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Optimization and Standardization of the Sales Process in a Service Sector Company through Lean Tools

Alonso Parodi and Sergio Montañez
University of Lima, Industrial Engineering Career
Lima, Peru
20181403@aloe.ulima.edu.pe, 20181220@aloe.ulima.edu.pe

Rafael Chavez Ugaz
University of Lima, Faculty of Engineering
Lima, Perú
rchavezu@ulima.edu.pe

Abstract

Lead times in the design and implementation of spaces in Lima represent 42% of the causes of customer dissatisfaction in the sales process. Therefore, the research focuses on the optimization of lead times, as they are usually very high in small companies (SMEs) and with non-standardized and therefore inefficient processes. A model is proposed that delineates a standardization plan for a process. Initially, it is necessary to map the existing state of sales process, recommend a new mapping of the quotation process using Value Stream Mapping (VSM), locate the critical path using Pert-CPM, and identify the activity that is causing the greatest amount of process delay. To make the process of identifying standards simpler, data is then gathered and categorized. After standardizing the sales procedure and validating the proposal with Arena Simulator, the outcomes are assessed. A 20.26% reduction was obtained with respect to the total time of the sales process of the initial model. Then, through the collection of non-consolidated data, it was possible to create a database with standardized items to make customer service more efficient completing two more projects in the same amount of time and reducing 6.26 days the average time of each project.The standardization of the sales process in the case study allows them to optimize and standardize it through a proposed model based on Lean tools. Furthermore, small and medium-sized businesses (SMEs) could adopt and adapt the application of Lean service tools to identify their most inefficient processes.

Keywords
Standardization, Lean Service, Services, Interior design, Database

1. Introduction
Lima is the capital of Peru and one of the most important cities in South America, it is also known for being a cosmopolitan and modern city, with a wide range of services and activities of public interest. One of the sectors that has grown the most in recent years is interior design. In fact, during 2023, this industry had an increase of 131.20 billion dollars because after the Covid-19 pandemic, people have changed drastically, and new trends and fashions were created (El Comercio, 2023). Currently, placing customer experience at the heart of service design has become a guiding principle of the current 'experience economy' (Li et al. 2022). This means that having good customer service is, ultimately, an important element for improving the performance of a company or organization. It is one of the main pain points, especially for businesses offering services as a product (Nagi and Altarazi 2017), where response capacity and the customer's experience when receiving the service can be crucial for business growth (Croft and Kovach 2012).

When analyzing the main problems and defects that household heads found in the remodeling and implementation services of spaces, it was found that delivery time represents 42% of the total problems, which means it is one of the factors that has demonstrated major problems in the interior design and implementation sector in the city of Lima (Chávez and Jhoel 2021). This indicates a gap in the regional economy. One current issue that the company is facing pertains to response times for customers, specifically in the sales process. This is primarily due to the activities involved within this process. A medium-sized interior design and implementation company in Peru will be the subject of the analysis. The company has been on the market for six years and is still growing. It offers complete services for both residential and office implementations and renovations, spanning from the design phase of a space to its actual implementation. This research is based on the need of this medium-sized company to enhance its processes through the analysis of its own database. Studies affirm that organizations can perform better by simplifying, redesigning, integrating, and aligning their various processes in pursuit of increased productivity and the benefits of adopting the standardized approach, resulting in improved resource management, increased profitability, among other advantages (Abubakre et al. 2020).

The purpose of this study is to provide process standardization with academic backing. The requirement for a medium-sized business to enhance its procedures through database analysis is the foundation of this study. Research confirms that companies can enhance their performance by streamlining, revamping, merging, and coordinating their various procedures in an effort to boost output. Using a standardized approach can lead to improved resource management and higher profits, among other advantages (Abubakre et al. 2020).

1.1 Objectives
The main objectives are to optimize the sales process of the company. Through the standardization of processes and the use of engineering tools. This includes analyzing the sales flow and identifying the process with the greatest deficiencies, utilizing Value Stream Mapping (VSM) and the Pert-CPM tool. Additionally, the aim is to standardize the deficient process using data collection, processing, and analysis tools to further optimize the sales process. Furthermore, the goal is to establish a database at the company to gain a competitive advantage over other companies specializing in space design and implementation.

2. Literature Review
Value Stream Mapping

Value Stream Mapping, or VSM for short, is a potent Lean thinking tool that helps visualize waste of all kinds in the value stream. It is also used before applying Lean tools to know which ones to use and to be able to apply them in the right way in order to eliminate future sources of waste that could arise (Habib et al. 2023). It uses the current state map to depict a system's current state and the future state map to propose a future system design. Generally speaking, the waste seen in the current state map is intended to be eliminated in the future state map.

While the manufacturing industry is the main user of VSM (Lacerda et al. 2016), it is also widely used in many other industries, including the service and manufacturing sectors. According to Fathurohman et al. (2021), "This tool is highly effective in identifying which of all the sub processes (workstations) are bottlenecks and have an impact on current problems." It also proves valuable in understanding the current state of ongoing processes."

