





Strategic optimization: redesign of internal processes in international bulk companies

Optimización estratégica: rediseño de procesos internos en empresas graneleras internacionales

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Abstract

This research aims to redesign the surveillance and scale processes of an international bulk company, with the aim of streamlining and improving them. The DMAIC Methodology was systematically applied at each stage from a structured approach that improved and optimized existing internal processes, clearly establishing the problem and objectives of the redesign to subsequently collect and analyze necessary information, establishing key measurement metrics that evaluated the success of the redesign. Once the causes and areas for improvement were identified, solutions were developed and changes were implemented in the structure of the processes. The results obtained were the redesign of the company's internal surveillance and scale processes with optimized times of 44 and 77 minutes respectively, obtaining a difference of 25 to 33 minutes, allowing the company to carry out a total of 900 loads per month in 28 minutes. per unit load.

Abstract

Esta investigación tiene como objetivo rediseñar los procesos de vigilancia y báscula de una empresa granelera internacional, con la finalidad de agilizarlos y mejorarlos. La Metodología DMAIC se aplicó sistemáticamente en cada etapa desde un enfoque estructurado que mejoró y optimizó los procesos internos existentes, estableciendo claramente el problema y los objetivos del rediseño para posteriormente recopilar y analizar información necesaria, estableciendo métricas clave de medición que evaluarán el éxito del rediseño. Una vez identificadas las causas y áreas de mejora se procedió al desarrollo de soluciones e implementación de cambios en la estructura de los procesos. Los resultados obtenidos fueron el rediseño de los procesos internos de vigilancia y báscula de la empresa con tiempos optimizados de 44 y 77 minutos respectivamente, obteniendo una diferencia de 25 a 33 minutos permitiéndole a la empresa realizar un total de 900 cargas por mes en 28 minutos por unidad de carga.



Process Redesign, DMAIC Methodology, Optimization



Rediseño de Procesos, Metodología DMAIC, Optimización

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Introduction

Process redesign is important for companies as it allows them to better adapt to changes in the business environment, improving operational efficiency, reducing costs, improving product or service quality, increasing customer satisfaction and remaining competitive in the market. It also facilitates the identification of bottlenecks, the automation of repetitive tasks and the implementation of best practices, which leads to more agile and efficient functioning in the organization.

According to [Ramos Aulla, C. G. \(2023\)](#). That the redesign of processes to achieve better control and internal management within a company focuses on the fact that every organization must have a mission, vision and organizational chart, to be able to establish its processes accordingly. The implemented processes have a characterization, a flow diagram that allows visual understanding, development of processes and indicators that allow their control so that they can be improved in the future. The Process Map and the General Organization Model. With the use of these techniques and tools, the critical issue of the business in the company is identified, the insufficient integrated management of the processes, weakens the possibilities of the entity to take advantage of the opportunities that the environment offers, jeopardizing the fulfillment of its mission. This is indicated in their research work; Alfonso-Robaina, D., Et. to the. (2011).

According to [León-Duarte, J. A., & Viramontes-García, C. G. \(2014\)](#). By establishing the correct processes that are carried out in each department or specific area of a company, they allow them to be streamlined. The redesign of processes in a warehouse management system seeks to stabilize the annual inventory levels of a marketing company, as well as establish the correct processes improvement consists of five phases: process selection, understanding the selected process, proceeding with process measurement, executing process improvement, and reviewing the improved process. Obtaining improvement results; the improvement in delivery times to customers, the improvement of the work environment, the development of sales and quality policies, as well as the improvement in communication between areas, as stated by [Cordova Gomez, S. A. \(2021\)](#).

[Campozano Moyano, N. A. et. al. \(2022\)](#).

They maintain that; The use of technologies with the purpose of reaching new business sectors to cover the technological demand of the market, increases their sales and their client portfolio, organizations have managed to quickly adapt to the needs of the market and innovate their internal processes to improve development of its products and services offered, conducting technical training for its staff, as well as introducing quality standards. ought the use of an appropriate Methodology.

Within global logistics; Supply chain management and competition in a globalized market justify the reasons for developing this research since it includes improving the productive efficiency of bulk carriers by evaluating and redesigning their internal processes, adapting to changes in the business environment such as new regulations, technologies. emerging or market demands, seeking a competitive advantage by optimizing its processes to offer products or services quickly, economically or with higher quality than competitors, reducing operating costs, waste and downtime, ensuring that internal processes comply with national and international standards and regulations in this sector, improving the customer experience in the delivery of products or services, promoting innovation within the company through the search for new ways to address human errors, failures in the supply chain supply or technological interruptions.

