Develop an Organization System that Allows to Optimize and Automate the Process of Access to Files

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Abstract — *A company has an excess of archived documents that go from 2003 to the present. The excess of files has limited the space in the office and the work of the employees. It also causes a very large monetary expenditure on materials such as paper and ink. The purpose of this project is to develop an organization system that allows to automate and optimize physical files in a digital way. The DMAIC methodology was applied to find a solution to the problem. Two possible solutions were evaluated. Once the best solution was selected, it could be determined that the digitization of files brings multiple benefits to the company. Among the benefits, a monetary saving of $ 29,930 can be mentioned.*

Key Terms — *Automate, Digital Way, DMAIC, Optimize.*

PROBLEM STATEMENT

Nowadays, there are many companies that continue using and archive a great quantity of papers. It is a fact that some physical files must be kept for 7 years either to avoid legal issues or by specific company rules, but what happens when the papers have been saved the legally required time and there is no more space to save them?

It is estimated that each employee loses an hour each day in the search and management of documents. Also, is estimated that 7.5% of all business documents are lost and never found. The time spent searching and replacing a lost document is significant. All that lost time could have been productive time that employees could use for other tasks. Having the file on paper often leads to an organizational chaos. For example, sometimes a copy of the same paper can be found several times in different places, which causes greater use of materials, such as paper and ink. The misuse of materials causes a greater financial expense for the company [1].

The mountains of papers can make the office an unpleasant space for employees, which in turn can negatively affect the processes [2]. When the company no longer has space to store these files, they resort to paying to external companies for the custody of these documents, which is an additional expense for the company. The management of companies can be much more organized and optimized if they worked hand in hand with technology. Why not create a system to organize spaces so the work can be done in a more efficient, automatic and optimized way?

RESEARCH DESCRIPTION

There is an excess of files in the office that go from the year 2003 until today. The files are not organized by sequence and are stored in different rooms, some are even kept under a custody company. There is no space available to store the new files that arise. In case of need access to a specific file, a lot of time is spending looking file by file on the different rooms. And for the files that are in custody, it is necessary to wait several days for the delivery, which delays the employee's work and avoids giving an immediate response to the costumer. In turn, it is invested too much in materials such as paper and ink since the daily flow of papers is high.

RESEARCH OBJECTIVES

Develop an organization system that allows to automate and optimize physical files in a digital way. The aim is to apply the correct methodology so that the company reduces monetary expenses and increases the physical space in the office. Also,

reduce the time invested by the employee looking for and organizing the files. The 60% of the files must be digitized.

RESEARCH CONTRIBUTIONS

This research seeks to benefit the company in different ways such as:

- Monetary savings for the company since they will not have to pay other companies to save and keep the oldest files.
- Savings on purchasing materials such as: papers, folders, ink for printers, etc.
- The money saved can be invested in improvements to other processes, in new projects or in its employees.
- Increase office space, allowing the company take advantage of that space for other functions.
- Decrease in pollution and environmental damage.
- Decreasing the time invested by employees in routine processes, increases creativity and performance.

LITERATURE REVIEW

Many companies are still using ineffective methods for document management, which translates into a burden for their employees, who cannot find, archive or catalog the data in an efficient way. Thus, these companies lose competitiveness with respect to those that, on the contrary, achieve it. In these cases, it is essential to efficiently manage the information, to have it always available and locatable in the shortest possible time. In order to determine the best ways to improve the process, we will utilize the 5s methodology and the DMAIC process.

Implementation of the 5S method helps organizations organize themselves; and is typically one of the first Process Improvement techniques that organizations implement. A well-organized workplace can result in more efficient, safer, and more productive operations and can boost the morale of an organization's workforce. The 5S

pillars or practices are based on five Japanese words: Sort (Seiri), Set in Order (Seiton), Shine (Seiso), Standardize (Seiketsu), and Sustain (Shitsuke). These pillars encourage workers to improve their working conditions and then reduce waste, eliminate unplanned downtime, and improve processes [3].

