Development and Application of Statistic Software using Lean Concepts to Monitor the Performance of the Quality Assurance Department

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Abstract

The majority of companies have integrated the lean methodology into their work environments, so they can be more efficient in their processes, eliminating and correcting errors within the manufacturing environment. An accurate way to know that the process is in control is by using statistical software to measure patterns and detect errors. However, to make these graphs or tables, one needs the human element to create them. This research paper derives from an in-depth study of different statistical software's that will help improve the manufacturing processes of a company, thus, removing waste. Currently, some programs configured can graphically give this information. With the information obtained, it can be analyzed, and conclusions can be drawn about the status of each process. It is of utmost importance since seeing these trends, certain improvement projects can be carried out, to optimize the process.

Introduction

The Department of Quality Assurance oversees auditing the documentation that is received when the batches complete their packaging process, after the documentation is audited the product disposition area proceeds to dispose of the batches so that they can be sold to the market. In this process there have been many delays in the delivery of the lots, a substantial increase in the number of records received in the area has also been observed, proving that the department fails to deliver to the product disposition area. This problem may be solved through the development of a tool that gives the quality assurance department personnel a live view of the lots they have in the area to improve dispatch times. It is important to create this tool by applying the Lean methodology because it can help the area improve and have more control over the products. Therefore, the research paper aims to accomplish a functioning tool that presents a live visualization of the statistics of the batch records to improve the organization of the priority of the product.

Background

Lean methodology has two guiding principles: respect for the people and continuous improvement. An article that connects to the problem statement of this research paper is "Development and application of lean product development performance measurement tool" written by Ahmed Al-Ashaab et al. The article focuses on presenting how the development of lean tools help identify areas for improvement and where one can employ this type of concepts to be able to modify the areas. This demonstrates the performance measurement tool is capable of being implemented on any type of company, that it is precise, and it achieves its function.

In the article "Lean manufacturing measurement: The relationship between Lean activities and Lean metrics" written by Diego Fernando Manotas Duque and Leonardo Rivera Cadavid it is presented two frameworks for lean implementation and its effect on the performance metrics of a company. It essentially tabulates how the implementation of lean methodologies helps improve productivity. While also highlighting that companies should implement tools that measure how the changes to processes work to increase productivity.

Each one of the research papers mentioned before concurs that eliminating waste in any manufacturing process benefits the company. If time frames in these processes are improved production will increase, which helps that a company has more capacity.

Problem

This research aims to develop a tool that permits a live visualization of the amount of batch records that arrive to the area of Quality Assurance. Finding a tool that can improve processes and eliminate waste is essential, therefore, it is important to test different statistic processors to find which one provides a live view of the lots in the Quality Assurance department.

Methodology

For this research, a search was carried out to determine which specialized statistical system can be programmable so that graphics can be produced automatically with minimal data entry. The following program evaluated were Excel, Minitab, and Smartsheet. These were evaluated by the following requirements: the functionality of the program, the complexity of programming the system so that it provides the information needed, and the cost of the license per user.

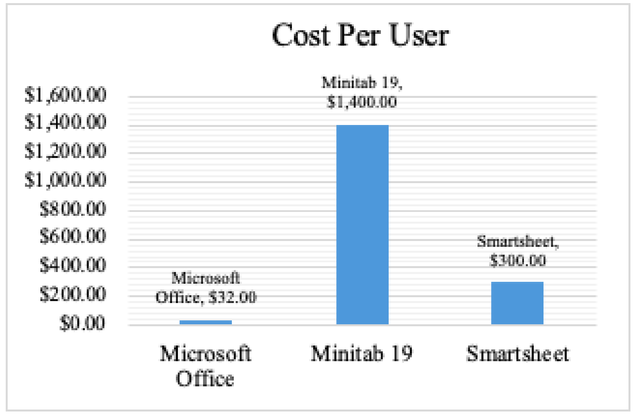
Results and Discussion

After gathering the data, each statistic program has its pros and cons. Microsoft Office Excel is a software used to view, create and edit spreadsheets. In terms of cost, Microsoft Office 365 for an enterprise cost 32.00 dollars per user and month, this includes the different software such as Word, PowerPoint, One Note, Publisher and Access. The software is not cost effective for a manufacturing company and the quality assurance department because it includes programs not used in the department. In the quality assurance department, the quantity of the batch records received, pending and released are entered in the statistic program to create a visible graphic. In excel, graphics can be created, but it does not show the productivity of the department in terms lean metrics. Excel does not show a realistic view of the status of each batch record making the graphic useless.