The Methodology used for this research was DMAIC used in Six Sigma to improve and optimize existing processes, performing an effective process redesign focusing on continuous improvement and maximization of value for the customer.

Six Sigma (6σ) is a business strategy aimed at improving competitiveness. It has two components: one aimed at management, which involves new ways of thinking, and another technical, based on statistics and 6σ metrics. It is based on six principles: customer orientation, process management, management based on data and facts, proactive management, collaboration without borders, and the search for perfection and tolerance of errors.

It is a business philosophy that seeks continuous improvement and customer satisfaction through reducing the variability of processes, increasing their The methodology for carrying out improvement projects used in 6σ is known as DMAIC (Define, Analyze, Improve, Control), in Spanish: define, measure, analyses, improve and control as stated by [Jaya Escobar, A. I. , et. al. \(2018\)](#). After carrying out the detailed analysis of the internal processes of the international bulk carrier, it has provided a solid basis for the identification of areas of improvement and formulation of specific recommendations. By implementing the proposed solutions, the organization will be able to improve operational efficiency, reduce costs and increase customer satisfaction, thus strengthening its competitive position in the global market capabilities and drastically reducing the number of defects.

Development of headings and subheadings of the article with subsequent numbers

In this research, to address the problems found that allowed the redesign of the company's internal surveillance and scale processes, the DMAIC methodology was used, due to the nature and characteristics that make it up, considered to obtain the necessary data. Treatment and analysis of the same and thus make the improvement proposal for the bulk company. First, a collection of company data was carried out to be able to make a sketch, a general sketch of the company to locate the areas of the surveillance and scale processes, a general organizational chart of the company to locate those responsible for the processes and the Ishikawa diagram to identify the general problem of the company, showing inefficiency in internal processes.

Box 1

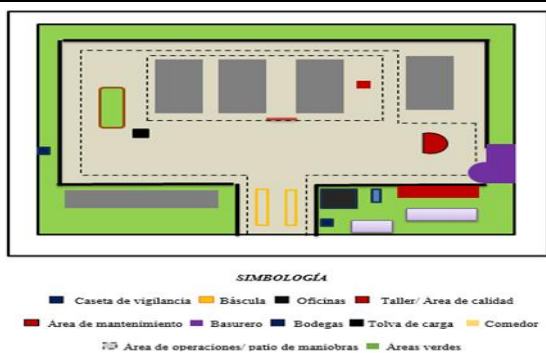


Figure 1
Sketch Granelera Internacional de Tuxpan S.A de C.V

Box 2

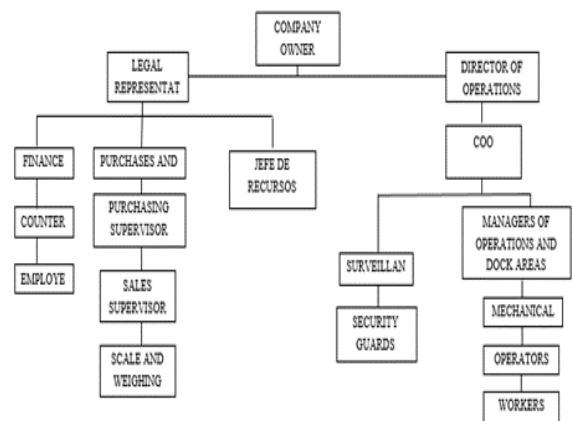


Figure 2
Organizational Structure of the company Granelera Internacional de Tuxpan S.A. of C.V

Box 3

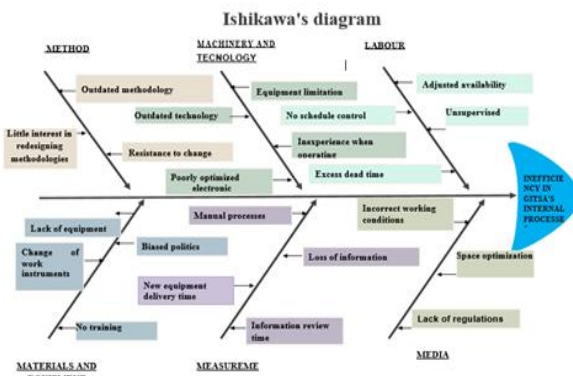


Figure 3
Ishikawa diagram to determine the problems of the company Granelera Internacional de Tuxpan S.A. of C.V.

