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Improvement In Inventory Management Using Six Sigma

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ABSTRACT

There has been considerable number of papers published related to Six Sigma applications in manufacturing and service organizations. However, very few studies are done on reviewing the literature of Six Sigma in all the areas including manufacturing, construction, education, financial service, BPOs and healthcare etc. Considering the contribution of Six Sigma in recent time, a more comprehensive review is presented in this paper. The authors have reviewed Six Sigma literatures in the way that would help research academicians and practitioners to take a closer look at the growth, development, and applications of this technique. The authors have reviewed various journal papers and suggested different schemes of classification. In addition, certain gap areas are identified that would help researchers in further research. The paper has been categorized in four sections. Section one & two present introduction to Six Sigma and preamble to literature review respectively. Section three presents classification of Six Sigma papers based on research methodology & research contents.

Keywords - DMAIC, Firm Performance, Inventory management, Process improvement, Six sigma

1. INTRODUCTION

American engineer Bill Smith while working at Motorola in 1986. Jack Welch made it central to his business strategy at General Electric in 1995. A six sigma process is one in which 99.99966% of all opportunities to produce some feature of a part are statistically expected to be free of defects. Six sigma improves the quality and performance of the product, but six sigma is not limited to the manufacturing limits only it can be easily implemented in school, colleges, organizations, firms, banks etc in order to improv the performance of corresponding entity, and this paper deals with such extends, we have taken the problem to analyse and study inventory management and workshop in mechanical department of “Terna Engineering College” to make better optimization and reduce the errors to see whether such kind of problems can be solved by sig sigma methodology or not.

2. SIX SIGMA

The term Six Sigma (capitalized because it was written that way when registered as a Motorola trademark on December 28, 1993) originated from terminology associated with statistical modelling of manufacturing processes. The maturity of a manufacturing process can be described by a sigma rating indicating its yield or the percentage of defect-free products it creates specifically, to within how many standard deviations of a normal distribution the fraction of defect-free outcomes corresponds. Motorola set a goal of "six sigma" for all of its manufacturing.

1.1 DMAIC

DMAIC refers to a data-driven quality strategy for improving processes, and is an integral part of the company’s Six Sigma Quality Initiative. DMAIC is an acronym for five interconnected phases: Define, Measure, Analyse, Improve, and Control.

1.2 DMADV

DMADV is a Six Sigma framework that focuses primarily on the development of a new service, product or process as opposed to improving a previously existing one. This approach Define, Measure, Analyse, Design, verify is especially useful when implementing new strategies and initiatives because of its basis in data, early identification of success and thorough analysis

2. PRELIMINARY SEARCH

Despite the fact that the inventory for any organization is important still there are lots of errors takes place due to employers, customers/consumers or management department as such. So how to reduce them? There are various solutions, approaches have been given my many researchers and these are effective as well but when

it comes to almost zero error there is no question that six sigma is the best choice.Nowadays everyone wants their organisation/companies defect free to give best results and such visions same goes for colleges as well. College also have their own inventory departments by which they keep on providing the best services to their students, staffs and other employees, but still lots of errors takes place and for that we have taken a survey in one of its departments (Mechanical department)

We have conducted a survey about the inventory related Mechanical department and we have found that major issues that students are facing are related to two things first is stationaries and other is workshop lab.About the stationaries college have a "campus me" form which students get all the stuff and accessories for their write ups, submissions, rubrics sheet, paper file of A3 size etc, but about the workshop lab we have found that students not getting proper equipment's as they deserve.There are various reasons to happens as such kind of calamities even during the exam seasons,We have taken some reasons that why such thing happens and analysed it with the help of Pareto chart.