A workplace that is clean, organized, orderly, safe, efficient and pleasant, results in [4]:

- Fewer accidents
- Improved efficiency
- Reduced searching time
- Reduced contamination
- Visual workplace control

The DMAIC is the classic Six Sigma problem-solving process. Traditionally, the approach is to be applied to a problem with an existing, steady-state process or product and/or service offering. The DMAIC methodology uses a process-step structure. Steps generally are sequential; however, some activities from various steps may occur concurrently or may be iterative. Deliverables for a given step must be completed prior to formal gate review approval. Step Reviews do occur sequentially [5].

The DMAIC five steps are: Define, Measure, Analyze, Improve and Control. Each of the phases will be discussed below [6].

Define Phase

The key objectives within the define stage of DMAIC are:

- Project definition. To articulate the project's scope, goal, and objectives; its team members and sponsors, its schedule, and its deliverables.
- Top-level process definition. To define its stakeholders, its inputs and outputs, and its broad functions.
- Team formation. To assemble a highly capable team and focus its skills on a common understanding of the issues and benefits of the proposed project plans.

These objectives should be satisfied before the team progresses to the measure stage.

Measure Phase

The objectives of the measure stage include:

- Process definition at a detailed level to understand the decision points and detailed functionality within the process.
- Metric definition to verify a reliable means of process estimation.
- Process baseline estimation to clarify the starting point of the project.
- Measurement system analysis to quantify the errors associated with the metric

Analyze Phase

The objectives within the analyze stage of the DMAIC problem-solving methodology include:

- Analysis of the value stream, the necessary steps that produce value for the customer
- Analysis of the sources of variation
- Determination of the process drivers, the little y's that correlate with the stakeholder requirements and significantly influence the process output.

Improve Phase

There are several issues to be completed within the improve stage:

- New process operating conditions are determined.
- Failure modes for the new process are investigated and addressed.
- Benefits associated with the proposed solution are estimated by the team and approved by the sponsor.
- Process improvement is implemented and verified.

The outcome of each of these steps may cause a reconsideration of the assumptions from prior steps, forcing further analysis of the proposed improvement. This diligence is often necessary for sustained improvement.

This stage is where the rubber meets the road. It defines the improvements and cost reductions that sustain the program. It forces the team to strive for new levels of performance and become true agents of change. Management support at this point is critical, as is management buy-in. The team must work closely with its sponsor to seek direction, authority, and approval before change can be implemented.

Control Phase

There are several objectives to be completed within the control stage of DMAIC:

- The new methods must become standardized in practice.
- The predicted impact of the improvements, the project deliverables, must be continually verified, especially the financial return.
- Lessons learned should be documented.

In the improve stage, changes are made to the process. Frequently, the process procedures will be changed. The old way of doing things is replaced with new and improved methods. Process variation may have been reduced by controlling the variation in one or more key input variables or by redefining more appropriate levels for these parameters. These changes may result in reallocation of personnel to adjust for peak demand at certain times of the day or control of the variation in key parameters, such as room temperature, to control the size of a key dimension.

The natural response of process personnel may be to gradually or even abruptly return to past practices. This may occur the first time the process experiences a shift in behavior, when personnel return from vacation and fall into old habits, or when you're just not looking.

There are several practices that are useful for standardizing on the new process methods:

- Process control is used to monitor process variation. The most effective methods often minimize process variation by precision control of the input parameters.
- Control plans are used to define the methods of control and to ensure that all potential sources of variation are addressed.

- Work instructions, flowcharts and process maps are used to document process procedures and responsibilities.
- Training is essential for process personnel to understand their new responsibilities. The communication of these methods, procedures, and responsibilities should be integrated into a training program for process personnel.