Subsequently, the stages of the DMAIC Methodology were applied to obtain more data, perform an analysis of these and be able to redesign and improve the already established processes, focusing on continuous improvement and maximizing customer value.

Methodology

Below you can see the application of the stages of the DAMAIC Methodology and the results of the data obtained for analysis and to be able to generate the necessary improvements and optimizations to the existing internal processes in the company with the purpose of redesigning them focused on continuous improvement and maximizing value for the customer.

1st. Define Stage

As the first stage of this DMAIC methodology, the aim is to define the current situation of GITSA. Therefore, it is stated that the Tuxpan International Grannelera S.A. of C.V Company currently operates as a for-profit organization, whose business is focused on the sale of grain by the ton.

Likewise, it is announced that one of the most notable areas that the institution has is the private dock located on the edge of the river, from which unloading operations for input imports are carried out. Likewise, a conveyor belt is provided whose function lies in the movement of grains from the landing stage to the four warehouses; this set of tools, in addition to providing operational benefits, positively influences the company's value chain. As part of the methodology, the respective areas that make up the internal processes of the Tuxpan International Bulk Company are defined:

Surveillance process

This phase represents the starting point in the structure of GITSA's internal processes. This stage consists of a strategic place in front of the main entrance. The personnel in charge of carrying out activities such as: recording all information on carriers and loading units, generation and approval of departure order documentation is called a security guard.

Likewise, surveillance personnel carry out anti-theft inspection activities by carefully inspecting each transport unit before and after shipping inputs. The interior of the trailer is examined in order to prevent the entry of trucks with objects that could alter its weight, or devices that affect the operation of the pit scale. It is important to mention that the waiting yard is related to the responsibilities of the surveillance area, since these elements are responsible for directing and announcing the order of entrances.(*see annex 1*)

Scale process

This activity is carried out on a pit or truck scale, which subsequently sends the tonnage of each unit to a computer and/or database for the generation of the corresponding control documentation.

Additionally, it is important to note that this process is carried out twice. The first time when the base tonnage of the truck is weighed and the ticket is given to the carrier to send it to the waiting yard, so that it can then load your order in the order indicated. And the second time when the gross tonnage of the truck is weighed, so that with this information the final details of the purchase and the subsequent release of the unit can be finalized. (*see Annex 2*).

Loading process

This process is carried out either inside or outside the four large warehouses that are part of the company's infrastructure. Likewise, this stage has a certain amount of hauling machinery called "travelers" that have the purpose of moving the grain on elevated conveyor belts, colloquially called by employees as "bazookas", whose functionality It is placing the inputs into the trailers and containers in order to complete the loading stage of the transport units.(*see Anex 3*)

Quality process

In this area, activities related to checking the quality of the grain that is loaded into the trailers of the transport units are carried out. To be more precise, specific tasks are carried out such as: fumigation, dusting and certification of the quality of the input. In turn, this stage is carried out on an elevated structure close to five meters high, which allows the person in charge or "fumigator" on duty to carry out each of the aforementioned activities. This milestone represents the last process within the maneuvering area, subsequently said unit must move to the truck scale to exit to its destination.(*See Annex 4*)

Problem description

According to the data collected and organizational movements observed and recorded, the internal processes of the company Tuxpan International Grannelera S.A. of C.V. present a considerable index of downtime that is generated both internally and externally, and therefore, due to the analysis of the nature and characteristics of the information, it was decided to direct attention to the stage of monitoring truck entries and exits.

Other causes found during the course of investigation:

The truck scale has the inability to display the exact tonnage that was loaded onto each truck. Furthermore, if there is a unit that is overloaded and the customer does not want to pay the difference, then it must be unloaded and reloaded until the requested weight is obtained. This situation eventually generates delays in the process.

Little availability of signs within the maneuvering area, as well as poor use of regulations and no safety culture practice, which is why, occasionally, accidents occur that cause delays in the process as a result of these deficiencies.