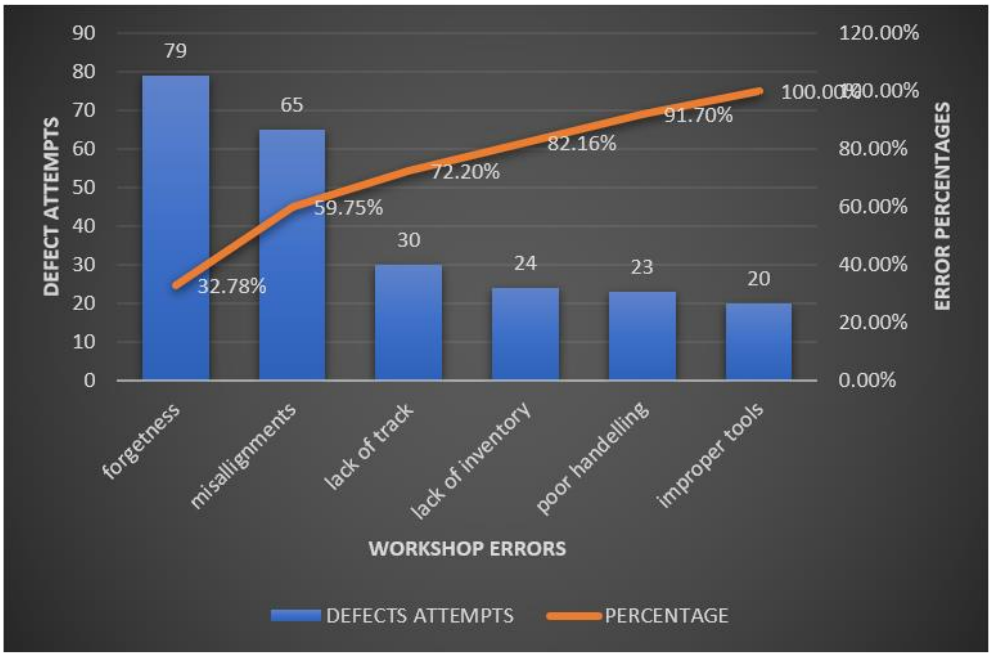

Figure 1. Pareto Chart

After conducting the proper survey we have concluded that most of the problems are occurring due to silliness and forgetness of students around 32.78% of errors are due to these alone and around 59.75~60.00% of errors are due to forgetness and misalignments of the students combine

3. INITIAL CONCEPT

The very initial reason for conducting the survey is to understand what are the actual errors, and after concluding the survey we have come up with an idea for providing a small software that will keep track an idea about the inventory related to stationary that will indicate the stocks, sales price, profit etc and on the other hand for workshop we need to make such kind of track maintainer that will keep a track on individual tools and its usage to avoid any further losses of such valuable tools

There are several ways to design such mini software to deal with the inventory or to keep a track on product usage and its availability. A rough layout has been given in the given layout diagram. The very main purpose is to maintain a proper track and to withstand sudden demands.

3.1 Development

The software has been developed in Microsoft excel 2019 developer. Developer Tab in Excel is used for accessing function and tools which are used in creating the macros. If the Developer tab is not available in the menu bar then to enable it File menu's Option and from Customized Ribbon tab add Developer tab from recommended commands to Customized commands list. Once we do that, we will be able to see Developer menu tab in the Menu bar which has Visual Basic, Macros, Add-Ins and Controls mainly. We can use Visual Basic to write a macro code. Excel is a soft processor. It's a complete Hardware & OS for the programmers, this is a big secret of the industry, that most software architect & senior programmers utilize the excel for all the mathematical operations to be utilized inside the architecture.

4. IMPLEMENTATION

Implementation of inventory management system and Tool Tracker.

