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Standardization of procurement and contracting processes for companies in the telecommunications sector

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ABSTRACT: *In Colombia, in the telecommunications sector, the organization in which the research was carried out, underwent rapid growth due to the increase in the needs and requirements of customers in terms of scale and frequency, which caused a focus on solving these requests generating a gap between the activities carried out in the field and the documentation. In this way, the company began a project with the Universidad Libre for the standardization of the purchasing and hiring processes to reduce time, rework and bottlenecks. Different engineering tools were used to obtain the primary information and then analyze it. With this, the action plan and the document delivery schedule were drawn up together with the board of directors, once these were approved a time study was prepared in which a reduction of 5 days in total was evidenced for the main sub-processes that executed the new documentation. Subsequently, an impact analysis was carried out which reflected a cost greater than $80,000,000 from the inherent risks of the old methodology, checking thus the influence on the performance of the area and company of the study developed.*

KEYWORDS: *Documentation, Hiring, Standardization, Purchasing, Processes.*

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I. INTRODUCTION

The exponential growth experienced by the organization in recent years and the great economic movement that took place during this time forced a greater importance to the resolution and fulfillment of the requirements for the client, thus promoting the updating of the processes in practice in search of a prompt response to the requests that were constantly and progressively presented with increasing scale and requirements. Due to the increasing level of work the company proposed a restructuring to expand its plant capacity and thus solve requests in a better way.

At this stage the board of directors realized the existing gap between the documentation and the operations that were being carried out, consequently, it explored the possibility of updating the documents as a resource to eliminate it. This methodology began mainly with the objective of improving critical activities for the company, however, due to the periodic change of the directive line in view of the reorganization of the business and the interrelation between areas it could not be completed in a functional way.

Aware of the direct relationship between departments, the firm created an orderly plan to mitigate the gap in a transversal way, including all the areas and tasks that comprised it. In this way a partnership was established with the Universidad Libre in order to document all of the procedures of the different sections such as Logistics, Human Talent and Supply.

In this way, the authors were linked to the standardization and documentation related to supply with the aim of improving and speeding up the development of the different activities in purchasing and contracting fundamental components in the optimal functioning of any association, noting the impact on the decrease of times, reprocesses and increased productivity.

II. METHODOLOGY

Diagnosis

From the beginning and together with the company, the need for a qualitative approach in the project was raised. Considering that previously documentary exercises had been carried out without direct interaction with the area officials which caused them not to achieve the expected results. The board of directors established the guideline of knowing first-hand the criteria of each one of those in charge of the different departments and transferred this task to the researchers, thus examining a technique that will provide human capital with an environment that would allow "direct conversation, but it is for a different purpose" [1] which was to obtain first-hand information regarding the different tasks of the process.

Considering that the interview "is a technical instrument of great utility in qualitative research, to collect data" [2] it was defined as the first mechanism and the one that would lay the foundations of all the methodology that would be carried out once clarified to each member of the department the form for its development. The tool was developed, in the first component the basic information of each worker was recorded, then standardized questions were formulated to each one such as: What are the critical tasks of their position? What do you consider to be the main bottlenecks? What functions do you consider unnecessary in your job? To later offer a free and confidential space in which they could express any concern or concept regarding the area, responsibilities, employees, occupations or other factor related to their activity.

Counting on all the information that was obtained and with the help of a flow diagram, "the steps that were followed in each task from the beginning to the end" [3] were represented. There was a continuous diagnosis with a weighting of the problems found in order to generate an action plan to classify and solve the greatest influence in an organized way using the Vester matrix "one of the most used and important techniques for prioritizing problems within a group of them" [4] and that also "allowed correlation between each other and identifying the impact of one on the other "[5], this tool was used confronting the possible causes against the difficulties found on an impact scale of 1 to 3.

Once the setbacks were prioritized and listed with their possible reasons, a cause-and-effect diagram was drawn up. This "quality tool allowed us to analyze all the factors involved in the execution of the different functions and visualize the root causes of the different problems" [6] based on the information obtained in the previous matrix, it presented to the company in graphical and simpler form the opportunities for improvement.

