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Six Sigma Applications in used Academic Bookstores

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Abstract: ***Six Sigma is a quality improvement tool to measure the process outputs for error reducing system. It aims to maximise customer satisfaction and minimise defects in products and services. To enhance the quality and meet customer expectations, it is necessary to bring in innovation.***
This paper presents a brief overview of Six Sigma, its tools and how it can be applied in the second-hand bookstore industry by using principles of enhanced productivity as well as process quality management in a well-defined framework. This study contains a survey of 180 college students (Our target customers) understanding their view on New books vs Second-hand books, the difficulties they face and their view in the implementation of the proposed innovation to improve quality in service as well as maximise customer needs. The proposed new solution will be explained through DMAIC methodology and its superiority to the pre-existing model, and also its benefits to both customers and sellers.
Keywords: Six Sigma, Lean, Used bookstore, second-hand, TQM, Measurement tools.

I. INTRODUCTION

A Second hands book store is a platform for students to buy used books at an affordable cost. In 2016, The National Association of college Stores found that 70% of students bought used books rather than brand new ones, predominantly because of the high pricing of new books, according to an article by Top Hat. This shows the importance of second-hand bookstores today and the dependency of students on this industry. These days the concept of quality improvement is catching up in all sectors. Today the second-hand bookstore is more of a service industry, where customer satisfaction is foremost. Since the product in this case is "Used books" the quality and order must be maintained for a large inventory to meet user needs. The pre-existing model for second-hand bookstores involve selling used books at half or three-fourths of the price. Six Sigma helps us do continuous appraisal and improve the quality of second-hand bookstores, It uses a set of measurement and statistical tools to quantify reasons behind the failure of the pre-existing model. This paper encourages the application of six sigma in activities such as inventory maintenance, logistics, cost control etc. With the help of six sigma the new proposed model will not only benefit the customer but also the seller.

II. OBJECTIVES

A. The main objective is to provide a model solution using six sigma tools to improve the overall efficiency in service, keeping in mind the customer requirements.
B. To evaluate "Customer satisfaction" for the proposed solution by carrying out a survey

III. DEFINITION OF SIX SIGMA

Six Sigma is a method that provides organizations tools to improve the capability of their business processes. This increase in performance and decrease in process variation helps lead to defect reduction and improvement in profits, employee morale, and quality of products or services. Six Sigma views all work as processes that can be defined, measured, analysed, improved and controlled. In metric terms, "Six" Sigma quality performance means 3.4 defects per million opportunities (DPMO)-(asq.org).
Six Sigma is a quality control technology developed by Motorola in 1986.It is a management method to work faster with fewer mistakes.
Six Sigma practitioners use a 5-step methodology namely **D**efine, **M**easure, **A**nalyse, **I**mprove, **C**ontrol to combat any problem faced. The idea is that any seemingly unsolvable problem can be solved using the DMAIC approach.
Six Sigma Academy (Ramasamy,2009) defines it as, "A business process that allows organisations to drastically improve their bottom line by designing and monitoring everyday business activities I ways that minimise waste and resources while increasing customer satisfaction".

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IV. ADVANTAGES OF SIX SIGMA

A. Customer focused
B. Involves the whole team rather than the top position holder alone
C. Provides faster solutions to problems
D. Provides better understanding of processes
E. Helps to work smarter rather than hard
F. Training is one of the integral parts of this method

V. SIX SIGMA METHODOLOGY TOOLS

Six sigma contains two basic process models namely DMAIC and DMADV. Here the emphasis is on DMAIC.

A. DMAIC

1) *Define-* This phase defines the core problem and the process involved. It identifies improvement opportunities and define the project in the form of project charter. Feedback of customers and the CTQ (critical to quality) is determined and a target is set. This step involves documenting of pre-existing model, CTQ, CCR etc.
2) *Measure-* The purpose of this step is to measure the specification of the problem. This phase involves quantification and benchmarking using the data available. With the help of given data, the performance of the pre-existing model is calculated and can be used in the end to compare with the target performance level. The defect level is measured and the corresponding six sigma level may be calculated that can be used as a baseline for future improvements.
3) *Analyse-* This phase guides us to decide the origin and identify the major source for defects. Statistical tools like pareto charts can be used to identify what major factors make up the subject being analysed. It helps us to prioritise the root causes that may help to identify a suitable solution.
4) *Improve-* This phase involves identification of the solution for the pre-existing model of product/service by eliminating key root causes and creating an implementation plan. Techniques such as “Brainstorming” are used to find out solutions.
5) *Control-* This phase reviews and controls the process. Changes are embedded to ensure sustainability. It is the final step of DMAIC approach and additional guidelines are introduced for smooth transition of processes. It ensures that the system policies are maintained throughout.

