

Realization and Research of a Six-sigma-based Project Management and Analysis System

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Abstract—At present, Six- sigma project management is changing some of more successful enterprises in the world and the road to implement Six-sigma management is the only way to each enterprise. But there were many problems in the promotion of Six- sigma management, the very low informatization level is the main problem. There are lots of Six- sigma project management software and analysis tools, but Six- sigma software combined the management with analysis are actually very few, which makes Six-sigma project management work particularly onerous. For this problem, we conducted a deep research on Six-sigma management theory methods as well as related technologies. This paper proposes a method of Six- sigma project management and analysis of modern enterprise based on this research.

Keywords-Six-sigma; Project management; Analyzing; Informationization; Software system

I. INTRODUCTION

The Six-sigma project management method was proposed first in the mid-1980s by American Motorola Corporation, initially it is primarily used to improve product quality. At present, at least 25% of the enterprises have implemented the Six-sigma project management among the world's top 500. Six-sigma project implementation process is not a linear process which is from the definition stage to controlling stage but a complicated as well as increasingly improving process that has certain circulation, repetitive steps .The traditional DMAIC model for Six-sigma project implementation process composed of Define, Measure, Analyze., Improve, Control^[1]. According the literature [2],[3],[4], we can see the DMAIC model is simply a reflection of the general implementation process, it does not consist with each company and the actual needs of each project, the actual project requires flexibility in implementing the process model.

At present, the informationization level of Six-sigma management is still very low, and it is mainly operated by manual work. By literature [5],[6],[7] the existing Six-sigma project management software and analysis tools such as the Project, Minitab, JMP, etc, which only have one of the functions of management and analysis but not combine with them. Enhancing the informationization of Six-sigma project management can improve the completeness and accuracy of information data collection of Six-sigma project, facilitate statistical analysis of data, standardize the method of implementation of Six-sigma

project process and reduce the onerous project management work of Six-sigma greatly, which make the results of data statistical analysis more realistic and accurate , thereby easy to project team to make correct strategic for the enterprises to solve practical problems

This paper is based on the author participated in the practical project, the quality problem of enterprises and the customer key requirements. With the guidance of the Six-sigma management theory and the continuous improving implementation of digital quality system management, this paper proposed and realized a Six-sigma project management and analysis system.

The system can effectively support enterprise to implement the Six-sigma management widely, enable the Six-sigma project management to work well and get continuous improvement. Also this system can assist Six-sigma project team to complete the basic project implementation work (measurement of data and processes, analysis, improvement and long-term control), help the trainees(training Black Belts and Green Belts) finish daily learning task of project, support the Six-sigma organization to assess the implementation effect.

II. GENERAL DESIGN OF SIX-SIGMA PROJECT MANAGEMENT AND ANALYSIS SYSTEM

At present, the informationization level of Six-sigma management is still very low, the existing Six-sigma project management software and analysis tools which only have one of the functions of management and analysis. In order to change this situation, enhance the informationization level of Six-sigma project management so as to improve the completeness and accuracy of information data collection of Six-sigma project, facilitate statistical analysis of data, standardize the method of implementation of Six-sigma project process and reduce the onerous project management work of Six-sigma greatly. Adopting this method, the project executors are able to implement the management and analysis in the same system which greatly improves work efficiency.

This paper proposes a method of Six-sigma project management and analysis of modern enterprise. It's proposed in reference[8] that Six-sigma project management software which is without analytical function under C/S mode .But this Six-sigma system incorporate Six-sigma project management and analysis into an integral one that is using B/S development model and

object-oriented programming ideas. This system is mainly composed of the Six-sigma process subsystem, Six-sigma tools subsystem, intelligent report generation system, and system maintenance subsystem, as shown in Figure 1.

