Automation of Variables Recording Process to Reduce Rework and Decrease Scripting Time

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Abstract

The companies of aerospace services need to maintain the highest quality of their product. Therefore, this project will focus in the improvement of a process when verifying and validating system level requirements. For these requirements, an environment must be designed to in which these system levels will be tested. The designs are programed in a script. These scripts contain the signals used to validate the requirements. Therefore, this project will measure and analyze the process of recording these signals. Furthermore, an implementation of a new tool to record these signals will allow to automate the process yielding in a high quality of testing, reduce cost of man-hours and rework.

Introduction

Our company provides aerospace services associated with the software development life cycle. Part of the tasks performed is the verification and validation of software utilizing test scripts. The employees work with system level requirements given by the customer. These requirements contain expectations on how the electrical system should behave given a certain scenario. The electrical system is consisting of a main computer and sensors installed around the airplane. These sensors provide a live status of its readings and the integrity of the system.

Problem

Depending on what kind of test is about to be validated, the numbers of signal to be recorded when scripting can vary. That is, for some test can vary from 5 to 10, while for others, range between 10 and 20 signals. In addition, before recording the signals, it is important to know from which processor of the system is the signal coming from. For this, the signal is evaluated on a tool individually to know from which processor comes from.

Objectives

The analysis of this process will identify the current time of the actual process. An evaluation of number of parameters to be recorded against the time it takes to record them will be studied. Design of an automated tool to record variables minimizing human error while scripting and reduction of delivery time in a test. Creation of standard work for implementation and sustaining of the new process.

Background

"Six Sigma is a rigorous, focused and highly effective implementation of proven quality principles and techniques. Incorporating elements from the work of many quality pioneers, Six Sigma aims for virtually error-free business performance." [1]. Hence, applying Six Sigma to the actual process can reduce the human errors and the employee will avoid doing rework due to incorrect recording of variables.

Methodology

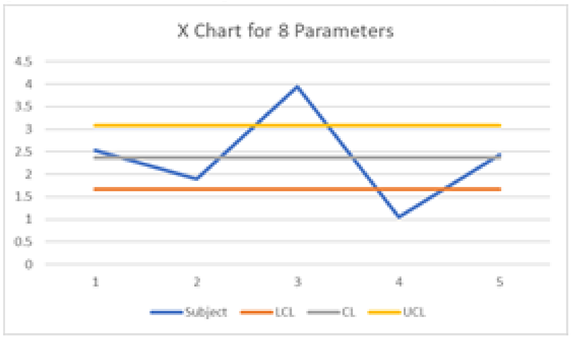
In this project some of the implementation tools to improve the process are the DMAIC model. DMAIC stands for: Define- Measure- Analyze- Improve- Control.

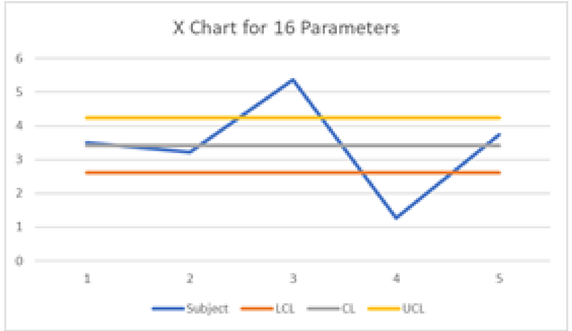
Methodology (Cont.)

D	Define the goals of the improvement activity and incorporate into a Project Charter. Obtain sponsorship and assemble team.
M	Measure the existing system. Establish valid and reliable metrics to help monitor progress toward the goals(s) defined at the previous step. Establish current process baseline performance using metric.
A	Analyze the system to identify ways to eliminate the gap between the current performance of the system or process and the desired goal. Use exploratory and descriptive data analysis to help you understand the data. Use statistical tools to guide the analysis.
I	Improve the system. Be creative in finding new ways to do things better, cheaper, or faster. Use project management and other planning and management tools to implement the new approach. Use statistical methods to validate the improvement.
C	Control the new system. Institutionalize the improved system by modifying compensation and incentive systems, policies, procedures, MRP, budgets, operating instructions and other management systems. You may wish to utilize standardization such as ISO 9000 to ensure that documentation is correct. Use statistical tools to monitor stability of the new systems

