

Optimization in Processing Purchases For Purchases of Information Technology Equipment At A Shared Service Center Using Arena Software, 5w2h Matrix and Form Adjustment

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Abstract — *The present study was developed to identify the waste of time in the process of answering the purchase requests of computer equipment of a Shared Services Center computer class and to create an action plan through the 5W2H matrix so that the wasted time would be reused in carrying out the other activities of the sector. The data used in the study were simulated in the Arena® software student 15.1 and the results presented allowed us to identify that with the adjustment of the request form it would be possible to obtain a 41.63% reduction in the occupancy rate dedicated to the attendance process, corresponding to 01 hours and 42 minutes per day to be dedicated to the others. sector activities allowing activities to be carried out within normal working hours.*

Keywords — *Process Optimization; Computational simulation; Arena Software; 5W2H.*

I. INTRODUCTION

Faced with an increasingly competitive and technological market, companies have sought to adopt with one of their strategies the optimization of their processes, aiming at getting quantitative and qualitative gains. One of the strategies adopted is to make your processes more productive and efficient, making them increasingly leaner, by making better use of their resources, reducing or eliminating process waste and bottlenecks.

Any waste in a process, whether because of operational failure, rework or even incorrect planning, generates an unnecessary cost for an organization, which could be used with other resources, thus making the process more expensive, reflected in the rising cost of the process, final product or profit reduction.

Besides process optimization, another relevant factor for an organization is the satisfaction of its customers, who increasingly seek quality service, where their needs are quickly and practically solved.

According to [1] in the current scenario where the market is increasingly seeking tools and technologies to optimize its processes and define its strategic actions, the relationship with the customer still needs to progress, because, despite a 86% of companies believe that customer satisfaction is a major factor in their operational planning, only 49% use a method to measure customer satisfaction.

Reference [2] state that according to a survey conducted involving 75.000 people, 89% of leading service leaders highlight your main strategy is to exceed customer expectations, yet 84% of customers claim not to have exceeded their expectations in their last experience and 22% of repeat requests are issues that lead to the parent request, even issue being resolved.

Based on the data presented, it is important to produce the present study, since exceeding customer expectations is a relevant factor in a service process and the simulation of the processes allows identifying its malfunctions, enabling corrective actions to be taken through analysis of results.

The main objective of the present study is to identify the waste of time in the process of meeting the requests for purchases and hiring Information Technology (IT) of a Shared Services Center in order to reuse this time wasted in other activities of the sector.

To achieve these objectives, it will be necessary to analyze the studied process, get data and information about care, perform a computer simulation to better identify the points that present opportunities for improvement, and from this, create an action plan to reach a solution for such points.

II. LITERATURE REVIEW

A. Process Definition

According to [3] a process is composed of inputs that, in order to achieve the fulfillment of a

planning, are transformed into outputs and has one or more phases giving rise to a sequence of activities.

According to [4] process is action, because it results in the organization in motion, allowing “make it happen”, deciding, objectives and goals in activities.

Reference [5] highlight that the processes correspond to the daily work routine of a company. According to [6] process has by its definition a collaboration of various activities, which aim to achieve a global goal, driven to the end customer.

According to the definitions of the authors cited, it can be considered as a process the activity of fulfillment of purchase requisition requests and IT hires, which will be the basis for the development of the process improvement study, since this activity is about a daily routine of the company and that counts with the input through requests that when processed originate in an output that is the issuance of the requisition.

a) Process improvement

Process improvement can be defined according to [4] as the delivery of superior performance, results in highlighting the previous and subsequent through indicators that prove the improvements related to implemented practices, planning a better situation.

In process improvement it is defined that “Process improvement initiatives typically concern specific improvements or process adjustments and imply projects that culminate in proposing a set of improvements to be implemented.” [7].