Pert CPM

For planning, managing, and controlling resources in business projects, operations researchers employ the PERT-CPM method (Tapia and Cevallos 2021). Using this method, the project's critical path—the set of tasks that determines the overall project duration—can be identified by building a network model that depicts the project's activities and dependencies. The reason the critical path matters is that if one of its activities is delayed, the project as a whole will be delayed as well (Castelblanco and Poveda 2020).

In order to apply the PERT-CPM method to time optimization projects, one must first identify the critical path of the project and identify activities that have slack, or can be postponed without affecting the overall project duration. With this method, it is possible to shorten the project's duration and speed up important tasks without sacrificing the caliber of the work (Tapia and Cevallos 2021).

Standardization

Standardization is the process of establishing a set of criteria or rules to ensure uniformity and consistency over time in the way data is handled in an organization (Poza and Sueiro 2020). With the current economic climate demanding a focus on cost reduction and operational excellence, many organizations specifically (re-)design their process in order to reduce process costs through process standardization (Rosenkranz et al, 2009). Standardization in industrial engineering can improve a company's efficiency and decision making because it facilitates the search, analysis and comparison of processes. This in turn leads to an improvement in the quality of its products and services, reducing costs and increasing productivity (Sanjuanino and Nuñez 2015).

In the case of a database of items from a furniture company for the implementation of spaces, standardization could involve the establishment of a series of rules on how to enter data, such as the format of item names, item descriptions, categorization, among others (Millán and Mauricio 2017)

3. Methods

For the present applied study, practical and experimental methodologies will be used. Because it seeks to improve the performance of certain processes in specific areas of the company through the analysis of its activities. This study qualifies as applied research since the company in question will explore experimentation and development, producing valuable outcomes that can be evaluated in the short- and medium-term In this case, a company that specializes in interior design and execution will use the suggested methodology in an effort to shorten the duration of a sales process. This methodology is expected to be transferable to other service areas, although with particular emphasis. For example, it could be used to standardize safety or logistical operations in the building industry. In the financial services industry, it might also be used, among other things, to improve transaction management. Overall, this concept shows potential for use in several businesses looking to streamline their operations, lower error rates, and maximize resource use. The study has an exploratory scope since our goal is to show how beneficial engineering tools are for process optimization. A mixed strategy was selected for the research methodology, which will employ numerical company databases to produce indicators in addition to gathering employee experience through a questionnaire.

3.1 Proposed Improvement Model

In order to optimize the company sales processes, engineering methodologies will be used in this applied study to map the current state of the company's sales process. A new mapping of the quotation process using Value Stream Mapping (VSM), identify the critical path (Pert CPM), identify the activity causing the majority of the process' delays, and, in the end, standardize the processes using the company's current data analysis method. An overview of the research approach to be used is provided in the following illustration, which explains systematically the methodology to be followed (Figure 1).

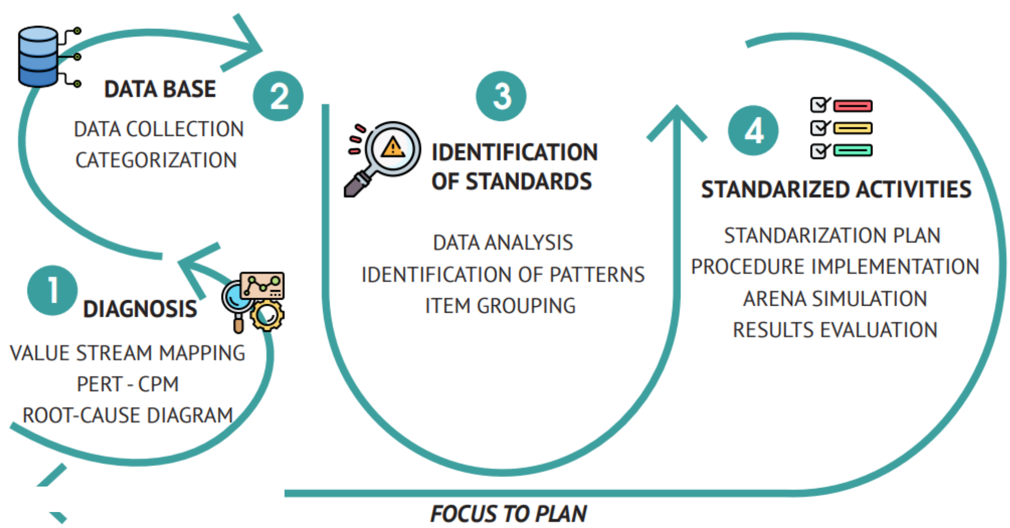


Figure 1. Model Proposed for Standardization Process

4. Data Collection

The data collection began by charting the company's sales process in order to collect data. This enabled us to determine how the process is structured and continue with the analysis. To do this, a sales process flowchart was produced with the help of company employees, which acts as a tool for conducting other sorts of studies like as PERT CPM and VSM (Figure 2).

