



## STOCK MANAGEMENT: A COMPARISON TO THE MANUAL AND AUTOMATED METHOD, APPLYING THE DMAIC METHODOLOGY

**Diego George Cavalcante Marialva**

Centro Universitário do Norte – UNINORTE, degree in Technology in Quality Management, Av. Joaquin Nabuco, 1469, Centro, Manaus - AM.

**Bruno Almeida da Silva\***

Centro Universitário do Norte – UNINORTE, Degree in Electrical Engineering, Av. Joaquin Nabuco, 1469, Centro, Manaus - AM.\*Corresponding Author

**Jemiffer Karol Rodrigues Vieira**

Centro Universitário do Norte – UNINORTE, degree in Quality Management, Av. Joaquin Nabuco, 1469, Centro, Manaus - AM.

**Patricia Alves da Silva**

Instituto Federal do Amazonas – IFAM, Degree in Mechanical Engineering, Av. Sete de setembro, 1975 – Centro, Manaus - AM.

### ABSTRACT

The measurement of processes with the aid of computer resources and through the use of statistics has shown to be a competitive differential for organizations. This type of analysis can aid in a characteristic look at critical processes. In the day to day of an organization it is necessary to exist a holistic vision to obtain acceptable results; inventory management in the freight forwarding and dispatching part is a critical activity in which any out of control situation can generate a perceived failure by the end customer. Checking the difference between two systems of conference and dispatch of merchandise through software that allows considerable and reliable results demonstrates the need for adaptations or improvements for certain systems. The use of the manual system through printed documentation is of considerable value to small businesses, since the adherence of an automated system such as WMS has a significant cost. Careful consideration of processes has become important because each task performed has its cost and added value. Time is a precious and expensive resource; trying to minimize the processing of goods and delivering them with quality is of great importance because an unfulfilled trade agreement or a delayed delivery as well as other potential failures that can happen in the process will bring unnecessary costs to the company. Therefore, the more an organization studies, analyzes and improves its processes, the more competitive it will be, because it will meet all the precepts for which it was created.

**KEYWORDS** : Management, Stock, Manual, WMS

### 1. INTRODUCTION

Since humanity began to cluster in cities, it was felt the need to stockpile various types of food, so that groups could have access to a particular item on specific occasions, for own use, sale or barter.

It is essential that every company to remain competitive in the market, have full control of its activity from the beginning to the end of its process, which is the arrival of the product or service to the final customer, controlling and avoiding unnecessary costs to the organization, the concern of inventory management is to maintain the balance between several component variables, such as: stocking and distribution: level of attendance to the needs of consumer users, etc. (SLAK et al, 2009).

The distribution company Lopes, object of study to be carried out, located in the street: José Romão neighborhood: José José Manário, Manaus-AM, which in 1984 started its activities as importer Lopes Ltda. and in 1998 the foundation of distributor Lopes Ltda., which now acts with the brands: Ajinomoto, Garoto, Nissin, PepsiCo, Danone etc.

Its area is built in: 7000m<sup>2</sup> and 4000m<sup>2</sup> of storage area, with 6000 pallet positions. The company, to the detriment of compliance with the legislation in force in the country, has as one of its priorities the safety and health of its employees in the work environment, respecting regulatory standards, such as: NR10: Electricity installations and services; NR11: Transportation handling and handling of materials; NR16: Dangerous activities and operations; NR17: Ergonomics; NR23: Fire protection; NR25: Industrial waste, among others. Work safety can be defined as a set of administrative, health, educational and behavioral technical actions, whose purpose is to prevent accidents, reducing unsafe conditions and procedures in the work environment (BARSANO, 2012), according to the article 157, of the CLT, it is incumbent upon companies to comply with the norms that are contained in the NRs of the Ministry of Labor and Employment, in the state constitutions, and normative

instructions of the fire department.

In this context, the main objective of this work is to analyze the process of conference and separation of goods in the internal scope, from the moment of issuing the order of service until the arrival of the merchandise at the docks, from the point of view of two systems, the manual system which uses printed documentation and the automated system with the use of Warehouse Management System (WMS), a software that allows the control of inventory and automation of warehouses, the WMS system is responsible for the management of day-to-day operation of the warehouse (AROZO, 2003).

Through six sigma methodology, which can be defined as a set of practices developed to maximize the performance of Processes within an organization, taking into account the essential elements of business process management (ECKES, 2001). The second concept that ensures the performance of the six sigma is update of the methodology, better known as DMAIC, a method used to improve existing processes (HARRY AND SCHROEDER, 2000).

### 2. Method and material

The present research is based on the field study, which is the deepening of the specific reality to capture the explanations and interpretations that occur in reality, field research is characterized by investigations in which, in addition to the bibliographical and / or documentary research, data collection is carried out (FONSECA, 2002). In this line of reasoning, collections of times converted in seconds from thirty samples of average lots of 80 boxes were carried out on 19/04/2017 and 04/28/2017 in the period from 8:30 am to 1:00 pm respectively, in the area of stock of the company mentioned in this survey.