Reference [4] states that to achieve satisfactory results, it is essential that improvement projects are guided in a consistent and structured manner, making use of methodologies and tools to identify opportunities and process rearrangement, enabling the implementation of new management practices, standards resources and technologies that bring improvements and ease in the flow of information, operations and materials.

B. Computer Simulation

As defined by [8], computer simulation is made up of the use of mathematical methods used in computers, making it possible to reproduce the operation of almost every real process. In other words, it is the analysis of the behavior of real systems through the use of modeling.

According to [9] the simulation involves not only the construction of a process model, but the whole method of analysis that follows, aiming to characterize the system behavior and hypotheses that test the observations made. In addition, it applies models for present behavioral analyzes or for predicting possible future events.

Since computer simulation is the use of mathematical techniques in computers, for greater

reliability of simulation results one must have concrete information about the process under analysis, thus avoiding divergent results from reality. According to [10] when performing a simulation, it is essential to build a model consistent with the reality that one wishes to simulate.

C. 5W2H matrix

According to [11] the 5W2H matrix is a tool that relies on answering 07 questions to perform an action: What (what to do)? Why (why to do)? Where (where to do)? When (when to do)? Who (who will do)? How (how will it be done)? How much (how much does it cost to make)? designed to improve the planning of any activity.

According to [12] 5W2H is a simple and objective methodology, used in the elaboration of action plans in project management, strategic planning, business plans and several other management disciplines.

III. METHODOLOGY

The research was based on a conceptual literature review. According to [13] the conceptual review tends to synthesize areas of knowledge to help in understanding the issues involved, offering a broad view of a particular subject.

For this study was used the nature of descriptive research which, according to [14] have as its main objective to describe the characteristics of a particular population, event or definition of relationships between variables. A quantitative approach was adopted which, according to [15] has many samples and is focused on objectivity, considering that the reliability of the information can only be obtained based on consistent data, collected with the support of standardized tools impartial.

For the analysis of the research it was used the case study used as a methodological procedure through the computational simulation performed to verify the possible results of the proposed improvement for the studied process based on the adjustment of the opening form of the form so it contains all the information required by the supplies system.

In the case study, a documentary analysis of the data related to IT equipment purchase requests was performed, having as indicators the attendance times of each step of the process from the opening of the request to the conclusion of the solicitation and the hours worked costs of the IT equipment employees involved in the processes.

For data analysis, a history of approximately twelve months was considered, containing information from 2018 to 2019, which allowed an applied analysis of the process. This history was obtained through a report extracted from the solicitation opening system containing the detailed information of the requisitions of the equipment under study.

The data were worked in different software. Microsoft Excel® 2013 was used to perform analysis related to service times, a survey of the information requested to the user and the proposed new form template. According to [16] Excel is a software produced by Microsoft based on spreadsheets, used for the elaboration of statistical analysis, forms, reports and various other attributes in everyday business and administrative. In Arena® student version 15.1, a simulation was performed to demonstrate the results before and after the proposed improvement. For process modeling to demonstrate its flow, Bizagi Modeler version 3.6 software was used, which according to [17] is an agile and easy process management tool that allows the design, documentation, diagram and publish processes following BPMN standards.

The action plan was prepared using the 5W2H Matrix which allowed defining the guidelines for changing the process in a more organized manner.

A. Company and process characterization object of study

The study was developed in a Shared Services Center located in Zona da Mata Mineira

that serves 11 companies located in different states of the 05 regions of Brazil.

The procurement and hiring sector performs various IT-related administrative activities, which are characterized by issuing purchase requisitions with the Procurement Sector, entering invoices for payment, registration of new homologated materials and budget registration.

According to the company object of study, items belonging to the IT class can only be requested by the IT purchasing and hiring sector, making it necessary for the user to make the purchase request through the solicitation opening tool whenever necessary of new equipment, from a desktop, notebook to peripherals (mouse, keyboard, computer monitor, among others).