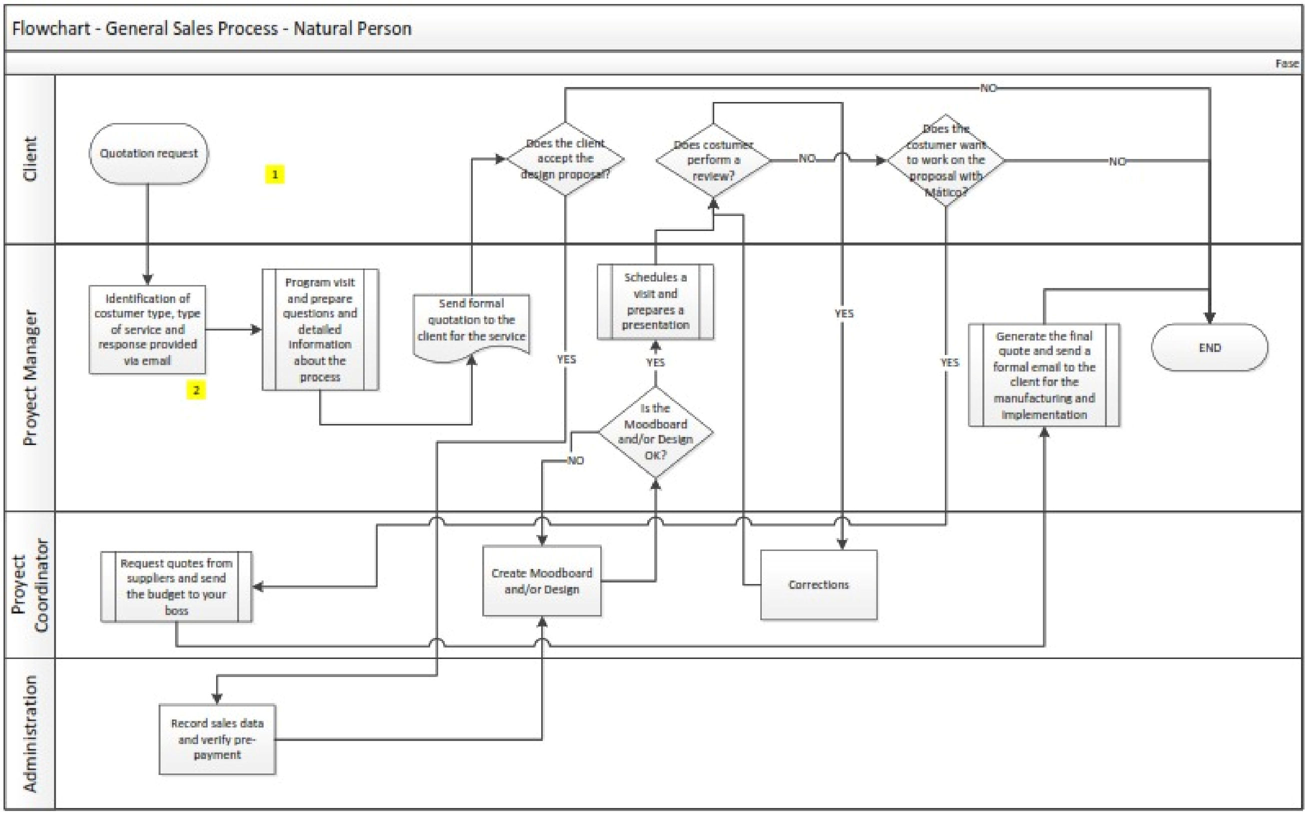


Figure 2. Sales process flowchart

After developing de VSM, Three opportunities for improvement have been identified. The first is in the quotation of suppliers, since it is not a standardized process and prices must be quoted for each new client. The second is the delay in the preparation of the design, due to its complexity and the fact that it is prepared by only one architect per project. The third critical point is the delay in the quotation with suppliers; this is because it depends a lot on the speed of response from suppliers because there is no set price for each piece of furniture. Therefore, the negotiation capacity decreases and it is necessary to quote with many suppliers for the same product in order to make the best decision. From the above analysis, it can be deduced that the most inefficient process is the quotation with suppliers (Figure 3).