And in that same current, politics and customs of resistance to change are introduced into the equation, since due to the reticent posture of certain subjects within the organizational structure of the company, the development of proposals and/or requests for improvements they take a long time to obtain a follow-up or the action is dismissed.

2nd. Measure stage

This second part of the methodology has the main objective of germinating an approach that is useful, to establish the bases that carry out the development and measurement of transition times, in which all internal processes are carried out within the International Bulk Carrier. from Tuxpan.

Therefore, representing one of the first activities carried out within the present study, a documentary investigation was carried out that was later transferred into tables, whose objective was to show the different variations in entry and exit times of each unit load between the three shifts in proportion to the first month of the exploration period.

Likewise, the internal processes that were subject to study were identified to collect significant data as explained in the previous section, that is, the four stages of surveillance, scale, loading and quality control will be measured.

3rd. Analyse stage

As a result of the previous research activities developed in the measure stage, much more supported knowledge has been obtained about the deficiencies suffered by the process subject to improvement.

Consequently, a descriptive analysis was carried out with the problem statement as reference points, in addition to all statistical and empirical information during the study period.

The following two tools were used as means for the development of this analysis:

Box 4

Table 1

Comparison matrix of current internal processes

Activity	Expected (Minutes)	Actual (Minutes)
Monitoring time (input)	2	3
Scale review time (entry timer)	2	1
Scale time (empty unit weight)	2	6
Charging times with bazooka per box	15	20
Hopper loading time per box	8	12
Quality review time	10	15
Scale time (unit weight with load)	6	10
Scale check time (exit timer)	2	1
Monitoring time (exit)	2	1
Total, Time of the units within the company (normal and full)	40 y 50 minutes	77 minutes = 01:28 hrs

Source: Self Made

Results

Taking into account the data obtained and the previous analysis of the data, a redesign of the internal processes was carried out as an improvement alternative for the company, implementing the use of a technological device to make it more efficient and streamline it as shown below:

Box 5

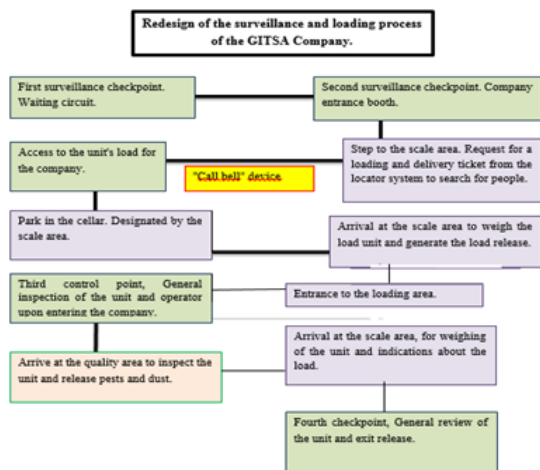


Figure 4
Redesign of the Surveillance Process with implementation of technological improvement

As we can see in the previous process, a suggestion was implemented to use a technological device, Call Bell* that notifies the operator without the need to physically go look for him at the unit and he is aware of the corresponding shift for his mobilization within the company maneuvering yard.

Call bell* Corresponds to the warning signal through a technological device (beepers or pager system), which the transporter of each unit will receive to let them know that their entry or exit turn is authorized.

The following diagram shows the redesign of the scale process and the use of the “call bell” device that will speed up the truck entry process times by announcing the access of the units in advance.

Box 6

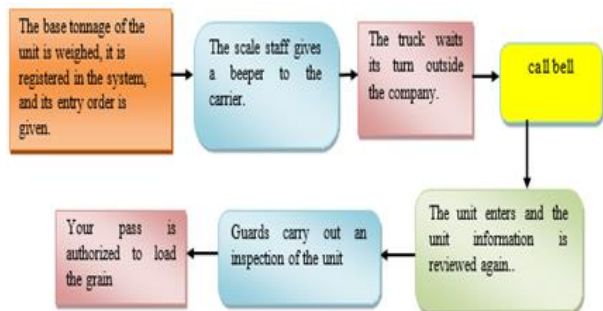


Figure 5
Redesign of the scale process with technological implementation

The implementation of the Call Bell* technological system represented a simple and appropriate alternative due to its characteristics, as well as its low implementation cost. One of the advantages of this device is that it does not require rigorous installation or training intensive to the personnel who will use it.