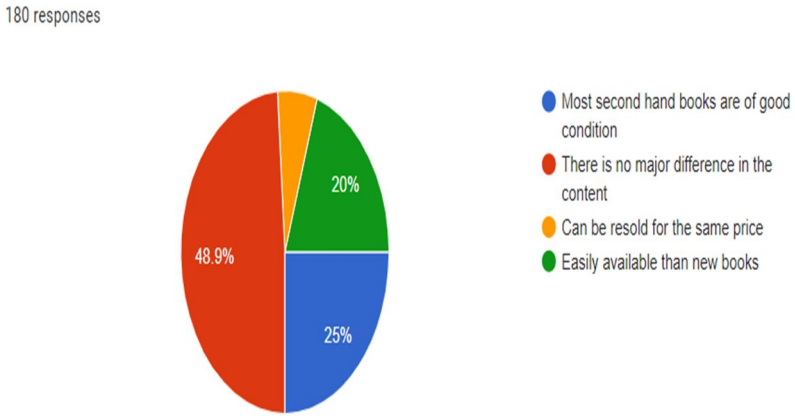
VI. DMAIC- WITH REFERENCE TO USED BOOKSTORES

A. Define

From the customer point of view, one of that main reasons that students prefer new books vs old books is the cost. According to the survey 64.4% of students prefer second-hand books.

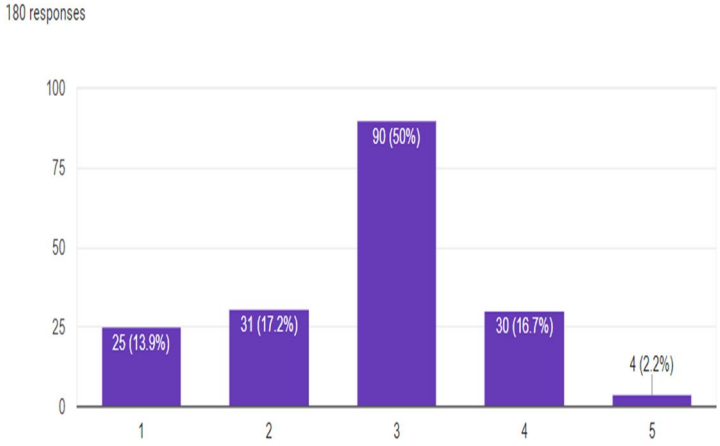
1) *Pre-existing Model:* Generally, second-hand bookstores sell used books at a much lower cost than the original price making it affordable for the same content.

When asked why students prefer second-hand books over new books, the response was recorded:



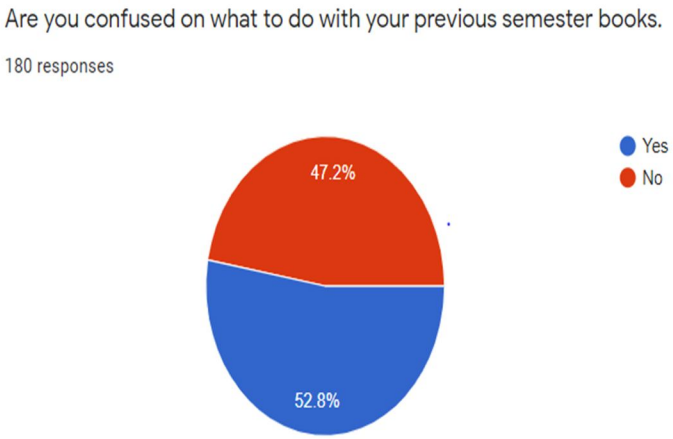
Graph 1

On asked how many times the students have encountered the books to be out of stock on a scale of 1-5:



Graph 2

50% of students say that 3 out of 5 times they encounter the books to be out of stock, this shows that second-hand bookstores are unable to meet the growing customer demands effectively.
52.8% of students are also confused on what to do with their previous semester books at home,



Graph 3

CTQ- Condition of books, Cost of books.