METHODOLOGY

To carry out this project a DMAIC methodology will be executed. The DMAIC process is chosen since it is categorized as a tool that helps to improve, optimize and establish the processes of a company in a practical way [7]. The phases of the DMAIC methodology are the following:

- Define- During this phase, the client's requirements and expectations will be determined. In addition, the critical stages of the process (CTQ's), the scope, benefits, risks and team members of the project will be defined through a project charter.
- Measure- the problem will be quantified; the method of data collection will be determined and the current performance of the process to be improved will be measured. The results of the current performance will be compared with the client's needs to identify the required improvements to the process.
- Analyze- evaluate the data collected in the previous phase to determine the root cause relationship. Also, the areas of opportunities in the process will be determined to eventually improve or eliminate them in order to meet the client's expectations.
- Improve- Implement techniques to improve the problem looking for innovative, creative and simple solutions. A detailed implementation plan will be created.
- Control- Monitor that the new system is implemented in the correct way. Standards and variances are defined and measured as a regular part of the process. Document the

monitoring plan to ensure that any problems that arise can be corrected in the future.

RESULTS AND DISCUSSION

During this section the problem will be stipulated and analyzed. In addition, possible solutions to the problem will be presented by applying the DMAIC method.

Define Phase

During this phase a Project Charter was created. Through the Project Charter, the fundamental and crucial aspects of the project are determined. As can been seen in Figure 1 the scope, objectives, team members, risks and approximate time of the project are defined. One of the benefits of the project charter is that it works as a direction and purpose guide for all team members.

Figure 1
Project Charter

Measure Phase

The flowchart diagram presented in Figure 2 shows the current file process of the company. Analyzing the process, it can be measured as follows:

- Files are stored in security areas. The security areas are 3 rooms of files, of which 2 rooms are scattered in different areas of the office while the other room is in another building of the complex. This implies that the employee can take a minimum of 7 minutes or more looking for a file since there is no record that determines the location of each file.
- The oldest documents are guarded by an external company. In case of need access to one of those files the company can take approximately 2 to 5 days to deliver the files to the office.

Considering the points mentioned above, if a client calls asking for a specific information, the employee can take a minimum of 7 minutes to a maximum of 5 days approximately to provide the information.

- Another step of the file process is make copies of all the documents delivered by customers. This step generates duplicate use of materials such as paper and ink. Approximately a total of 20 paper boxes are purchased monthly at a price of $30 each. This is for a total of $600 per month, which is equivalent to $7,200 annually spent in paper.
- The division has 6 printers and approximately 70,000 copies per month are printed on each photocopier. The printing company charges $ 0.001 for each copy, so for each printer the company pays $70 per month, if you multiply the $70 for the 6 printers there is a total of $420 per month. In addition, 2 of the 6 printers have an additional maintenance cost of $150 per month for each one. If the company add the $420 spent on printing plus $150 monthly maintenance for each of the printers the company have a total of $720 monthly in printing costs.
- Other factor to consider is that the custody company every so often collects the oldest files to create space for the new ones. This service is an additional expense for the company. The office is divided into 10 departments. Taking

as sample the smallest department, it has a total of 127 boxes in custody. The custody company, for guarding these boxes charges approximately $0.40 per month per box, which is equivalent to $50.8 per month and $609.10 per year. Assuming, that the other departments have at least 127 boxes also in custody, there is an expense of $508 per month and $6,096 per year.
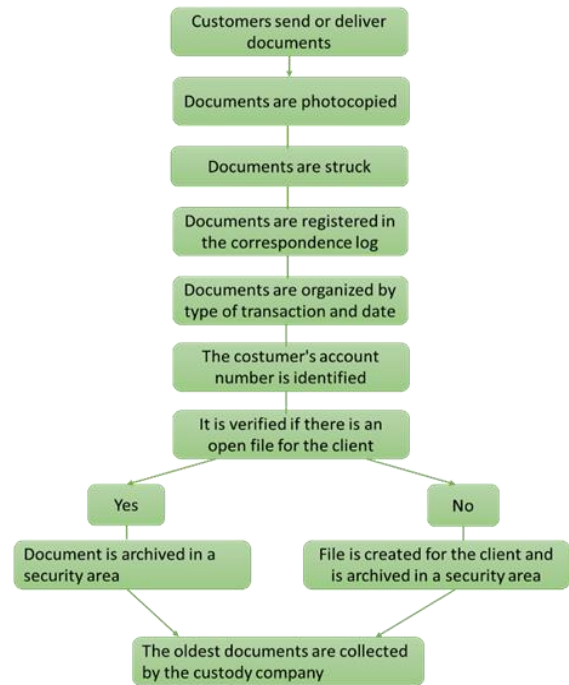

Figure 2
Flowchart for Current File Process

As additional expenses, it is necessary to consider other service rates of the custody company, mentioned in table 1.

