

Electronic Report Improvement Using Six Sigma DMAIC Tools

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Abstract — *The purpose of this project is to evaluate the application and benefits of Six Sigma tools to electronic reporting. In this particular case the DMAIC (Define, Measure, Analyze, Implement and Control) method is applied to a repetitive quality electronic report. It is of great importance to reduce the report compilation time, reduce variations and errors and at the same time increase the quality of the report. It is in the best interest of service companies to have their clients satisfied by delivering a competitive product. Previous studies show a relation between productivity and the quality of a product. Utilizing the DMAIC method, the areas of opportunities were identified and determined that automating the report will resolve these areas of opportunities. The automation represented a 75% time reduction, minimized the variability within the report and a cost reduction of \$9,758 per year. This automation principle will be implemented on other similar reports in order to increase quality and reduce costs.*

Key Terms — *automatic database report creation, DMAIC, electronic reporting, service companies.*

PROBLEM STATEMENT

In today's economy the production costs have been rising so much that it has become very common for companies to contract services from third party entities to perform some tasks. Companies require these services to be accurate, precise, and be delivered in a short time period. For these reasons and many others, third party entities are in need to use sophisticated and automated resources to manage the provided service.

The most important part for a service company is to have a satisfied customer and the easiest way

to achieve such a goal is to deliver a good quality and cost efficient product. The efforts done in order to improve the quality of a product, whether simple or complex, are a great attraction for clients; at the same time the product is improved.

Research Description

When third party companies are contracted the main objective is for them to do the more clerical work in order for the main company to focus their efforts in other areas. This research will focus on the improvement of the productivity of a quality report.

The process of the quality report is the following: data is extracted from a major database, unnecessary data is eliminated and the report is created. The data is analyzed and presented; this is our final product. During the creation of this product many resources are used, such as time and personnel. In addition we have to overcome the unforeseen difficulties of data compilation. The most common encountered problems are missing data, incorrect data compilation, among others. These difficulties translate on rework which increases the costs of production for this report.

Research Objectives

It is of vital importance to reduce the downtimes and errors in the creation of our quality reports. For this reason we have established the following objectives:

- Reduce the data compilation time by at least 60%.
- Automate the unnecessary data elimination.
- Automate the creation of graphs for the report analysis.
- Reduce the variability of the report in order to obtain a standardization of the report.

- Increase report quality and productivity.
 - This increase will be measured by the repeatability of the report and the decrease of creation time.

Research Contributions

By achieving our objectives we will be able to increase the quality and productivity of our report. We would be able to recreate this report in less time that is currently done. This will translate in cost reduction for our company. There will be less rework due to errors and the quality of the report will be increased. All this improvements will be reflected in the money factor. The less time spent in the creation of the report and its rework, the cheaper the report creation will be. These two factors will be extremely important in client satisfaction.

LITERATURE REVIEW

For service companies, one of the most important things is to have a satisfied client by delivering a competitive product. Since the product is based in a service, the human contact is greatly important during the delivery of the same. The services have an immediate impact on the clients and a positive experience can maintain customers with the intentions of returning in search of that product. Those same positive experiences are the best presentation for a service company; they will be the first steps in building a loyalty bond with the customer. The costs of acquiring a client for life are so high, that losing that client can have devastating effects for a company [1].

Previous studies show that there is a strong relation between productivity and the quality of a product. These studies sustain the assertions made by quality experts, such as Deming, that an improvement in the quality of a product is an improvement on its production process [2].

Automations will reduce the human factor and therefore improve its repeatability and standardization of the report. Fiebrich and Crawford, [3] found that the automated

observations of climate data for Oklahoma state had less discrepancies than the observations made by Cooperative Observer Program (COOP). Their study illustrated that most of the largest errors archived in the daily COOP/HCN dataset likely could have been eliminated if automated temperature observations were available.