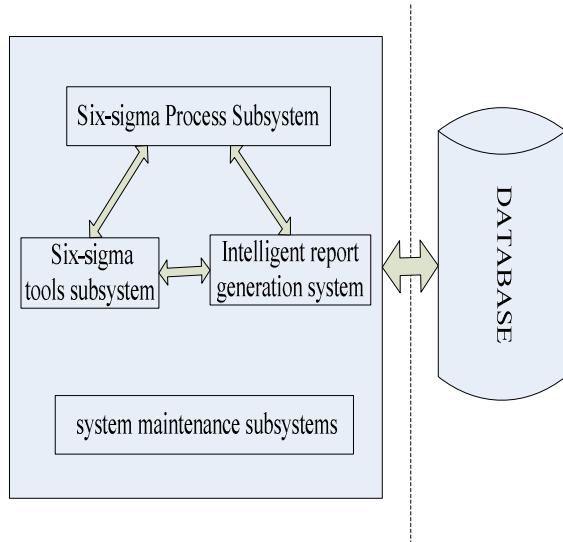


Figure 1 Six-sigma management and analysis system architecture

Taking the Six-sigma process subsystem as the main line, the first three subsystems are interconnected while the other two sub-systems penetrated through them, which make the Six-sigma management and statistical analysis a very good combination. System maintenance subsystem mainly composed of basic information management of the project, registered landing management and user rights management which are some simple basic information management not entering into details.

III. SIX-SIGMA PROCESS SUBSYSTEM

The Six-sigma Process Subsystem has five function modules: Model manage, Project implement, Node manage, Process control, Track manage. As shown in Figure 2. And this subsystem goes throughout the entire process as a main thread of the whole system all the time.

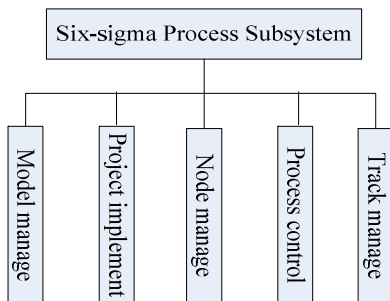


Figure 2 Function module of Six-sigma process subsystem

The implementation process of Six-sigma project is not a linear process which is from the definition phase to the control phase. On the contrary, the implementation process of Six-sigma project is a complex process which has some cycling and repeating steps. Therefore, this subsystem mounted on simple workflow and used the dynamic model-establishment to found the model which satisfies the realistic requirements, rather than the traditional fixed model. Then each step in the model is defined as a node (process), some of nodes are defined as key nodes. Because the nodes of module are dynamic, so the node itself, parent-child relationship of the nodes, sequence relationship of nodes, the work list in the nodes, the resources, and the documents can be added, deleted and modified. There is no never-changed model. But there is the model which changes according to the requirements of different companies and projects. So the users can customize or modify any model they want. Although the node is independent of the model, the model can call the node arbitrarily. Work lists, resources and documents of each node in the model can be standardized, templated, and added with standardized indicative data. As a result, the model can be fixed and become a standard model. In this way, all the user models are based on the standard models.

The implementation process of Six-sigma project is mainly controlled by the node. There are several corresponding parts on each node to control the process which composed of the node controlling part, document managing part, analytical tools part, project-related indicators managing part etc. Since the Six-sigma project management is a continuously improving process, each key node is equipped with stage review to confirm the results of the previous stage. And simultaneously the process decide whether to enter the next stage by examining the indicative data management to see if the indicators achieving the target. The data, graphics, texts and other data of nodes generated during the repeating course are uniformly saved as documents which are generated by the intelligent report generating subsystem. To determine which number and stage the documents belong to by the serial number, aware of the repeat courses in the whole process by viewing of historical projects.

Through the process control and track management to determine the direction of process stream and the progress schedule, and that make the leader or the charger of project understand fully at a glance. The last node set up project ending module to ascertain whether the project is finished and show the obtained achievement.

IV. SIX-SIGMA TOOLS SUBSYSTEM

Six-sigma tools subsystem which combined the advantages of existing analysis tools such as MININTAB, JMP and so on mentioned in literature [7] simplified the procedures as well as changed the previous situation that separate exists of analysis tools. It can be called in the management process directly that makes project operators

understand, familiarize and master the various statistical analysis tools easily.

Six-sigma tools subsystem is mainly composed of data process, statistical analysis, and graphical tools three-parts, as shown in Figure 3. It serves as a relatively independent subsystem that we can add tools according to requirement at any time without modifying the system itself. Also it can call the stage of the necessary tools according to different need in each stage of process stream. This facilitates data processing and analysis to conduct at any time.