B. Current process flow

After receiving the request through the ticket, the clerk accesses the supplies system, issues the purchase requisition for the material and informs the user requesting the approval of the manager responsible for the cost center informed for debit. Figure 01 shows the steps of the request issuance process.

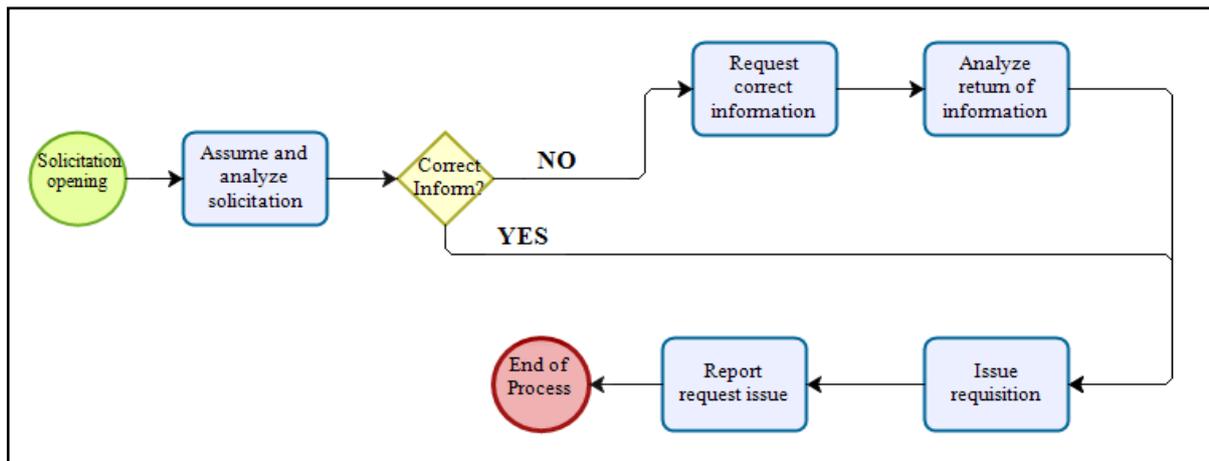


Figure 01: Current flowchart of the procurement and hiring process- Source: Author 2019.

The studied process flowchart is detailed below:

Solicitation opening: In this step, the request is opened by the user, where the form is completed.

Assume and analyze solicitation: In this step, the clerk assumes the request for fulfillment and performs the analysis of the completed data to verify if the information is sufficient to issue the request.

Request correct information: When information is insufficient, it is necessary to interact with the user through a process in the solicitation itself.

Analyze return of information: In this step, the attendant checks the information that the user has

returned to proceed with the service. In the observed database, no incorrect information was identified after this step, so it was not considered the decision criterion in the flowchart.

Issue requisition: This step comprises every action taken by the clerk when issuing the request, from entering the data in the system to sending the request for approval.

Report request issue: At this stage, the clerk informs the user that the requisition has been issued and submitted for approval by the responsible manager.

IV. RESULTS

A. Simulation of the current process model

The simulation of the current process was performed considering the values present in the database extracted from the system. The data were processed, being expunged from the base all solicitations that were not answered by cancellation of the applicant, thus not having an action of the attendant.

In the simulation, the replication parameters of 08 hours per day over a period of 30 days were considered, obeying the probability distributions for each process step represented by the expressions described in Table 01.

Table 01 - Probability distribution of each process step.

Process	Distribution	Expression
Solicitation opening	Beta	$0.999 + 483 * \text{BETA}$ (0.406, 2.17)
Assume and analyze request	Beta	$8 + 5 * \text{BETA}$ (1.04, 1.02)
Request correct information	Beta	$5 + 6 * \text{BETA}$ (1.18, 1.37)
Analyze return of information	Uniform	UNIF (9, 13)
Request Issue	Uniform	UNIF (10, 16)
Report Issue	Triangular	TRIA (1.05, 2.12, 2.45)

Table 01- Source: Author 2019

Through the simulation of the current process represented in Figure 02 it was possible to identify the times dedicated to each activity in the simulated period, since all activities are performed by the same attendant.