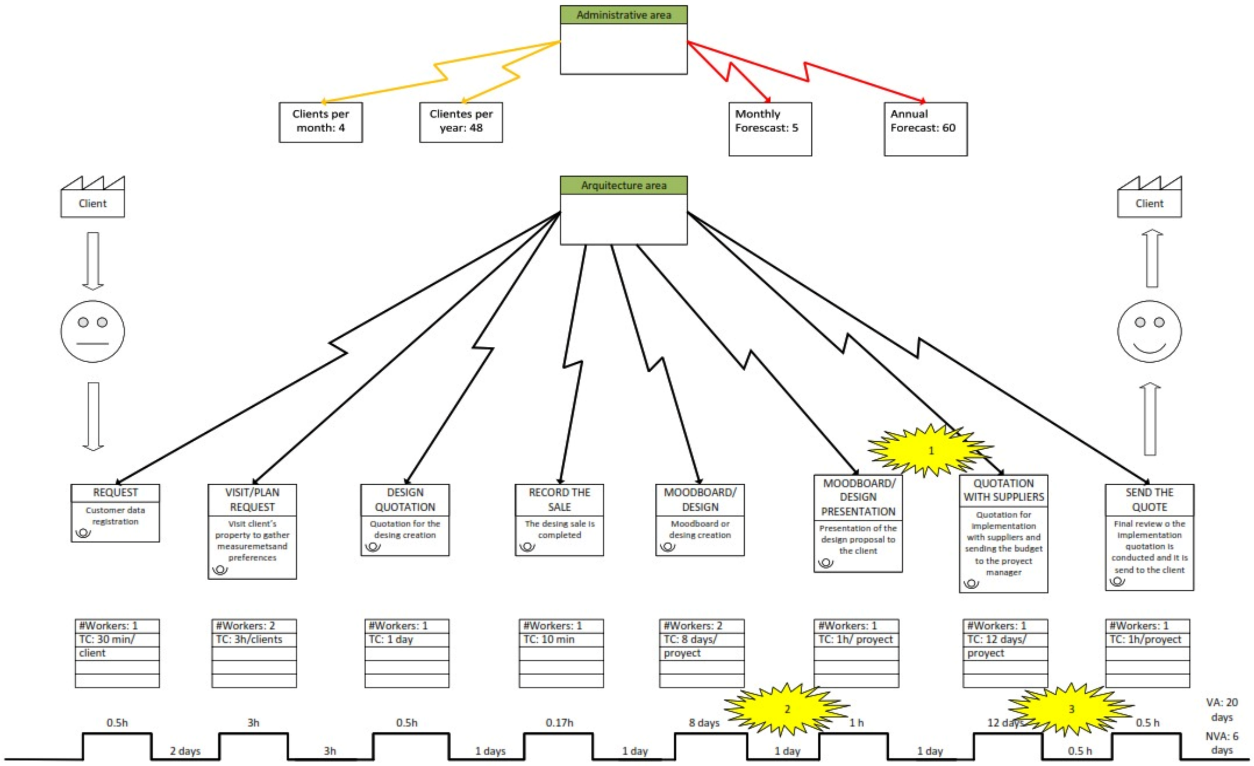


Figure 3. Value Stream Mapping of the actual process

For the Pert-CPM, the activities of the supplier quotation process with the company´s project manager and sales manager were identified. Subsequently, the precedence's of the activities were determined to begin diagramming the CPM. The next step is to assign times to each activity, the time it will take to complete that activity. It should be noted that they based on previous project timelines gave the timing information to us (Table 1).

Table 1. Duration of the activities (days)

Code	Activity	Optimal time	Pessimistic time	Expected time	Precedents
A	Assembly of the budget in excel	0.25	2	0.5	
B	Assembly of the technical specification	1	3	2	A
C	Quotation for civil work	1	3	2	B
D	Furniture quotation	2	4	3	B
E	Lighting fixtures quotation	0.5	1.5	1	B
F	Upholstery quotation	0.5	1.5	1	B
G	Glass quotation	0.5	1.5	1	B
H	Entry of quotations into the budget sheet	1	4	2.5	C, D, E, F, G
I	Price adjustments and evaluation	1	3	2.5	H
J	Preliminary review with project manager	1	2.5	2	I, H
K	Budget optimizations with suppliers	1	2.5	2	I, J
L	Final review	0.25	1	0.5	K

After this table, PERT-CPM diagram can be implemented. The previously obtained times will be used to find the optimal time and the worst time (initial and final) and then find the slack of each activity. Once the slack is obtained, it could be find which is the critical path which in our case would be A - B - D - H - I - J - K - L, this is known since the critical path is the one that gives a result equal to zero.

The PERT CPM facilitates the identification of possible delays and bottlenecks in the quotation process. With this, it can be concluded that the most critical activity in the whole sales process is the furniture quotation. Therefore, it was proceeded to collect 20 quotations from the company to analyze them and move on to the item standardization stage by creating a database (Figure 4).