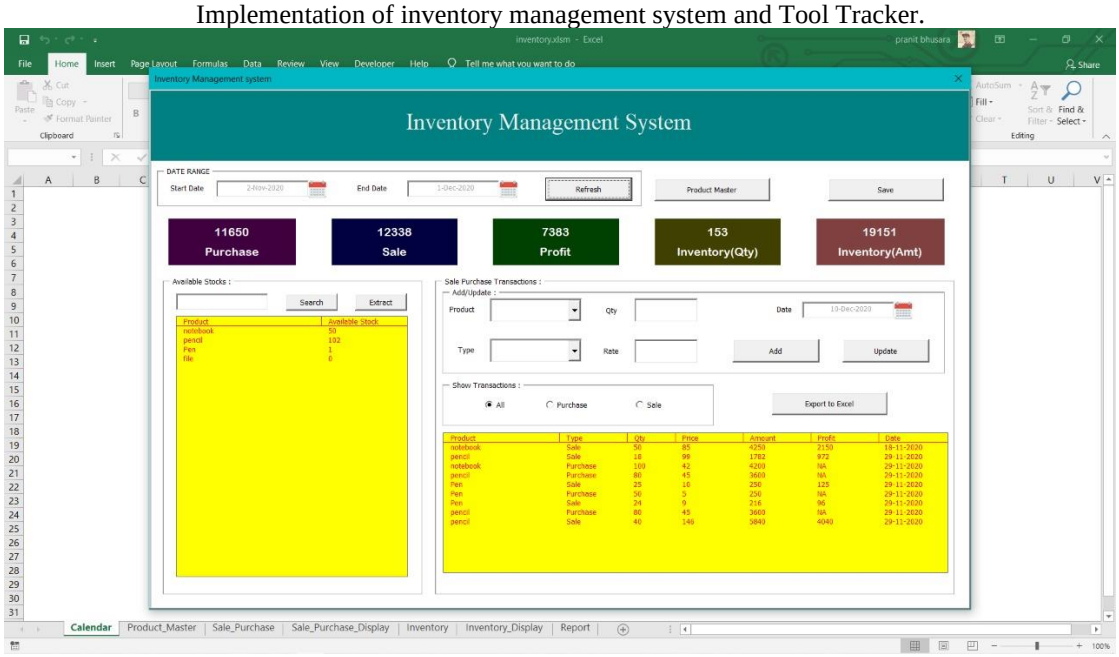

Figure 2. Inventory Control Tool

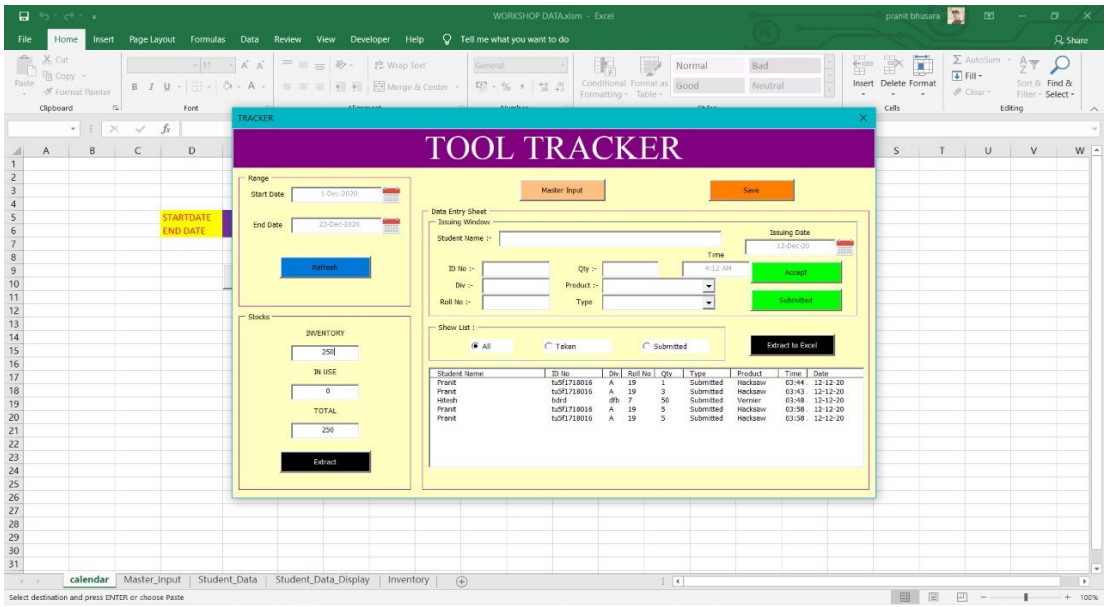

Figure 3. Tool Tracker

After implementation we have checked this mini software several time in order to check its functionality and it was successfully working without any error. We supplied this software to respective departments with the higher authority permission to implement this in actual working conditions, but only collecting data is insufficient we need to show the sigma level as well to check the current level and on what parameters work is needed to be done and for that we have to make a dashboard which will represent everything in visuals and for that too we decided to use the same platform.

4.1 Equations and Formulas

Now that we have made a small software to keep a track on products and tools in the inventory and by which we have collected the data regarding all sorts of errors we are now planning to find out what the sigma level could be. Here are some methods to calculate various terms regarding sigma level:-

$$DPU = \frac{\text{Defects}}{\text{No of units}} \quad (1)$$

$$DPMO = \frac{\text{Defects}}{\text{no of units x opportunities/units}} \times 1000000 \quad (2)$$

$$PPM = \frac{\text{Defective}}{\text{No of units}} \times 100000 \quad (3)$$

$$\text{Yield (\%)} = \frac{\text{Number of Opportunities – Number of Errors/Defects}}{\text{Number of Opportunities}} \times 100 \quad (4)$$

Table 1

Yield %	Sigma level (σ)
99.7450	4.3
99.6540	4.2
99.5340	4.1
99.3790	4.0
99.1810	3.9

4.1.1 Dynamic Dashboard

Figure 4. Dynamic Dashboard Initial Sigma Level

After collecting all the data and working on all desired parameters we implemented sigma methodology period for almost 4 months and we found out we could get the sigma level up to sigma 4.2-4.5σ.

Figure 5. Expected Sigma Level in Dashboard

5. CONCLUSIONS

Six sigma is one of the most effective methods to achieve that 3.4 defects per 1 million of opportunities, this project is just a little approach towards that goal by the help of DMAIC approach, we have found that after implementing this two mini software a sudden reduction in complaints from students, they said it is not the best but not the worse too. At the initial stage it was quite time consuming to every time entry all data but if we look at the other side even attendance takes that much time for individual student. Even teachers are accepting such new approach for minimizing the errors and the problems we face when we need those things the most but lack of availability we could not get it. After implementing these still few people are not fully satisfied with it they still like the old traditional ways to let things go, on the other side now teachers and staffs can keep exact track on all the tools in workshop, which student took, for how long etc with these it is very easy to detect any student who is not following the protocol.

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