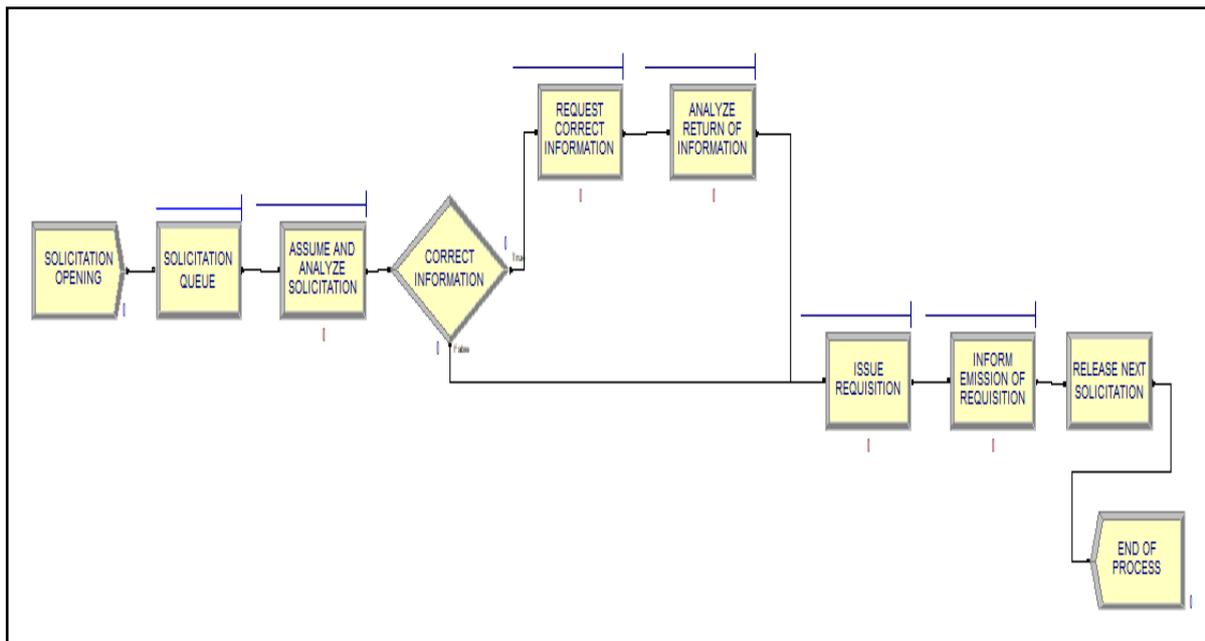


Figure 02: Simulation of the current Arena process - Source: Author 2019

It has been noted that the current ticket form located in Figure 03 does not contain all the information required to issue the requisition, and that as a user does not issue purchase requisitions in the supplies

system, it does not know what data is required in such a system, providing only the data required in the form.

Requester data:

Company *

Username *

Telephone *

Sector *

Cost Center *

Service Region *

Solicitation description:

Place for installation: Unit / Building / Sector / Floor / Room *

Equipment description *

Reason for request *

Comments / Note *

Area for debit *

Budget (Capex / Opex) *

Budget (Capex / Opex) *

Figure 03: Current opening solicitation form - Source: Author 2019. Adapted from the solicitation system of the studied object company 2019.

The lack of information generates rework, because the attendant needs to interact with the user through a new procedure within the solicitation and analyze the information sent by the user twice, at the moment of taking care and after requesting the missing information. The results presented by the simulation, as shown in Figure 04, demonstrated the user occupancy rate throughout the process, showing the details of each step.