Finally, with the priorities established, a characterization was developed. This tool facilitated "the description, management and control of the processes through the identification of their essential elements" [7] delimiting all of the information previously obtained and classifying it in "their requirements, its main actors, clients, the products it generated, as well as the control mechanisms" [8] With all the tabulated data the development of the documentation and the work schedule were programmed.

Delimitation of current documentation

The development of the different flowcharts based on the information obtained in the interviews of the real practice carried out by the officials allowed "to represent the sequence of activities in each task" [9] and to refine the procedures and formats that were anachronistic or not used as well as those of greater urgency due to their continuous use. The outdated methodologies and the respective adjustment were then validated with the members of the dependencies so that they were functional again.

The documentation that was in disuse had to be elaborated again through the debate that was a "very useful tool to transmit knowledge, exchange points of view and, ultimately, enrich critical capacity" [10] was established with those in charge of the divisions, the focus that the new guide should have, the proposals of each member of the area, the elements that should be brought from the previous version and the new components. Finally, in conjunction with the department the virtual tools and the use that were made of it were checked.

All this information enabled the development of the action plan as well as the work schedule, "a record that showed in an orderly manner the different tasks and milestones, the precedence and precedence relationships between them, their duration, the beginning and end of the project" [11]. This giving a clear roadmap to the organization of the documents at that time, their status, the new proposal and the periods in which the new version would replace the previous one.

Establish roles and responsibilities

Counting on a clear visual of the documentation and with the help of human capital, the scope and responsibilities for that time of both the department and each official were defined in addition to the specific tasks in which other areas were linked, clarifying the inputs and outputs for the employee's processes.

Subsequently, with each employee the non-conformities and suggestions regarding the individual and global functions and obligations of the supply work were established to "enable in-depth understanding" [12] of the area's activities.

Finally, through a flow chart with the new ways in which the processes would be carried out, "an organized and clear document was delivered, to control quickly" [13] to the activities in the department below. Each one of these steps was established in detail by means of a document that contains the table of activities of the agency and of each member which specified the scope, duties and functions in accordance with the new methodology.

Control and measurement tools

Together with the area officials, the critical processes and activities that should be subject to evaluation were defined, as well as the rubrics and units of measurement for the generation of the indicators. The method of delivery and preparation of the reports was established in addition to their periodicity and registration for historical control reaching the resolution that in order to be easy to use said indices should be as far as possible, within the same documents or formats.

In this way "data was collected, organized and related so that a quick search could be made" [14] within the critical sections that stored more information, thus developing a format for the simpler reevaluation, which allowed generating the concept and storing of the results of different providers. A matrix of requirements was also renewed in the document for the evaluation that "allowed to align the needs of the project with the objectives described in the scope of each request." [15] Finally, the traceability matrix the company had was updated to respond to the needs of this new methodology.

Time analysis

Once all the new accepted documentary proposal was available, a study of the period in which each activity was carried out was undertaken in to "establish a durability standard to perform a specific task based on the measurement of the content of the work of the prescribed method" [16]. Considering that despite being approved it was not in full application and due to the global condition caused by the COVID-19 pandemic, it was sought to develop this analysis through the methodology of time with experts.

For this methodical tool, forms were developed to "record a large amount of data, both the times and the observations that the technicians or officials could present" [17] in which the average intervals that were handled in each of the activities that made up each thread.

After receiving all of the records filled out by the specialists and those in charge of the area, all the data was tabulated leaving the same unit of measurement and the standard for each function. The process and macro-process was defined, then a comparison was made in which it verified the numerical and percentage difference of the cycles managed by the company with respect to the calculated standard time which allowed defining the influence of the new proposed methodology on the duration of each individual and global task.

Impact evaluation

After completing the documentation, a study was started to determine the importance of this project culminating in the operation and performance of the company, under the guidelines of a Pareto analysis, a prioritization diagram was developed to "organize the different problems, based on the weighting of its impact on the area" [18].

Next, the different internal and external methodologies that were used at the time in which the previously listed difficulties arose and the department officials involved in each of them were established, then the average income of a professional in each of the positions of the division in order to make a cost estimate of the effect that appear if any inconvenience was generated.

