and integrate/re-used in new product development is still unclear and has not been fully established. The proposed project attempts to bridge these gaps by developing a framework that integrates DFSS and CAD/CAE/PDM.