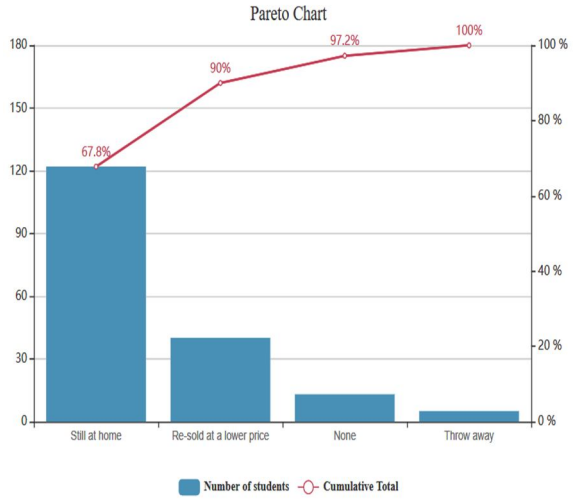
B. Measure

From Graph 2, it is shown that 50% of students say that 3 out of 5 times they encounter the books to be out of stock. Sigma level of the second-hand bookstore industry can be found out with this data.
In general issuing of second-hand book involves around 5 steps, like condition of the book, inventory, cost etc and suppose each part of this process has 3 chances to have defects like warehouse issues, improper cataloguing or bad condition of book,

1) Total defect opportunity is 5x3=15
2) If 3 out of 5 times the book remains out of stock due to certain defects,
3) Defects per issue = 3/5= 0.6
4) Defects per opportunity (DPO) is= 0.6/15= 0.04
5) Defects per million opportunities (DPMO) is= 0.04x1000000= 40000
6) Thus, the sigma level for this model is 3.25

C. Analyse

The survey asked the students on what they did with their previous semester academic books, their response was recorded and a pareto chart was plotted.



Graph 4

From the pareto chart, it can be inferred that around 90% of the students have their books still at home or have resold it for a lower price. (where 67.8% of the students have their books unused still at home).

From graph 2, it is clear that, 3 out of 5 times the students have had to deal with the books to be out of stock, ensuring that there is no proper inventory maintenance by the second-hand bookstores to meet the demand.

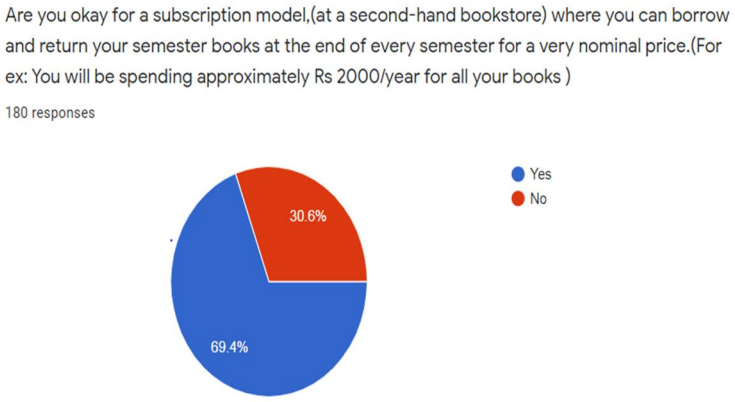
The inventory of these bookstores have become a major issue which needs to be solved, also students have a lot of their previous semester books piled up at home, a solution can be developed that shall not only maintain the inventory but also make sure students don't have to pile up their previous semester books if they feel it is going to be of no use to them in the future.

D. Improve

One of the solutions that can be implemented to solve the issues faced by both customers and sellers is a subscription model. A subscription model where books can be rented for the whole semester by the students and returned at the end of the semester. This solution has its benefits:

The sellers do not have to worry about the inventory to be maintained and the number of times students encountering a book to be out of stock can be reduced.

Since the students are returning the books at the end of the semester, they do not have to pile up books at their home if they find no use of it.

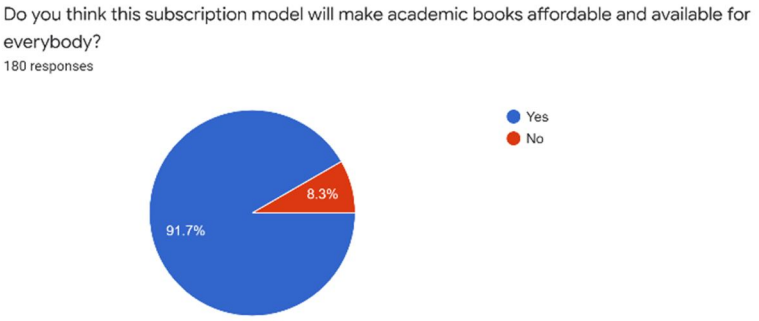


Graph 5

69.4% of the students from the survey are okay with this model of subscription-based renting second-hand books.
With this system, as the students are only renting the books, the expenditure by students for these books can also be reduced even more. This will not only make academic books available to all but also affordable.
From the seller's point of view, their expenditures towards maintaining inventory can be reduced and their customer base will be constant for a longer period.
This system also promotes reusability which is a key feature of Six Sigma.