Finally, the company was given a graph that allowed visualizing the weight of each of the mitigation tools in the different impediments that could arise and their economic influence through a matrix that "agreed on the local position and the specific performance of said activities with the strategic purposes of the area"[19] in relation to the listed risks, an order of prioritization of the processes that allows, in the event of a new reorganization or exposure to a new problem to facilitate the preparation of an action plan that provide an agile response.

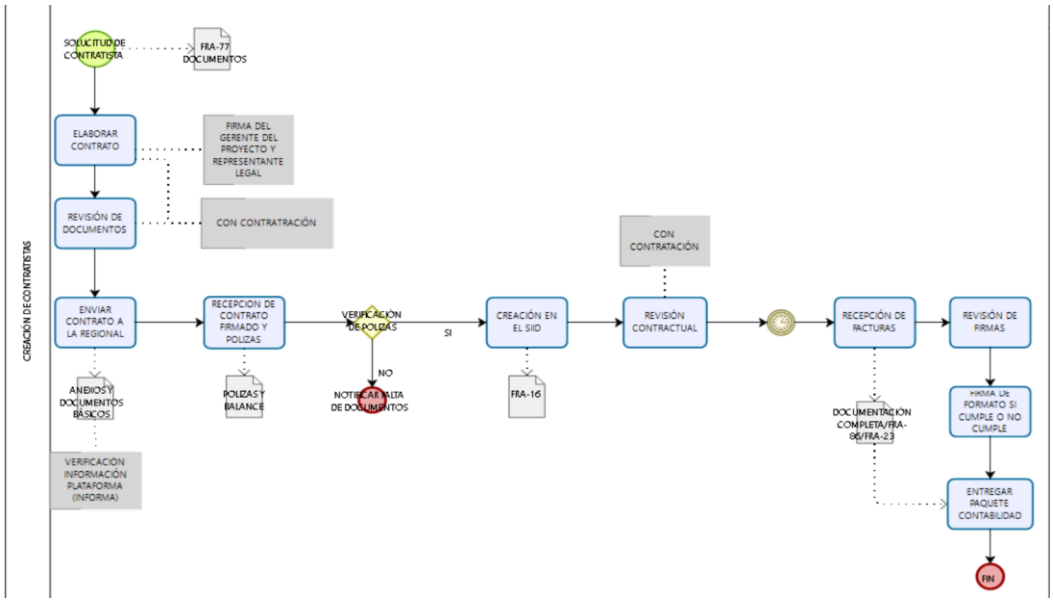
III. RESULTS

In a growing company that has branches throughout the country it is normal not to give importance to small reprocesses or unnecessary activities and the costs that they entail. In the short term this cannot mean much in organizations that handle high Capital sums, however, were observed as within a long timeline this can represent significant value.

In the diagnosis to define the current situation of the company through the direct conversation that facilitated the interview, "meanings, conclusions from heterogeneous data and qualitative criteria were extracted" [20], which allowed a more assertive approach and greater coverage. After the documentation, and

based on the tabulation of this information, diagrams of the process flow were elaborated in the real practice carried out at that time. (See Fig. 1)

Fig 1. Old process of creating contractors



Source: The authors. 2019

This diagram allowed "to identify activities without added value to improve the final performance" [21], subsequently and recognizing the current state of the functions that were carried out. Ten problems that directly affected the tasks were identified. They were prioritized and reflected through a Vester matrix in which "through a series of rows and columns it showed both horizontally (rows) and vertically (columns) the possible causes (variables) of the different problem situations" [22] (See table 1).