In the service industry one way to improve a product is to increase the repeatability of the report. This research will focus on the automation of certain report. The lack of information regarding automation benefits has resulted in industry reluctance to implement new automation technologies. Ly-Ren Yang [4], studied the impact of phase-level automation adoption on quality of project deliverables and identifies project deliverable leveraging tasks and common characteristics associated with these critical tasks. The research provides empirical evidence that supports the expectation of gaining significant benefits with higher levels of automation implementation. The analysis suggests that the quality of project deliverables is significantly associated with automation usage in the front-end, design, procurement, and construction phases. The results also indicate that automation is critical to assist in the execution of project tasks and may contribute significantly to the quality of deliverables in terms of correctness, timeliness, completeness, and flexibility. Findings from this research also provides direction for decision making of automation investment and are helpful to managers in deciding whether to apply automation to tasks with certain characteristics on capital facility projects.

The competition among companies has caused a boom in the search of improving their processes and therefore their products. One of the most known improvement discipline is Six Sigma, it uses a strong data-driven approach and methodology for eliminating defects in any process whether it is a product or a service. The main objective of Six Sigma is the implementation of a measurement-based strategy that focuses on process improvement

and variation reduction through the application of improvement projects.

In order to meet our objectives, we used the DMAIC (Define, Measure, Analyze, Improve and

Control) sub-methodology. This methodology is used to improve processes that are below specification and looking for incremental improvement.

What is known?	What we don't know?	Which are the questions to make?	What will we do, to answer the questions?	Taken Actions	Person Responsible (Due Date)
Existing procedure is taking a significant amount of time and resources	The precision of the created reports	How could we improve the precision and quality of the report?	Investigate if the automation of the report meets these requirements	Meet with programmers to verify that automation is feasible.	Javier A. Perez (08/2010)
Report needs to be created in a precise manner and as fast as possible.		Will the automation of the report reduce its creation time?			
The quality of the report depends on the precision of its compilation	The possibility of time reduction of report creation and analysis.				
Customers requirements					
Report creation has an existing standard procedure.					

Figure 1
Thought Process Map

METHODOLOGY

The first step of the DMAIC method consists on defining of what the project is about. In the need to recognize what is the project about, we identify what is known and what is not known. For this we used a Thought Process Map (TMap). This is a live document, which could change as the project progresses. This map is a visual aid of what has been done and what is missing. It also helps to present the project in a clear and simple manner. See Figure 1.

A second tool used to define a project is a Project Charter. The project charter will present what the project is about and the goals to complete. The Project Charter consists of two parts:

- First part attacks the reason for which a project is being done.
- The second part focuses in explaining how the project is aligned with the company goals and expectations.

After defining what the project is going to be, the actual process is measured. The Value Stream (VSM) helps to identify the parts of the process that are not value added to the process. Another technique used to measure the problems of a process is the Pareto Chart. This chart is used to

quantify the problems and attack the ones with the most amounts of incidents.

Once the process has been measured the process is then analyzed. The areas of opportunities and/or non-value added are identified utilizing the VSM and/or the Pareto chart. In some occasions some non-value added parts are inevitable to a process, if that is the case their impact has to be minimized.

After the process has been analyzed and its flaws identified, the changes to be made need to be created for their implementation phase. Once the changes are implemented with positive results, the new process is standardized. For the standardization of the process a series of instructions are created in the most detailed manner possible. This is the best way to implement and control a process.

Results and Discussion

By utilizing the DMAIC we were able to define our project; measure the existing problems and identify ways to improve the process of creating reports. The T-Map and the Project Charter in order to define the project and its needs was utilized. Also the report requirements were outlined.

With the T-Map it was identified what was known and what was not. It helped identify the questions that needed answer and what could be done to improve the report. Also it helped us to identify that the automation of the report will help reduce existing identified reports problems and issues. Once the automation of the report was contemplated as a possible solution, it was proceeded to measure the existing process in order to determine which areas to attack with the report automation.

In order to measure the existing process the Value Stream Map (see Figure 2) and the Pareto Chart (see Figure 3) were utilized. The VSM showed the steps taken to create the report and allowed us to show the areas that are non-value added of the report. In this case the report had no non-value added areas, since all the steps are required to complete the report.