Number Busy	Average	Half Width	Minimum Value	Maximum Value
R_QUEUE SPACE	0.5084	(Insufficient)	0.00	1.0000
R_REPORTING ISSUE	0.02147083	0,003230089	0.00	1.0000
R_REQUESTER CORRECT INF	0.08986990	(Correlated)	0.00	1.0000
R_REQUISITION ISSUER	0.1510	0,022632228	0.00	1.0000
R_RETURN ANALYST INF	0.1238	(Correlated)	0.00	1.0000
R_SOLICITATION ANALYST	0.1222	(Correlated)	0.00	1.0000

Replications: 1 Time Units: Minutes

Key Performance Indicators

System	Average
Number Out	167

Figure 04: Occupancy rate per process step and a number of requisitions issued. - Source: Author 2019

It was observed that in the current model the attendant dedicates 04 hours and 05 minutes of his daily routine of 08 hours for answering solicitations, and of this amount, 41.63% corresponding to 01 hours and 42 minutes are spent exclusively in the steps of a request of the correct information and analysis the return of the information leaving only 03 hours and 55 minutes for the other activities. In addition, it was possible to demonstrate that after 30 days, 167 requests were issued.

Based on documentary analysis of the company object of study, it was possible to reach the cost of the hour worked by the attendant which was the value of twelve reais. So with the steps highlighted are spending twenty reais and forty cents a day.

Still based on documentary analysis, it was possible to identify that the attendant has in his hour bank a history of approximately 18 hours of overtime per month. Based on this, it is understood that the amount of hours available for other activities is not enough, since the employee needs to extend his daily work routine.

B. Action plan elaboration

Given the results obtained with the simulation of the current process model, an opportunity for improvement in the solicitation opening form was identified, once it does not include all the necessary information and that after the return of the user had no history in the solicitation procedures by the attendant, and it is possible to issue the request from the data returned.

Information not included in the current form is: Approver at coordinator and manager levels that are not informed, but required to submit the request to approval; Service tag also not required and required for “brand X” battery, charger and other equipment requests; Incorrectly reported cost center; in some requests the area acronym is inserted; Budget entered incorrectly, In some requests are informed CAPEX budget (investment) to purchase OPEX items (expenses) as well as the reverse, being limited by the supplies system the further issuance of the requisition. Given this, the matrix 5W2H was prepared to map the change of the form according to table 02.

Table 02 – 5W2H matrix for form change.

5W2H Matrix		
5W	What?	Adjust the solicitation opening form.
	Who?	Solicitation system maintainer.
	Where?	In the system used for solicitation opening.
	When?	November 2019.
	Why?	To eliminate the steps considered as rework in the requisition issuing process.
2H	How?	Creating a new form according to the template shown in Figure 05.
	How much?	R\$ 494,50.

Table 02- 5W2H Matrix. - Source: Author 2019.

Based on the matrix 5w2h a new form was proposed as shown in figure 05.

Requester data:

Username *

Telephone *

Service Region *

Reason for request *

PMA Approver (Coordinator) *

PMA Approver (Manager) *

Equipment data:

Equipment description *

Equipment Specification *

Quantity *

Service TAG *

Informative: To purchase X branded peripherals, you must provide your Service TAG number (Service Tag, consisting of 07 characters alternating between letters and numbers, usually located on the bottom of the product). For other equipment mention "NOT APPLICABLE".

Billing Data:

Company for invoice invoicing *

Cost Center Number *

If selected material item is classified as OPEX:

OPEX budget *

If selected material item is classified as CAPEX:

CAPEX budget *

Comments:

If in doubt about budget, please check with the person in charge of your area.

THIS FIELD WILL OPEN ACCORDING TO SELECTED MATERIAL TYPE:

OR OPEN OPEX OR CAPEX OPTION.