### 3. Results and Discussion

#### 3.1 Dados e análises do processo manual.

The activities of the manual process of conference and dispatch of

goods are carried out by means of printed documentation, the process cycle starts when the separator receives the service order (OS) and verifies it directing the area of picking (separation and preparation of orders) where the goods are sorted, the time data collected in the process were entered into the MINITAB program, in the type of I-MR control chart shown in figure 1.



Figure 1 – letter of control I-MR with the use of manual system.

Source:team.

With the analysis of this chart it can be verified that the points studied are within the limits of control, following a random sequence, it is said that it is under statistical control based on the statistical calculations used in this research, and to prove the veracity of the same was calculated the mean of the samples which is equal to 1.916 and the range equal to 30.6, to calculate the upper and lower limit, the formula  $LSC = X + (A2.R)$  was used obtaining a result of 59.444 (higher) and the  $LSI = X - (A2.R)$  obtaining the result of 55.616 (lower).

In order to calculate the CP and CPK process capacity indices, where the LIE (upper limit of the specification) is equal to 960 seconds and the LSE (upper limit of specification) is equal to 1800 seconds for this process, we obtain a value of CP = 5.16 is a value of CPK1 = 21.74, CPK2 = 11.75.

It was observed that the volume of merchandise in this process has its capacity compromised, using a lot of manpower and printed documentation, because if the demand increases, more employees will be required to carry out the necessary activities within the sector, even if it proves to be a process is limited to a certain quantity of goods depending on the number of employees employed in the process.

**3.2 Dados e análises do sistema automatizado (WMS).**

The system (WMS) is supported by a bar code reader that facilitates the operations in the stock area, so the system allows the order of service (OS) to arrive online directly to the separator, where it does the use of the automated system with the barcode reader, streamlines the operation, reducing the time of accomplishment, the margin of errors and the possibility of the batch arriving incomplete in the shipping area, which increases customer satisfaction and generates a better use of time, as well as greater daily batch processing, in the same way the I-MR chart was used to analyze the behavior of the times of each sample according to Figure 2.

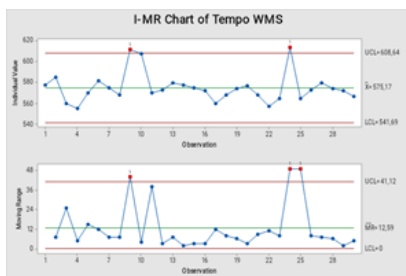


Figure 2 - letter of control I-MR with the use of WMS system.

Source:team.

It was observed that in figure 3 the control boundary points are out due to special causes in the process under analysis, thus eliminating the points outside the control limits and calculating again, the result of this recalculation showed us that the process is under statistical control and we obtained another I-MR control card, see Figure 3.

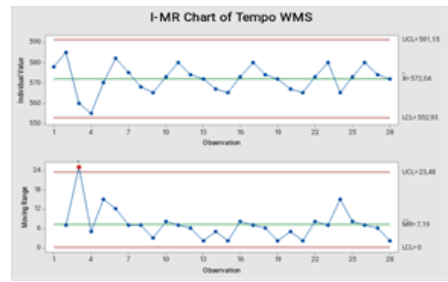


Figure 3 - letter of control I-MR with the use of WMS system. Source: team.

With this other letter we will perform the statistical analyzes with average calculations of the samples that gave a result of 575,166 and the range of 12, to calculate the upper and lower limits of control, we used the formula of  $LSC = X + (A2.R)$ , the result of 23.135 (upper) and  $LSI = X - (A2.R)$  was obtained the result of 21.984 (lower).

In order to calculate the CP and CPK process capacity indices, where the LIE (lower specification limit) is equal to 360 seconds and the LSE (upper limit of specification) is equal to 900 seconds for this process, we obtain a value of CP = 8.46, a value of CPK1 = 10,189, CPK2 = 6,854.

As the first statistic control card of this process had points outside the control limits and therefore we recalculated and obtained a result under statistical control, the calculations of  $DPU = 0.06$  were performed, where two samples were outside the limits of divided controls for the thirty samples collected and its  $DPO = 0.0044$ , where the number of points outside the control limits was divided by the number of samples collected times times the percentage of fifty percent of sample error, for the calculation of the  $PDMO = 4.4$ , the result was obtained by multiplying the  $DPO$  times 1,000,000, according to the process performance table, a process that has a sigma level above 4, is classified with world-class diagnostics, so a level result was obtained sigma of 4.4 classifying as world class for performance of the analyzed process.

The study explores the differences found between two systems, the manual and the automated, is relative to the sample quantity collected, so it can be subtended that the larger the number of samples, the better the classification of the data obtained.

**4. CONCLUSION**

Based on the calculations we decided that the WMS system offers the company a satisfactory cost benefit, because despite the cost to obtain and implement an automated system, it offers the company a greater capacity to control its inventory and its time.

Therefore, the data presented in this research contribute to a critical look at both the automated and manual systems of shipping and dispatch, with the help of sophisticated methodologies and software that allow a statistical base reading, visualizing the processes from a different perspective, serve as a parameter for further in-depth studies on logistics inventory management.

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