The second tool used to evaluate the existing report creation process was the Pareto Chart. This chart helped to identify the biggest existing issues with the report.

When analyzing the data obtained in the first two steps of the DMAIC process, we were able to identify the following:

- The first three steps of creating the report took an average of 8 hours.
 - Obtaining data
 - Organizing data
 - Filtering data
- These same first three steps were also related to 83% of the errors encountered with the creation of the report.

	Obtain Data	Organize Data	Filter Data	Create Report	Analyze Report
Cycle Time (hrs)	2.5	3.5	2	1	1
# of Resources	2	1	1	1	1
Recolection Method	Manual	Manual	Manual	Manual	Manual
Comments	Too much time and resources	Too much time	Too much time		

Figure 2
Value Stream Map-Prior to Automation

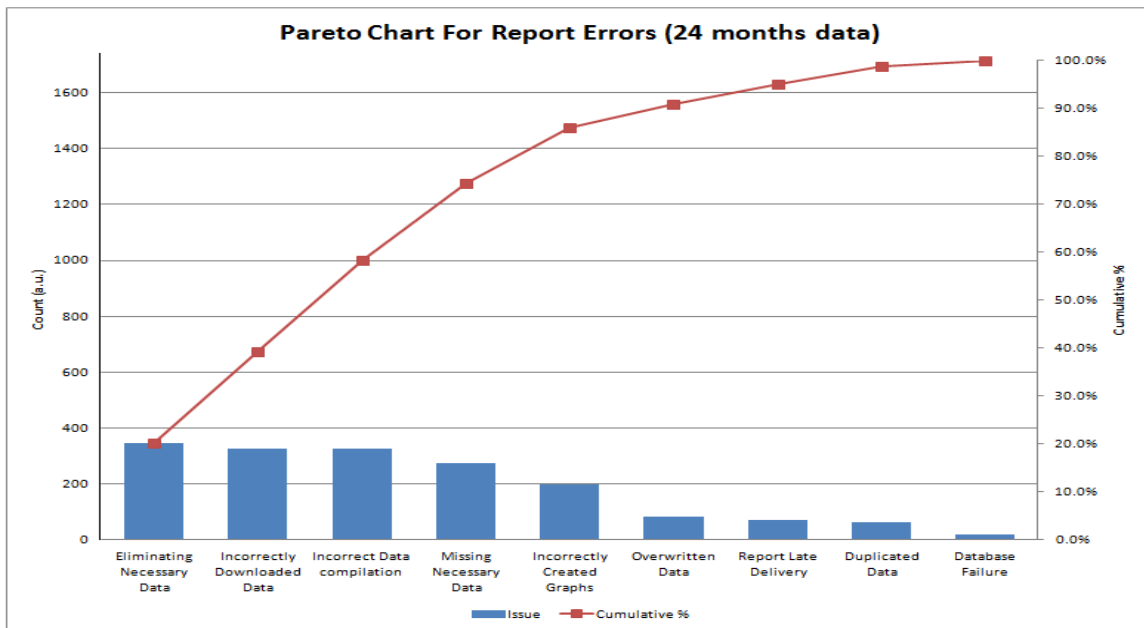


Figure 3
Pareto Chart- Prior to Automation (24 months data)

The mayor areas of opportunities are found in the first three steps of creating the report. This is due to the extended amount of time it takes to create the report and the amount of error related to these steps. Since all of these three steps are of added value, the report automation will have to minimize the impact.

With the obtained results, report automation is the way to eliminate these issues. By automating the report the human errors will be eliminated and the reports will be more consistent. An inter-phase between excel and access was created in order to automate the report. This inter-phase will obtain the data directly from the database, organizes the data and eliminate the data that is not required for the report. The required data is presented in Microsoft Excel® and the graphs are done in Microsoft PowerPoint®.