Table 1. Vester matrix. Prioritization of identified problems

CÓDIGO	PROBLEMA	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	TOTAL X
P1	Falta documentación de algunos procesos y procedimientos.	0	3	2	3	2	2	3	2	2	2	21
P2	Los pocos procesos y procedimientos que están docuentados no se cumplen correctamente	2	0	2	3	1	3	3	2	3	1	20
P3	No existe un plan de compras actualizado que puedan seguir los integrantes del área	3	2	0	3	2	2	1	2	3	2	20
P4	No hay un manual de funciones ni de procesos actualizado	3	3	2	0	1	2	2	3	2	1	19
P5	Falta más comunicación con todas las áreas de la empresa, especialmente con el área de logística.	2	2	1	2	0	1	2	2	3	1	16
P6	No se respetan los tiempos de pedido lo cual atrasa el proceso de órdenes de compra	2	3	3	2	1	0	1	3	3	2	20
P7	No hay una documentación estandarizada en los procecos de contratación	3	3	1	1	1	2	0	3	1	2	17
P8	Tienen varios procesos que se repiten lo cual hace que los trámites sean poco eficaces	2	2	2	3	2	2	2	0	2	1	18
P9	No hay control total de la manera en la que las órdenes de compras son recibidas	2	2	3	1	1	3	2	2	0	2	18
P10	Solo hay un encargado de las actividades, lo cual hace que las funciones no sean claras para todos los trabajadores	2	1	3	1	1	3	1	2	2	0	16
TOTAL Y		21	21	19	19	12	20	17	21	21	14	

Source: The authors, based on information provided by the company. 2019

Based on this, a scatter plot was generated to classify the different difficulties found in: Liabilities, assets, indifferent and critical. In these processes, it was observed that most of the problems were in the critical category which caused the procedures to be delayed and the personnel in the area to be overloaded with work.

Fig 2. Vester Matrix

Source: The authors, based on information provided by the company. 2019

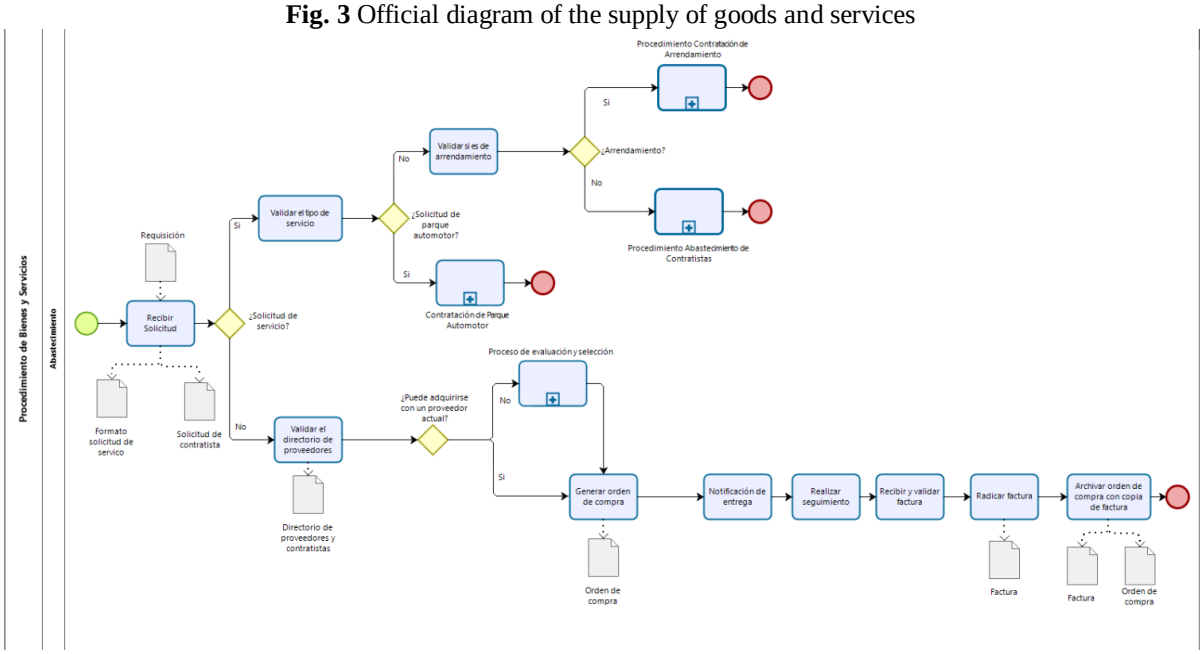
It was evident in the matrix that the main difficulties were the lack of and non-compliance with the existing documentation, the lack of clarity in the definition of the scope regarding the positions and processes of the company related to the codes "P1", "P2 "," P3 "and" P4 "in addition to the lack of a filter by the purchasing process for the receipt of purchase orders" P9 "and the ignorance of some people in charge of other processes in relation to the required periods" P6 " which resulted in the main problem facing this area.