The following Table shows a comparison of the times carried out in each of the areas and internal processes of the company, showing the difference in each one and the total time necessary that each unit must carry out within the maneuvering yard. the company obtaining an optimization of it per unit within the maneuvering yard.

Box 7

Table 2

Comparison matrix of completion times of new internal processes.

Activity	Expected (Minutes)	Reals (Minutes)	Difference (Minutes)
Monitoring time (input)	2	3	1
Checking time on scale (checker-entrance)	1	1	No difference
Scale time (empty unit weight)	3	6	3
Charging times with bazooka per unit	15	20	5
Hopper loading time per load	8	12	4
Quality review time	8	15	7
Scale time (unit weight with load)	5	10	5
Scale check time (exit timer)	1	1	No difference
Monitoring time (exit)	1	1	No difference
Total time of a unit within the company (normal and full)	44 and 54	77 minutes = 01:28 hrs	25 and 35

Box 8

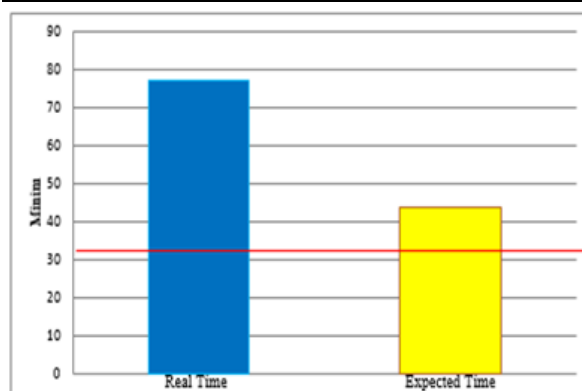


Figure 6
Expected time cycles per unit of load within the maneuvering yard

Article

In this graph we can see the expected cycle times per load units in real time, which as we can see is a lot of wasted time and the real expected time as shown in the following table six where we calculate the Takt Time of the company and which represents the ideal time to be carried out and meet the client's demand.

Box 9**Table 3**

Development of takt time of internal processes

Specifications	Unit	U. time
Expected monthly demand	927	Loads/month
daily demand	39	Loads/day
Net available time	1906	Total minutes
Result	28	Total minutes to be performed per unit

In the previous table it is observed that; the accumulation of days minutes worked, unproductive times such as breaks; shift changes; The period of availability of the tools and the percentage of loss of the inputs, represent a set of significant elements for the search for the TAKT Time in the processes, resulting in a monthly demand of 927 units loaded with a daily demand of 39 units and A 28 -minute realization time dedicated to each unit in the total process within the company.

Conclusions

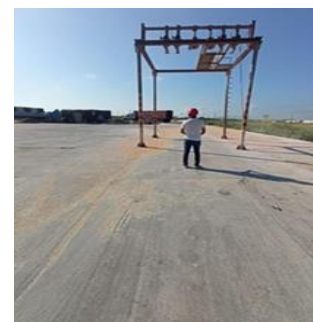
Finally, we can conclude that the redesign of internal processes of an international grain Decisions based on data, these benefits are fundamental to maintain the competitiveness and success of the company in a globalized business environment.

The use of DMAIC methodology; (Define, measure, analyze, improve and control), raised through a structured approach to improve and optimize the processes existing in any company through an effective redesign, focusing on continuous improvement and maximizing the value of customers. For future studies it would be convenient to analyze how the redesign of the processes affects the profitability of the graneras companies, the return of investment, as well as the impact of customer satisfaction at the national level and investigate how the organizational culture influences the success of the processes redesign.

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Annexes**Annex 1***Surveillance Area Process***Annex 2***Scale Process***Annex 3***Loading process*

Annex 4

Operations Diagram of the International Bulk Carrier



Declarations

Conflict of interest

The author declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Author contribution

Benitez-Lopez, Guillermo: Developed the idea of the project, method and applied research technique.

Availability of data and materials

The data used in this study come from various internal and external sources. Internal sources include operating records and performance data provided by the International Company of Tuxpan S.A. of C.V. participant of this study. External sources Industry databases and sector publications.

Entroys in obtaining specific data can contact the author to discuss the possibility of access, under adequate confidentiality agreements:

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Abbreviations

List abbreviations in alphabetical order.

DMAIC methodology; (Define, measure, analyze, improve and control)

GITSA Granelera Internacional of Tuxpan S.A. of C.V.

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