After implementing the new process and identifying that it was having positive results it was time to standardize the new procedure. The first step of the standardization process will be to create a new standard operating procedure to explain how to use the new tools. Together with the standardization process, practitioners working with this report will be retrained. After the report automation was standardized a new value stream map was created in order to compare with the initial process.

As seen on the VSM, the report went from an initial average of 10 hours to a 2.5 hours reduction. With the Pareto Chart we can see that the errors of report creation were drastically reduced. Present values for errors are due to database problems and the only problem related to the automation, was linked to a human factor. The practitioner selected an incorrect time frame.

	Obtain Data	Organize Data	Filter Data	Create Report	Analyze Report
Cycle Time (hrs)	1.5				1
# of Resources	0			1	1
Recolection Method	Automated				Manual
Comments	Reduced Time				

Figure 4
Value Stream Map- After Automation

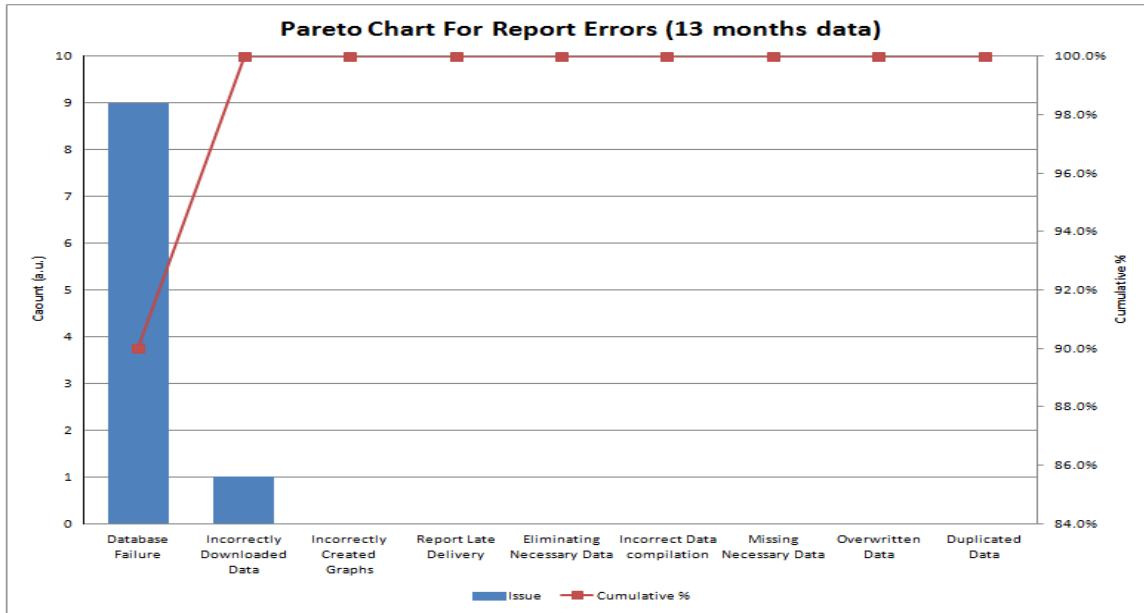


Figure 5
Pareto Chart- After Automation

CONCLUSION

Utilizing Six Sigma tools, we improved the production process of the report and its quality at the same time. By automating the report, its production time was cut down from an average of 10 hours to 2.5 hours. This represents a 75% time reduction. In this manner the variability existing within the report was eliminated. The numbers of errors during the report creation have been minimized to virtually no errors. This reduction in production time translates to \$9,758 per year to our customer.

Even though the automation was a great success, it still has areas of continuous work. If changes are made to the database format or report format, new changes will have to be done to the automation. This is due to the existing relationship between the current formats used in the database and the report. As of today this may be the only documented limitation that this automation had.

Overall this new automation has been of great advantage, not only for the customer but for the company as well. The automation not only reduced the reports production time, it also reduced human error. This will all be reflected in dollar value for our customer, which is always appreciated. Most important this automation principle can be implemented on many other reports created for this or any other customer. This will reduce man hours that can be dedicated to other tasks.

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