With the results of the Vester tool and all the information analyzed, a general summary of the purchasing and contracting problem was prepared using an Ishikawa diagram.

This diagram allowed “a glimpse of the problem at different levels: from small, low-impact failures to serious obstacles that can severely affect operation” [23], identifying problems such as communication between areas, the response times of the different officials involved, ignorance, non-compliance or undocumented activities. As well as processes related to the fundamental evaluation to mitigate the difficulties.

Once there was a clear overview of the different problems and their possible causes, the order of delivery of the documentation according to its priority and the methodology by which the documents would be presented, reviewed and approved, began with the preparation of the flowcharts for each sub-process according to the new proposal. (See Fig. 3)

Fig. 3 Official diagram of the supply of goods and services



Source: The authors. 2020

Subsequently, once all the diagrams approved by the company and the project director were available, official documents were prepared through virtual sessions with the area officials to define the details of each specific activity in the process, its inputs, outputs, responsible and time. Under the guidelines of the schedule, the different documents of the new proposal were presented and approved. Some were put into effect and practice.

Once the documentary section was concluded, the analysis of the influence of the project on the performance of the company began. In this way "the study of times allowed to determine with the greatest possible accuracy, the time that should be assigned to an official knowledgeable about his work to carry out a certain task "[24]. In this way two duration measurements were carried out with experts in the area in different companies. (See table. 2)

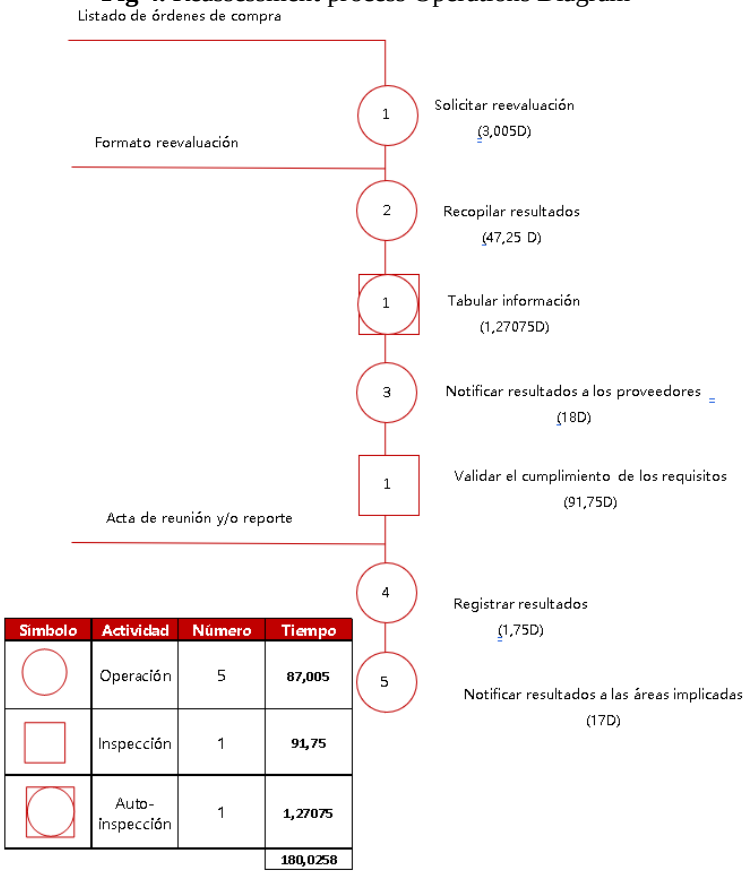
Table 2. Time taken for the procedure for supplying goods and services expert 1