Table 1
Additional Service Rates of the Custody Company

Service	Cost
Temporary withdrawal of each box	$1.00 and up
Rush withdrawal of each box (Next labor day)	$1.66 and up
Destruction of each box	$5.00
Shred papers from recycling bins	$7.25 each bin
Pick-up Boxes	$12.02
Deliver Boxes	$12.02

The identified critical quality needs (CTQ) are: time, space and expenses. A CTQ Tree, shown in

Figure 3, was created with the purpose of listed all the measurable performance requirements that will help meet with the customer's needs.
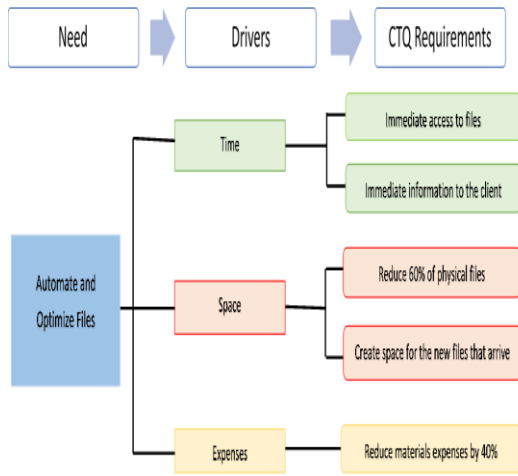

Figure 3
CTQ Tree

Analyze Phase

Measuring the problem helps determine that having the files in a physical form is a great waste of time and space for the company. So why continue with that great loss when it can be implemented a scanning system or a program to store all the documents electronically.

By eliminating the physical storage of the files, the company could have a saving of approximately $15,840 annually in materials and printing. They would also eliminate the expenses that they invest in the custody company since their services would not be necessary, which is equivalent to a savings of approximately $610 or more per year, this without including additional expenses for transportation, removal and destruction of documents.

Another saving that the company can obtain through the implementation of the digital file method is the elimination of some office clerks, since the flow of paper will be less. With the new method it will not be necessary to have a high volume of employees to maintain the files. An office clerk earns $11.00 per hour which is equivalent to a saving of $21,120 per year for each employee less. The total expenses of the company between materials, printing, the custody company services, and the salary of an office clerk is $37,570 annually approximately.

The amount of money saved on materials and maintenance can be invested in the digitalization program since it will bring multiple benefits for the company, such as:

- Immediate access to information
- Immediate answers to customer inquiries
- Space saving that can be used to position advanced electronic equipment or add more desks
- Avoid loss of documents
- Avoid the deterioration of documents over time
- Reduces the risk of information theft since the information will be protected by access codes and restrictions may be added to users
- The information can be accessed from any location which would allow the employee to work while outside the office
- All employees can view the information simultaneously.

Improve Phase

During this phase, two possible solutions to the problem will be evaluated. The alternatives are presented in Figure 4.
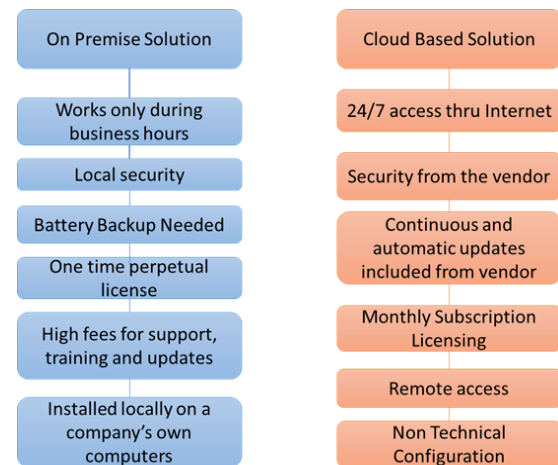