Figure 05: Proposed model solicitation opening form - Source: Author 2019

The maintainer of the tool is a collaborator of the company object of study, thus, for the costs for adjusting the form were considered the hours used by those involved in the phases of creation,

approval and validation of the change. The values for the calculation were based on a documentary analysis of the company under study. The deadline for the change was established considering an estimate of the deadlines needed for alignment between the sectors.

C. Simulation of the proposed model

Based on the action plan prepared to solve the problem, a new simulation was performed considering a new model represented by Figure 06.

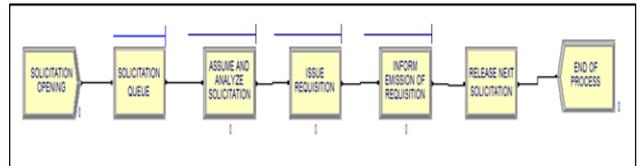


Figure 06: Simulation of the current Arena process - Source: Author 2019.

In the new simulation, the steps of requesting the correct information and analysis of the feedback of the current process were disregarded. The results obtained with this new model are highlighted in Figure 07.

Number Busy	Average	Half Width	Minimum Value	Maximum Value
R_QUEUE SPACE	0.3193	(Insufficient)	0.00	1.0000
R_SOLICITATION ANALYST	0.1346	0,025981172	0.00	1.0000
R_REPORTING ISSUE	0,02292074	0,004233991	0.00	1.0000
R_REQUISITION ISSUER	0.1618	0,030351584	0.00	1.0000

Replications: 1 Time Units: Minutes

Key Performance Indicators

System
Number Out Average 180

Figure 07: Occupancy rate and a number of requisitions issued using the proposed model - Source: Author 2019.

It was possible to verify that the time spent on answering solicitation was reduced by 01 hours and 31 minutes, thus, would dedicate 02 hours 34 minutes to answering solicitation. As for productivity, there was also a gain of 13 more solicitations being answered within the 30 days considered for the simulation, totaling 180 solicitations answered.

Considering the 01 hour and 31 minutes reduction in the attendant's working time during the 30 days used in the simulation, there is a cost reduction of five hundred and forty six reais. That amount would be sufficient to cover the costs of system improvement. But the main highlight for the improvement is the fact that, the gain in hours with

the modification of the form would allow the activities to be carried out within the normal working day, thus preventing the employee from performing additional hours. Another relevant point is that with the new model the requester would have his request fulfilled on the first request, not having to enter the tool more than once to make the same request, thus providing greater customer satisfaction.

V. CONCLUSION

The present study aimed to identify the waste of time in the process of meeting requests for equipment purchase of the computer class and from this, create an action plan so that the wasted time was reused to perform other activities in the sector. For the elaboration of the action plan, the seven questions from the 5W2H matrix were answered, an important tool within an organization, as it has a fast, easy and effective communication, where each question answered becomes the basis for the next question. After filling in the matrix, it was proposed to adjust the form to eliminate two process steps.

Computer simulation is an extremely important tool for an organization, as it allows tests to be performed to identify the best model to be worked on in a process, assisting managers in decision making. In the study, computer simulation was used to analyze the attendant occupancy rates in each process for 30 days and to evaluate what the scenario would look like after the suggested improvement. After applying the data in the Arena® student 15.1 software was certified the new model has a reduction of 41.63% in the time spent by the user in the service process, corresponding to one hour and forty-two minutes of eight hours of work. Such reduction will allow the activities to be carried out within normal working hours and will present a reduction of five hundred and forty-six reais in the cost of the process, being sufficient to pay the investment of the improvement.

The study made a contribution to any organization that has a process involving an application form, as it demonstrated the importance of the applicant entering the correct and complete data so that the flow is continuous and not reworked. For the elaboration of this study some challenges were found, among which what stood out most was the identification of the incorrect information in the procedures for the elaboration of the new form because, it was necessary to access each request and to analyze the procedures individually. For future studies I suggest the analysis of the other activities present in the sector, proposing a better routine management, optimizing even more the time of the employees of the sector.

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