Abastecimiento de Bienes y Servicios Experto 1		
Actividad	**Días**	**Comentario**
Recibir requisición	0	Momento "0" del Ejercicio
Validar directorio de proveedor	0,5	Tiempo promedio asumiendo que es un bien o un servicio básico o de bajo valor
Generar orden de compra	1	
Realizar seguimiento	1	
Recibir y validar factura	0,5	
Radicar factura	0,5	
Archivar orden de compra y factura	0,5	
SUMATORIA EN DÍAS	4	

Source: The authors. 2020

Based on this information, operations diagrams were made for each of the procedures of the purchasing and contracting units identifying the operation, inspection and self-inspection activities. Subsequently, the standard times for each activity were located, which were calculated considering the estimates of the specialists and the organization. (See Fig. 4).

Fig 4. Reassessment process Operations Diagram



Simbolo	Actividad	Número	Tiempo
	Operación	5	**87,005**
	Inspección	1	**91,75**
	Auto-inspección	1	**1,27075**
			180,0258

Source: The authors. 2021

With all this tabulated information, the difference in relation to the standard time for the different processes was analyzed according to the measurements given by the experts and those in charge of the area (See tables 3 and 4).

Table 3. Time analysis. Supply of Goods and Services

Bienes y Servicios								
Actividad	**Empresa**	**Experto 1**	**Experto 2**	**Promedio**	**Tiempo estándar**	**Diferencia Empresa**	**Diferencia Experto 1**	**Diferencia Experto 2**
Recibir requisición	0,83	0	0	0,27666667	0,415	0,415	-0,415	-0,415
Validar directorio de proveedor	0,0067	0,5	0,0067	0,17113333	0,130025	-0,123325	0,369975	-0,123325
Generar orden de compra	0,01	1	0,0033	0,33776667	0,255825	-0,245825	0,744175	-0,252525
Realizar seguimiento	0,83	1	5	2,27666667	1,915	-1,085	-0,915	3,085
Recibir y validar factura	0,013	0,5	0,0033	0,1721	0,132325	-0,119325	0,367675	-0,129025
Radicar factura	0,42	0,5	0,0033	0,30776667	0,335825	0,084175	0,164175	-0,332525
Archivar orden de compra y factura	0,21	0,5	0,042	0,25066667	0,2405	-0,0305	0,2595	-0,1985
					3,4245			

Source: The authors. 2021

Table 4. Time analysis. Evaluation and Selection

Evaluación y Selección								
Actividad	**Empresa**	**Experto 1**	**Experto 2**	**Promedio**	**Tiempo estándar**	**Diferencia Empresa**	**Diferencia Experto 1**	**Diferencia Experto 2**
Recibir solicitud	0,042	0	0	0,014	0,021	0,021	-0,021	-0,021
Validar solicitud	0,21	3	0,021	1,077	0,86025	-0,65025	2,13975	-0,83925
Comprobar si es un proveedor o contratista nuevo	0,0067	1	0,0033	0,33666667	0,254175	-0,247475	0,745825	-0,250875
Establecer si es un bien o servicio crítico	0,033	1	0,0033	0,34543333	0,267325	-0,234325	0,732675	-0,264025
Realizar cotizaciones	1	7	0,083	2,69433333	2,27075	-1,27075	4,72925	-2,18775
Realizar el comparativo	1	2	0,0067	1,00223333	1,001675	-0,001675	0,998325	-0,994975
Solicitar documentación	1	1	1	1	1,000	0	0	0
Evaluar al proveedor o contratistas	0,028	3	0,083	1,037	0,78475	-0,75675	2,21525	-0,70175
Seleccionar al proveedor o contratistas	0,028	1	0,0067	0,3449	0,265675	-0,237675	0,734325	-0,258975
Registrar al proveedor o contratistas	0,042	2	2	1,34733333	1,021	-0,979	0,979	0,979
					7,7466			

Source: The authors. 2021

It was concluded that critical processes such as, for example: supply and the evaluation and selection of suppliers which were prioritized in their documentation and implementation presented a positive difference in relation to the standard time. However, the activities that did not implement the new documentation in its entirety had a negative difference (See table 5).