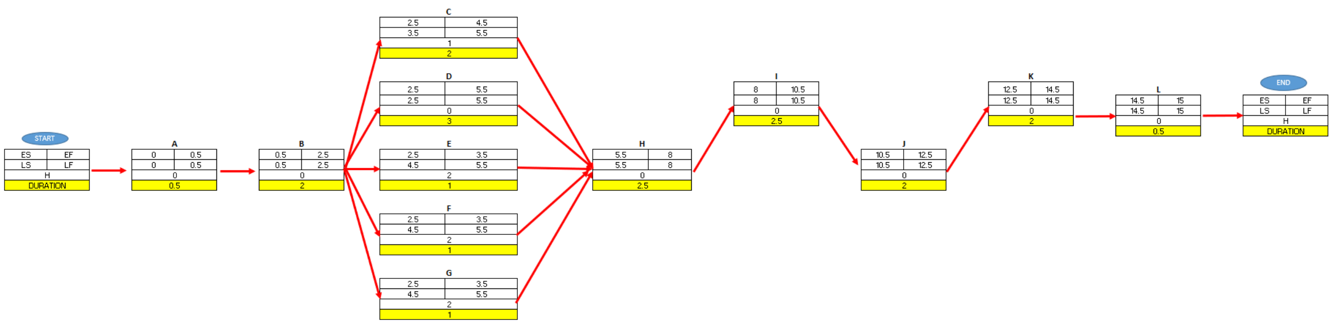


Figure 4. PERT CPM

A thorough data collection process was used to obtain relevant and concise information for the identification of variables. All data from interviews and company archives were combined into a Microsoft Excel document for further analysis. The first stage of information processing was taking the random variables out of the model, gathering past data, and entering it into the Arena Input Analyzer to determine each variable's distribution properties (Table 2).

Table 2. Distributions of random variables

Random Variables	Distribution
Time between request arrivals	EXPO(7)
Technical visit time	TRIA (0, 0.174, 0.58)
Design time	UNIF(7, 9)
Review time	NORM(2, 0.2)
Correction time	UNIF(2, 3.5)
Quotation time	UNIF(12, 18)

5. Results and Discussion

5.1 Numerical Results

This table presents the main indicators used in this project. It also presents the results of these indicators, obtained from the simulation model. This table is presented because it helps to measure whether the proposed improvement in the offer process generated significant improvements in the sales process. The results of the proposal are detailed in the next table (Table 3).

Table 3. KPI's

KPIs	AS IS	TO BE	Variation	%Var
Total average time per project in days	31.1	24.8	6.3	-20.26%
Time to complete a project in days	25.52	19.02	6.5	-25.47%
Time to complete a design in days	20.89	17.69	3.2	-18.09%
Number of projects completed per year	48	50	2.0	+4.16%
Number of requests that end up in projects (per year)	44.02	45.26	1.24	+2.82%

The KPIs column represents the most relevant indicators when evaluating the improvement, the AS IS column represents the data obtained from the simulation model before the improvement proposal, the TO BE column represents the data obtained from the simulation model after the improvement proposal, the variation column shows the difference between the AS IS and TO BE data. The percentage variation column shows how much the final or proposed model has varied with respect to the initial model.

It was observed that the total average time per project in days has decreased by 6.3 days, obtaining a reduction of 20.26% with respect to the initial model. Likewise, with the proposed model, the number of projects completed per year has increased by 4.16%, due to more efficient and faster delivery times. Finally, it can be seen that the project completion time in days has been reduced by 25.47%, i.e., the total time that the project entity spends in the system performing value-adding activities.

5.2 Graphical Results

For the graphical results, a 50-iteration simulation yielded graph of average total times and a Scatter plot of total time for two scenarios: the proposed state (TO BE) and the current state (AS IS). This analysis allows for a thorough understanding of the time difference achieved by the improvement by offering a detailed view of the variability in observed times across multiple iterations (Figure 5).

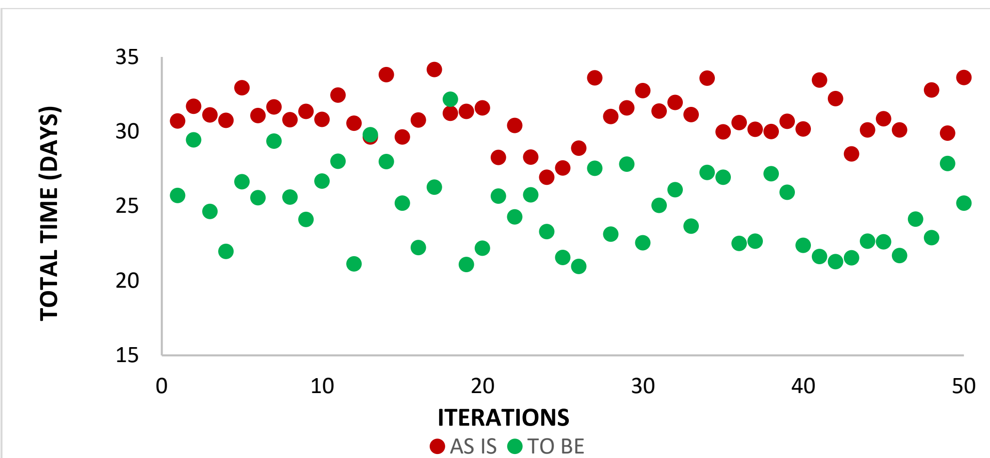


Figure 5. Iterations/total time graph

These graphs shows that the average times trending in the direction of the suggested model (To Be) is primarily less than the current times. The data's consistency between iterations, which shows an average 20.3% decrease in sales process times, is indicative of this. As a result, the process's time reduction model becomes positive and predictable.