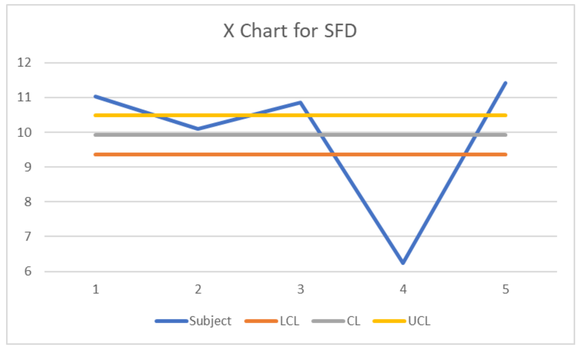
Results and Discussion

For more insight of the process, a scenario was created so that each employee has to record a number of parameters and the time it takes will be measured. The first measuring will be a case in which the employee has to record eight parameters. The second measuring will be a case in which the employee has to record sixteen parameters. Finally, the last case is the recording of parameters taken from a special format of documentation (SFD).

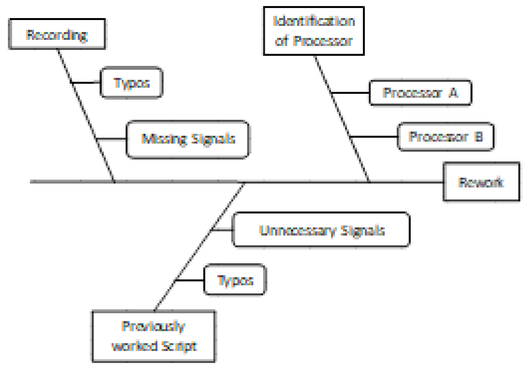




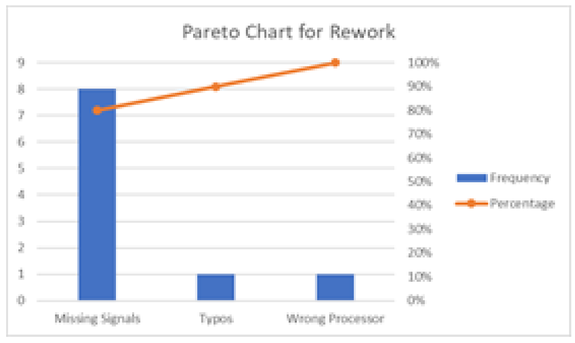
Results and Discussion (Cont.)



Therefore, it is a good practice to determine the variables and contributing factor that yield in error. Hence, a fish-bone diagram is used for a cause and effect analysis.



The errors of typos or wrong processor are not that common unlike missing signals while scripting, but still they are encountered throughout the process.



For the implementation phase, a tool was created to automate the process. Each of the signals to be recorded has a specific format. Therefore, using this specific format it was possible to develop the program. The program was created in excel using Visual Basic. The following tables has a comparison between the old and new process.

Old Process 8 Parameters Recording			New Process 8 Parameters Recording		
Process Capability	Sigma Level	Average Time (mins)	Process Capability	Sigma Level	Average Time (mins)
0.23	0.69	2.371	0.69	2	0.166

Old Process 16 Parameters Recording			New Process 16 Parameters Recording		
Process Capability	Sigma Level	Average Time (mins)	Process Capability	Sigma Level	Average Time (mins)
0.19	0.57	3.425	0.61	1.83	0.136

Old Process SFD Recording			New Process SFD Recording		
Process Capability	Sigma Level	Average Time (mins)	Process Capability	Sigma Level	Average Time (mins)
0.09	0.27	9.932	0.69	2	0.164

Conclusions

Observing the data and the process, it can be said that the project's objectives were met. The measurement of the old process allowed to identify what was the common mistakes and how much time it was taking. Once these details were identified, a solution for this problem was tackled creating a tool to automate the process. This tool allowed not only reducing the time considerably, but also it eliminated the human errors. In turn, this will avoid rework due to this process. Therefore, the man-hours invested in scripting are reduced since the process avoids errors that produced hours of rework. Moreover, the process avoids costs, not just of the process, but of the rework too, which ultimately represents the higher cost.

Future Work

Finally, as part as future work, the employees feel more confident and have a better idea on how they can keep improving the process. They were asked to keep identifying areas of opportunities to keep increasing the quality and reducing the time of our work. In turn, this will be reflected in more tests delivered given a specific time.

References

[1] T.Pyzdek, and P. Keller. "What is Six Sigma?" in The Six Sigma Handbook, fourth ed. McGraw Hill Education, 2014, ch. 1, pp. 3.