Figure 4
On Premise Solution vs Cloud Based Solution

The cloud-based system has greater advantages over the On-Premise system, such as:

- The cloud allows access to files at any time and from any computer with internet connection, including cell phones, which allows the employee to work even if they are not in the office. This unlike the On-Premise that requires a local installation.
- Usually the cloud is paid through a monthly subscription, so it is a more comfortable payment for the company. In addition, the updates are included by the vendor and are performed constantly and automatically, which frees the company from having a system that can become obsolete over time. In the On-premise solution the payment is a one-time license, which implies a very high investment. The expenses in maintenance and updates are additional.
- In the cloud the security of the data is in the hands of the vendor and not local as it is in the case of the on-premise solution. The advantage of the vendor overseeing the security is that in case they detect any suspicious activity on the server they quickly alert their clients.
- The cloud in case of needing some maintenance does not require the presence of an IT. The maintenance is carry out quickly by the vendor. In the case of the On-Premise it is necessary to wait for the intervention of the IT which causes a delay in the processes
- The cloud allows the flexibility to expand to new regions or countries without the need for large investments.

The advantages mentioned above allow to conclude that the alternative that meets the needs of the company on a larger scale is the cloud-based solution.

Once determined to archive the documents in the cloud, it is important to take into consideration the following steps to obtain a successful process:
- Determine the amount of storage necessary to keep all records. In this case it is estimated that a total of approximately 250 GB is enough to start the project.
- Analyze the different systems and suppliers in the market that meet the needs of the business and provide an attractive offer considering the cost, characteristics and storage capacity. In this case one of the most attractive alternatives is Microsoft Azure. Azure has a cost of $ 0.021 per hour per 250GB and provides 250 GB free during the first 12 months.
- Determine the number of users.
- Determine the accesses of each user. All users will have access to view and upload documents. Only managers and supervisors will have access to edit and delete documents, as well as view and upload.
- Define access codes for users.
- Once the criteria of the cloud are configured, all documents must be collected to be processed, eliminating all the clips and folders.
- Scan the documents in PDF format. The PDF format takes up less space storage compared to a JPG format.
- Perform a back-up.
- Destroy all physical documents once they are digitized complying with the rules of the security manual.

Control Phase

To ensure proper functioning of the process once the storage system has been implemented, it must be monitored that the documents have been digitized according to the date they were struck as received and that they were filed under the correct file. The quality of the image of the documents once digitized must also be monitored. Verify every two weeks the amount of papers destroyed, in addition to monitoring that the proper safety method is followed. It is important to evaluate and identify the adaptation and level of knowledge of the employees with the program. Trainings and seminars can be coordinated for the employees if necessary. And finally check monthly that the new documents received are scanned immediately and then are destroyed.

CONCLUSION

During this design project, the file process was evaluated and analyzed in order to optimize and automate it. In the office were documents archived from 2003 to the present. Part of these files were also under a custody company. Having the documents physically filed affected the company in three aspects: time, space and expenses. The DMAIC methodology was applied to improve this process. During the Define phase, a Project Charter was created which served as a direction and purpose guide for all the team members. In the Measure phase a flowchart was created with the purpose of analyzing the physical file process and identifying the critical quality needs. During this phase, the company's monetary expenses on materials, printers and custody company services were also investigated. In the Analysis phase was determined that the company spends approximately $37,570 per year in materials, printers and custody company services. To solve this problem, two possible solutions were evaluated, which are: cloud-based solution and on-premise based solution. The cloud-based alternative turned out to be the most beneficial. Among the benefits can be mentioned: cost, accessibility and flexibility. The possibility of implementing the Microsoft Azure server was evaluated. Rent 250GB of this server would cost approximately $8,640 per year. Selecting this server would imply a saving for the company of approximately $28,930 per year. It should be noted that the company is open to evaluating other offers from other servers. In addition, it is possible that given the high volume of documents the project extends until 2019. Through this project it was possible to prove or at least establish that the digitalization of documents has multiple advantages for the company. Among these advantages are: monetary savings, better customer service and contribute to the reduction of environmental pollution.

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