5.3 Proposed Improvements

The proposed solution is to use a standardized methodology. The main suggestion is to have a selection of standardized elements. These standardized components should be used during the quotation process to reduce existing furniture quotation times. Once the critical path was found, furniture budgets were collected from various projects to identify the categories to be used for database assembly. The extracted information was grouped in tabular form. The following categories, present in most of the descriptions analyzed, were then identified: item, material, finish, color, measurements, details, unit, supplier, unit cost and total cost (Figure 6).

IMPLEMENTATION BUDGET — MĀ | MĀTICO ARQUITECTURA & DISEÑO

Fecha: 18/10/2023

FURNITURE, LIGHTING, AND DECORATION

ITEM	UN.		PROVEEDOR	COST W/O IGV		PRICE W/O IGV	
				P/Unit	P/Total	P/Unit	P/Total
HALL							
Walls painted in gray color	2.2	m2	RENZO	S/100.00	S/220.00	S/128.21	S/282.05
Console with drawers made of Walnut Terracotta melamine. With a structure and shelf made of oven-baked black-painted metal	1	Unit	CARMEN	S/1,100.00	S/1,100.00	S/1,410.26	S/1,410.26
Installation of a polished circular mirror with a 4cm black MDF frame. Diameter: 60 cm.	1	Unit	RENZO	S/30.00	S/30.00	S/45.00	S/45.00
					S/ 1,350.00		S/ 1,737.31
LIVING ROOM / DINING ROOM							
Sectional sofa, upholstered in gray fabric, with wooden legs	1	Unit	GABY	S/1,949.15	S/1,949.15	S/2,498.91	S/2,498.91
Wooden-framed pictures, 2cm. Includes installation. Dimensions: 0.70m width x 0.90m height (2 units)	4	Unit	GABY	S/338.98	S/1,355.93	S/434.59	S/1,738.37
Black gloss-painted MDF sideboard. With doors and drawers made of Walnut Terracotta melamine. With a 6mm tempered glass tabletop.	1	Unit	CARMEN - RIVER	S/1,660.00	S/1,660.00	S/2,128.21	S/2,128.21
Two-seater sofa upholstered in beige fabric with wooden legs. Measurements: 2.15m x 0.85m x 0.85m	1	Pack	NYLA, RENZO	S/903.56	S/903.56	S/1,158.41	S/1,158.41
					S/ 5,868.64		S/ 7,523.90

Figure 6. Project furniture quotation

The analysis of the data was carried out in order to identify the most repeated items, that is to say, to find patterns for the standardization of the database. The objective of this improvement is that the architects can enter the budgets directly into the database to have a better view of the furniture items and in turn have the prices of the items they offer in real time. In addition to having the necessary information on each item when needed, this proposal is intended to shorten lead times, reduce supplier quotation times and improve customer service.

Finally, once the base was created, a standardization plan was developed and a standardized catalog was created, each item will have a category, subcategory and other relevant details. Unique codes were assigned to each item in the catalog to facilitate the unique identification of each item. It is essential to understand that this proposal is not intended to eliminate the possibility for customers to customize the service to suit their preferences and tastes. Rather, it is an option presented to the customer that can save costs and speed up the implementation process (Figure 7).