E. Control

To sustain this method, it must be ensured that the quality of books is not compromised due to the subscription system. Regular customer feedback must be taken to quantify their satisfaction. Another problem that might arise is the limited number of second-hand bookstores and its presence only in certain areas.
An online platform can be created to bring in all Second-hand bookstores from various regions under one roof so that the lead time may be reduced and the inventory may also be distributed over a vast network.
On successful implementation, 91.7% of potential customers believe that this model can make academic books accessible and affordable by many who still cannot afford even second-hand books.



Graph 6

VII. CONCLUSION

Second-hand book stores is an industry that has to focus on quality of books and user satisfaction. Six Sigma has be mainly used in the manufacturing sectors to reduce waste and increase productivity. The same principles can be used in second-hand bookstores to maximise customer satisfaction and improve service. New innovations have to be brought into pre-existing model to satisfy user needs. Therefore, it can be concluded that Six Sigma can be applied in the second-hand bookstores to find out the major drawbacks in the system and invent models to overcome the issues.

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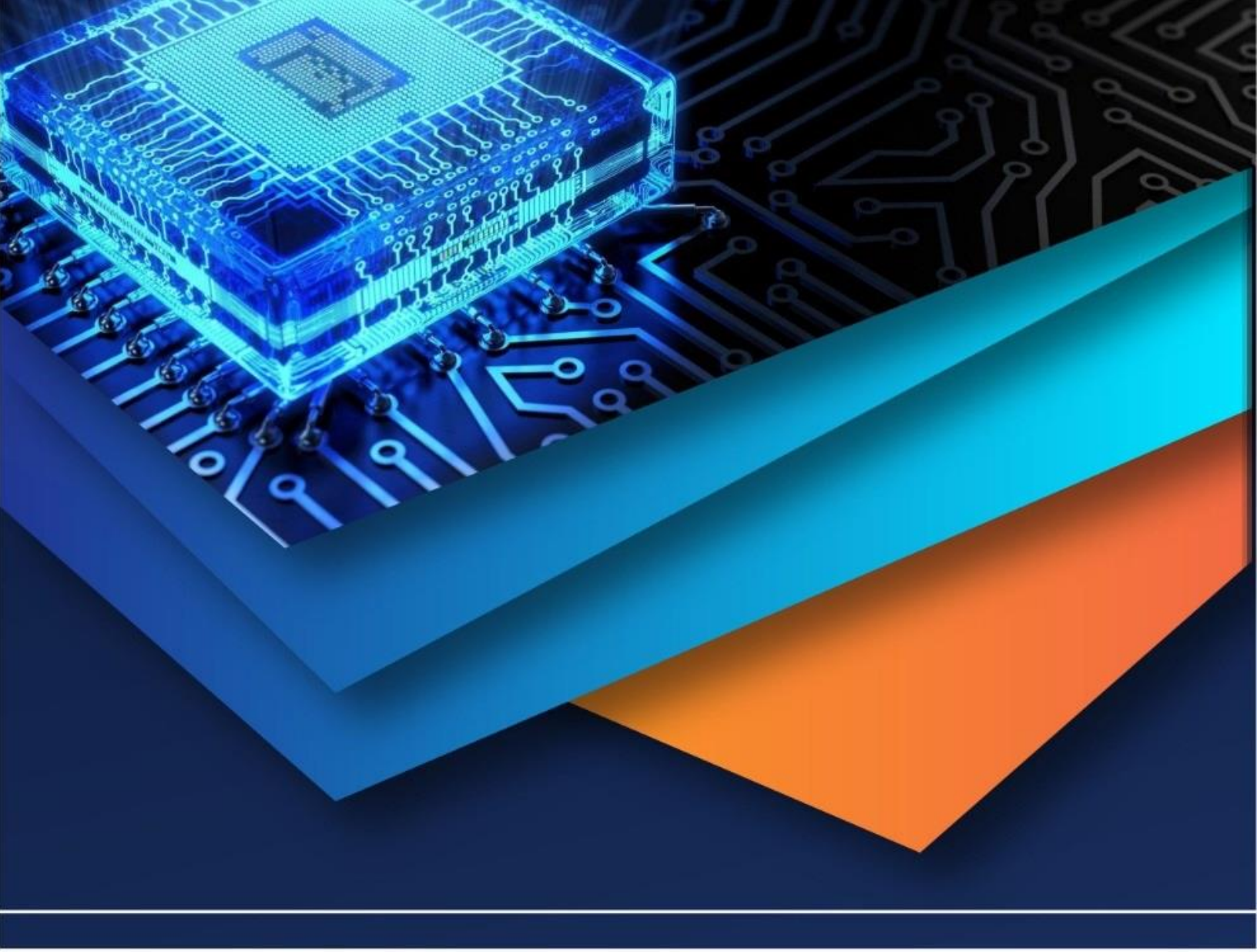

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