The next statistic program tested was Minitab. Different results were gathered, and cons were presented after the analysis. Minitab cost exceeded the budget for the quality assurance department. This software's license cost 1,400.00 dollars for each user. For productivity graphics this software does work for the department. However, in term of efficiency it does not meet expectations. Minitab does not provide a dashboard. A dashboard is a place where information is presented in an accessible, visible and accurate view. This software requires the QA to create a new spreadsheet each time information is updated making it inefficient.

Finally, Smartsheet was the last statistic software analyzed. Smartsheet is a combination of both Excel and Minitab in terms of friendliness of usage. Yet, it provides much more than the previous mentioned programs as it focuses more on workflow. It is cost effective for the department as the Smartsheet license cost 300.00 dollars per year. It also allows employees who do not have the license to edit and view the graphic and tables in the software. Therefore, one does not have to buy a license for each employee of the department. Smartsheet provides a dashboard that displays an accessible, visible and accurate view of the information entered in the spreadsheet. Therefore, one does not have to create different spreadsheets each time the information needs to be updated like with Minitab. In this dashboard one can view different graphics of the entered batch records in terms of shifts, days, months and years. This complies with the lean metrics as one can identify where waste can be reduced to improve the workflow. This software seems connects with the goals of companies that use the lean methodology.

Graphic 1. Cost Per User of Researched Statistic Software.



Graphic 2. Cost for Quality Department of Researched Statistic Software.

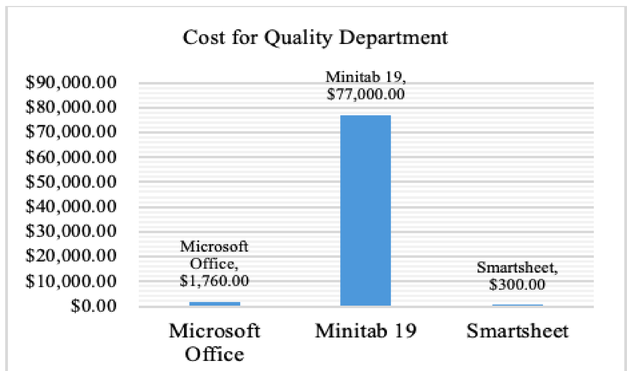


Table 1. Comparative Table of the Feature of the Researched Statistic Software.

System Features	Microsoft Office	Minitab 19	Smartsheet
Graph	✓	✓	✓
Table creation	✓	✓	✓
Dashboard			✓
Accounting tool	✓	✓	✓
Lean metrics		✓	✓
Live actualization	✓		✓
License per year	✓	✓	✓
Additional programs (email, writing, presentation)	✓		
Compatible with Windows and Mac	✓	✓	✓
Access through mobile devices	✓		✓
User friendly	✓		✓
Blog Support	✓	✓	✓

Conclusions

It is very important to have a system that provides updated information on the status of the Batch Records that are received in the Quality Assurance area. With this tool the area will have an updated view of the quantity and status of the batch records that are received in the area. Through this research, a computer system can be found that helps not only count batch records, but also generate statistical graphics used in the Lean Methodology to measure productivity. Through the research carried out, three statistical programs were analyzed. Which were compared to measure which of them would be more suitable to perform the work we need to carry out the monitoring and perform productivity metrics for the department. After evaluating the three programs we were able to determine that the program chosen to be used is Smartsheet. This program was chosen out of the three for its diverse applications, as well as being the most cost efficient when compared to the other two programs.

Future Work

As a part of future improvements and avoiding errors in the Quality Assurance department, further development of tools is necessary. As a future project, a fusion of the system Spotfire and the statistical software Smartsheet will be innovative to a manufacturing company. Spotfire would be able to download information from an electronic system to the statistical system Smartsheet. In this way, the data entry by users would decrease and the information obtained digitally. Further research in this area would be essential and the focus of future works.

Acknowledgements

I would like to express my gratitude to Dr. Rafael Nieves Castro for his valuable input and his suggestions during the process of planning and development of this research paper. His willingness to provide guidance during this time is greatly appreciated. I would also like to acknowledge Professor Digna Delgado López for taking her time to review and correct the very same. Their generosity and expertise have improved this study in numerous ways. Finally, I would like to thank Ms. Leyshla Dávila for her support and encouragement throughout the study.

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