QUOTATION MODEL / DATABASE | MĀ MĀTICO

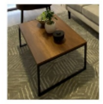
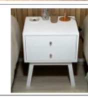
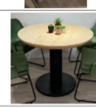
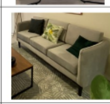
COD.	ITEM	MATERIAL	STRUCTURE	COLOR	L	W	H	PHOTO	DETAILS	QUANTITY	UNIT	PROVEEDOR	C/UNIT	P/UNIT
1	CENTER TABLE	MELAMINE	METALIC	WOOD	0.90	0.90	0.35		Center table with caramel Pelíkano melamine and black metal structure.	1	UNIT	CARMEN ANCA	S/ 480.00	S/ 685.71
2	CENTER TABLE	MELAMINE	METALIC	WOOD	0.76	0.24	0.40		Circular tabletop in 18mm caramel Pelíkano melamine with matte black baked metal structure.	1	UNIT	CARMEN ANCA	S/ 750.00	S/1,071.43
3	CENTER TABLE	MDF	WOOD	WHITE	0.85	0.35	0.40		Center table with white gloss MDF tabletop and natural wood legs	1	UNIT	CARMEN ANCA	S/ 650.00	S/ 928.57
4	CENTER TABLE	MARBLE	METALIC	NEGRO	0.95	0.95	0.45		Center table with Marquina marble tabletop and metal legs	1	UNIT	JULIO RODRIGUEZ	S/1,950.00	S/2,785.71
5	NIGHTSTAND	MDF	WOOD	WHITE	0,4	0.50	0.60		White gloss MDF nightstand with 4 natural wood legs painted in white duco	1	UNIT	CARMEN ANCA	S/ 850.00	S/1,214.29
6	NIGHTSTAND	MDF	WOOD	WHITE	0.40	0.50	0.50		Nightstand with drawers made of 15mm white gloss painted MDF	1	UNIT	JULIO RODRIGUEZ	S/ 650.00	S/ 928.57
7	DINING TABLE	MELAMINE	METALIC	BLACK	1.10	1.10	0.75		Circular dining table with caramel Pelíkano melamine and baked black iron base	1	UNIDAD	JULIO RODRIGUEZ	S/ 900.00	S/1,285.71
8	SOFA	WOOD	WOOD	GREY	0.65	0.57	0.35		3-seater sofa in light gray fabric. Natural wood structure in black color	1	UNIDAD	DECORAS MUEBLES	S/1,950.00	S/2,785.71
9	SOFA	METALIC	METALIC	GREY	0.53	0.50	0.70		Sectional sofa upholstered in gray with metal legs. Mático catalog fabric	4	UNIDAD	GABY	S/2,033.90	S/2,905.57

Figure 7. Project Database

5.4 Validation

In order to investigate the temporal discrepancies between the present project timelines and the anticipated timelines derived from the modeling, a simulation pertaining to the design of the initial proposal will be carried out in Arena. The random variables listed in Table 1 and their corresponding distributions were used for the simulation development. With the help of this method, it was able to produce outcomes that were quite similar to reality and evaluate how well the process worked after the standardization improvement was implemented. The simulation model developed in Arena is presented below in Figure 8.

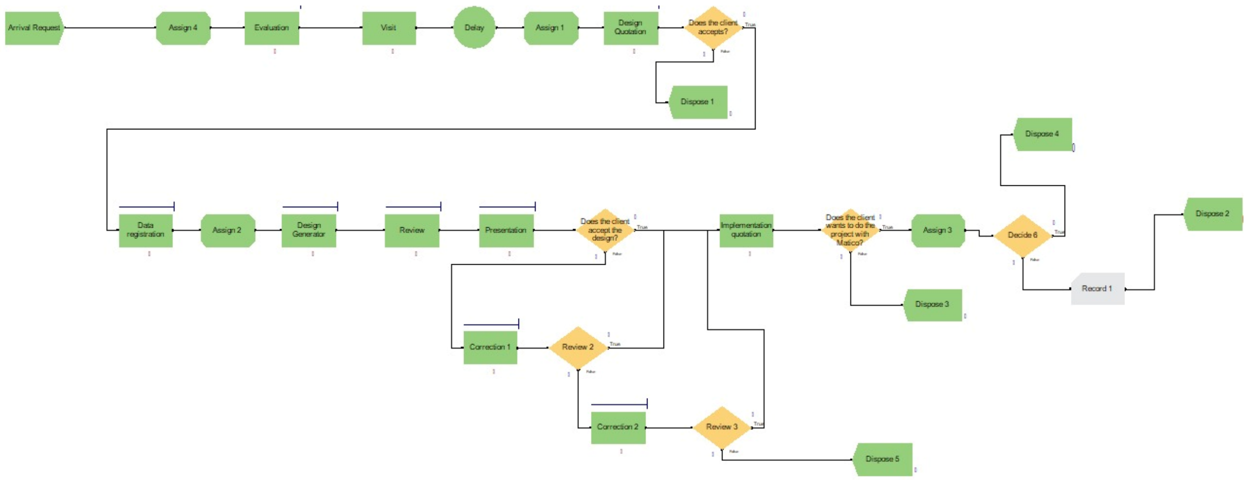
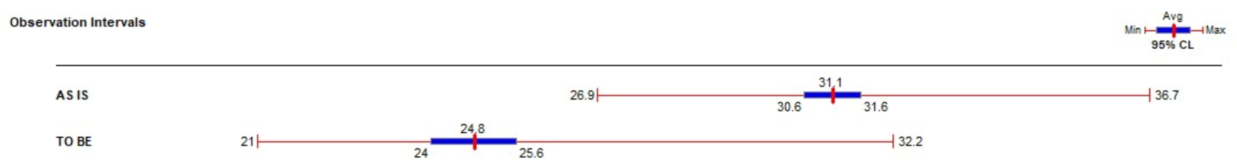


Figure 8. Arena Simulation Model

The model was run with 50 iteration over the course of a calendar year, giving us a sizable sample for outcomes that are more in line with reality. The Output Analyzer tool in Arena was used after simulations comparing the current model to the improved model. The behavior of the TOTAL TIME variable for both the current and the suggested processes as they are run through the Output Analyzer is shown in the image below on Figure 9.