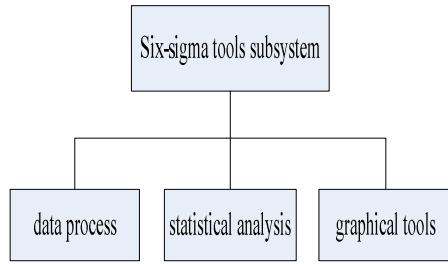


Figure 3 Function module of Six-sigma tools subsystem

In the Six-sigma project implementation process, data processing and statistical analysis are important means which the project executors deal with the data and analyze the result. The data processing mainly includes: Subset of the worksheet, Split the worksheet, Merge the worksheet, Split the column, Stack the column, Stack column block, Stack the line, Transpose the column, and Sorting, etc. The statistical analysis mainly includes: Statistics, Regression analysis, Variance analysis, Multivariable analysis, Kappa, and DOE, etc.

Graphical tools are the main components of this subsystem, the main graphics include: SIPOC, FEMA, Cause-effect Graph, SPC, Scatter Diagram, Rectangular Diagram, Point Diagram, Pie Chart, Histogram, Probability Diagram, Pareto Graph, Experience Cumulative Distribution, Sequential Chart, Single-value Diagram, Boundary Chart, etc. There is graphical tool corresponding to different process stage. Figure 4 is a Pareto Graph which describes the scrap rates of various models of capacitor in the obtained data during the initial stage in the implementation of an Electronic Company's project process, and shows certain models of capacity visually which has a high scrap rate.

This subsystem obtained the results and corresponding graphics by processing the data of Six-sigma process subsystem, and set the interface connecting with intelligent report subsystem. The results and graphics can be called directly by intelligent report subsystem directly.

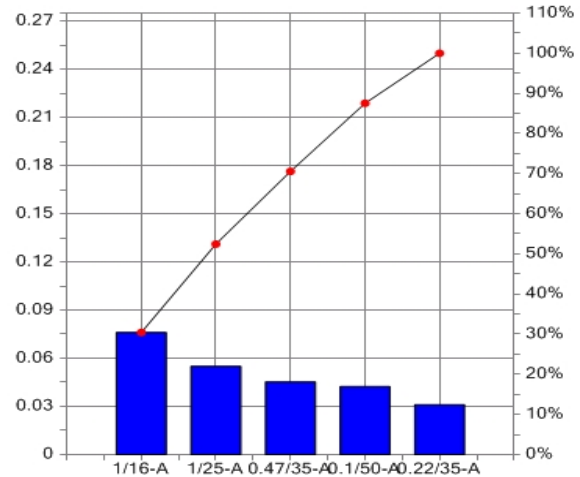


Figure 4 Pareto Graph

V. INTELLIGENT REPORT GENERATION SUBSYSTEM

Documents are essential in Six-sigma project management. Currently, the documents are arranging by human work and not form a complete set of documents. As a result, it is trouble to find documents. Intelligent report generation subsystem solve this problem well which put the document into two parts such as fixed model documents and non-fixed pattern documents, as shown in Figure 5.

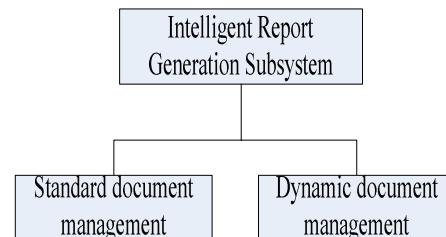


Figure 5 Function module of Intelligent Report Generation Subsystem

Fixed pattern standard document has been already existed in the process which is just need to generate documents according to filled contents of the document. Non-fixed pattern documents are generated in the process according to the requirements which are complex documents composed of the text objects, data objects, graphic objects [9]. Gain the corresponding data and graphics by interacting with Six-sigma tools subsystem, then generate the customized documents by combing the data and graphics with text in the process. During the implementation of the project process, the documents in each stage that are stored in chronological order to form a complete set of documentation and easy to access and use.

The project implementation of Six-sigma project involves lots of fixed model documents and non-fixed mode documents. The referred documents in this article are: Standard document, Project process control document,

Process document generated by the project node, Project result document, Project ending document, Auto-generated document, data document, etc.

VI. CONCLUSION

In summary, this article put the process of Six-sigma project management, data analysis and document management together to make sure that resources are effectively shared and used in the process of Six-sigma project progress and the project process are effectively control. In this way, we reduced project risk. It has important practical significance on some aspects such as standardizing Six-sigma project management, improving the level of enterprise informationization and reducing labor costs as to help the enterprises to establish a Six-sigma project management system.

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