Classical C.I. Intervals Summary

IDENTIFIER	AVERAGE	STANDARD DEVIATION	0.950 C.I. HALF-WIDTH	MINIMUM VALUE	MAXIMUM VALUE	NUMBER OF OBS.
AS IS	31.1	1.79	0.508	26.9	36.7	50
TO BE	24.8	2.7	0.769	21	32.2	50

Figure 9. Output Analyzer

With the help of this tool, it was possible to measure a variable's behavior over the course of the entire procedure with a 95% confidence interval. The total sales process time was the chosen variable, and the improvement showed a reduction of 6.3 days, or 20.25%, in the total process time.

Regarding the authors that served as reference for the study, some points were found that coincide with the conclusions of other studies. The project is specifically based on research on companies in the service sector that use process simulation to reduce processing times. According to Kusrini et al. (2019), there was a 16.25% decrease in uptime, i.e., 136.36 minutes less. Hidayati et al. (2019) have conducted a relevant study suggesting a new business process that decreases the number of activities from 21 to 14 and processing time from 8 to 4 days. Their findings show a staggering 50% decrease in total processing time. In comparison, our study shows a 20.26% reduction.

The overlap between these investigations and ours reveals shared themes in the quest for process optimization in the service sector. Although each study takes a different approach, together they highlight the importance of streamlining tasks and shortening processing times. Based on these observations, our study contributes to a 20.26% reduction in process duration. Respect to the limitations that might emerge during the use of the suggested approach, staff members are needed for the duties of collecting and analyzing data as well as creating different standardization recommendations for the business. Employees must also receive training in order to guarantee teamwork and adherence to particular policies intended to achieve process uniformity, which is also known as a work philosophy.

The process of developing standardized processes becomes much more difficult in the absence of this practical approach. Finally, by focusing on a relatively new service in the area, the current research significantly advances the field. The proposed methodology is relevant due to the limited availability of information about this particular service. Depending on the intended focus, businesses in different industries or within the same industry can use this methodology. In terms of the outcomes attained, they provide insightful information on the present difficulties encountered by the industry, suggesting significant importance for industry decision-making and ongoing development.

6. Conclusion

After the research work, it can be concluded that the engineering tools, in order to be used correctly, must follow a methodology, so that better results can be obtained in their use. In the case of the present research, the flow diagram of the sales process was elaborated to determine how the process was structured and to proceed to the analysis, then information was collected on the times and the Value Stream Mapping was assembled to identify the main problems of the sales process. Then, the quotation process with suppliers was deepened and the sub-processes of this process were identified to find the critical path with PERT-CPM, and then find the bottleneck. The problem was attacked by standardizing the process through the creation of a furniture quotation database. It should be noted that this required the identification of repeating patterns in the database, the grouping of this furniture and thus the standardization plan. Finally, with the improvement proposal finalized, we proceeded to perform a simulation of the sales process in Arena, where a reduction of 20.26% in the total average time of the sales process would be achieved. This shows that by using the engineering tools in the right way, results can be obtained, giving an important value to the research.

In this research it was found that the main delay in the sales process was in the quotation with suppliers, being more specific the quotation of furniture, and it can be concluded that the standardization of processes is key to optimize times, especially in small and medium enterprises (SMEs) in the service sector that generally do not have standardized processes. In the service sector, standardization makes it possible to optimize the sales process by guaranteeing quality and consistency in the provision of services, in this case ensuring that delivery times are shorter, thus achieving a faster sales opportunity and freeing up resources to prioritize other tasks. It is concluded then that with the application of these lean tools, in the sales process of a company in the service sector, it will be possible to easily identify which is the deficient process, then provide a proposal for improvement to the observed problem, and finally implement this solution to optimize the process. In this way, it will be possible to generate greater profitability, reduce costs or increase the company's profits.

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Biographies

Alonso Parodi graduated from the University of Lima with a bachelor's degree in Industrial Engineering in 2023. He has experience in the commercial sector and is currently employed in this field. He is interested in developing data-driven commercial strategies and finding solutions to new challenges in the industry.

Sergio Montañez graduated from the University of Lima with a bachelor's degree in Industrial Engineering in 2023. He is currently involved in resource management and has experience in both the commercial and logistics sectors. He has a strong interest in business intelligence and data analysis.

Rafael Chavez-Ugaz PhD (c) from Universidad Pablo de Olavide, Spain. Masters in strategic business administration from CENTRUM Católica, Peru. MBA in General and Strategic Management from Maastricht School of Management, Netherlands. Industrial Engineer from Universidad de Lima, Peru. Executive with experience in service, pharmaceutical, and telecommunications companies, in commercial, quality, and operations areas. Consultant specialized in strategy and business improvement. Associate professor with 18 years of experience in Engineering and Business.