Table 5. Time analysis. Automotive Park

Parque Automotor								
Actividad	**Empresa**	**Experto 1**	**Experto 2**	**Promedio**	**Tiempo estándar**	**Diferencia Empresa**	**Diferencia Experto 1**	**Diferencia Experto 2**
Recibir solicitud	1	0,21	0,4	0,53666667	0,6525	0,3475	-0,4425	-0,2525
Buscar vehículo	8	0,042	1,5	3,18066667	4,3855	3,6145	-4,3435	-2,8855
Solicitar documentación	1	0,21	0,34	0,51666667	0,6375	0,3625	-0,4275	-0,2975
Validar documentación y seleccionar vehículo	1	0,21	0,33	0,51333333	0,635	0,365	-0,425	-0,305
Revisar y seleccionar vehículo	1	0,21	0,33	0,51333333	0,635	0,365	-0,425	-0,305
Contratar vehículo	3	0,21	1,5	1,57	1,9275	1,0725	-1,7175	-0,4275
Activar en plataforma	1	0,01	0,5	0,50333333	0,6275	0,3725	-0,6175	-0,1275
Confirmar contratación	1	0,01	0,1	0,37	0,5275	0,4725	-0,5175	-0,4275
					10,028			

Source: The authors. 2021

The difference was established for each macro-process in which it was observed that the development of the new documentation favored the reduction of times in relation to the processes that had all the implemented methodology (supply and supplier evaluation) which suggested that once the entire new proposal is fully developed this positive difference will be transferred to all processes, generating a greater and better influence (See table 6).

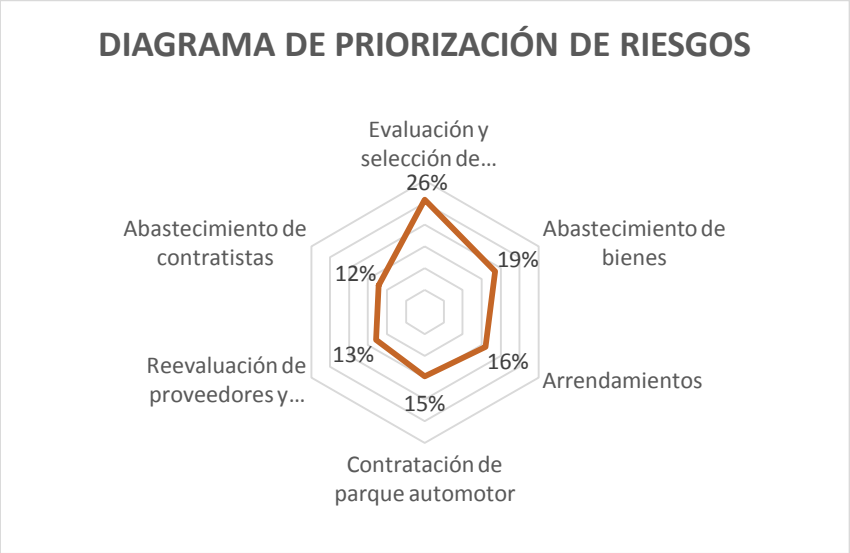
Table 6. Difference between time in standard days of each Company procedure, experts and the average time of each process

Procedimiento	Empresa	Experto 1	Experto 2	Promedio	Tiempo estándar	Diferencia Empresa	Diferencia Experto 1	Diferencia Experto 2
Bienes y servicios	2,32	4,00	5,06	3,79	3,42	-1,10	0,58	1,63
Evaluación y selección	3,39	21,00	3,21	9,20	7,75	-4,36	13,25	-4,54
Reevaluación	246,05	23,00	205,17	158,07	180,07	65,98	-157,07	25,10
Parque automotor	17,00	1,11	5,00	7,70	10,03	6,97	-8,92	-5,03
Contratistas	22,37	31,00	0,23	17,86	18,99	3,38	12,01	-18,76

Source: The authors. 2021

Following the time analysis, an "impact analysis was developed to identify the potential consequences of a change and help the organization to make informed decisions" [25] in this way after a risk definition matrix and under the guidelines of a Pareto analysis was prioritized and analyzed the behavior of the areas against the possible difficulties that could arise (See Fig. 5).

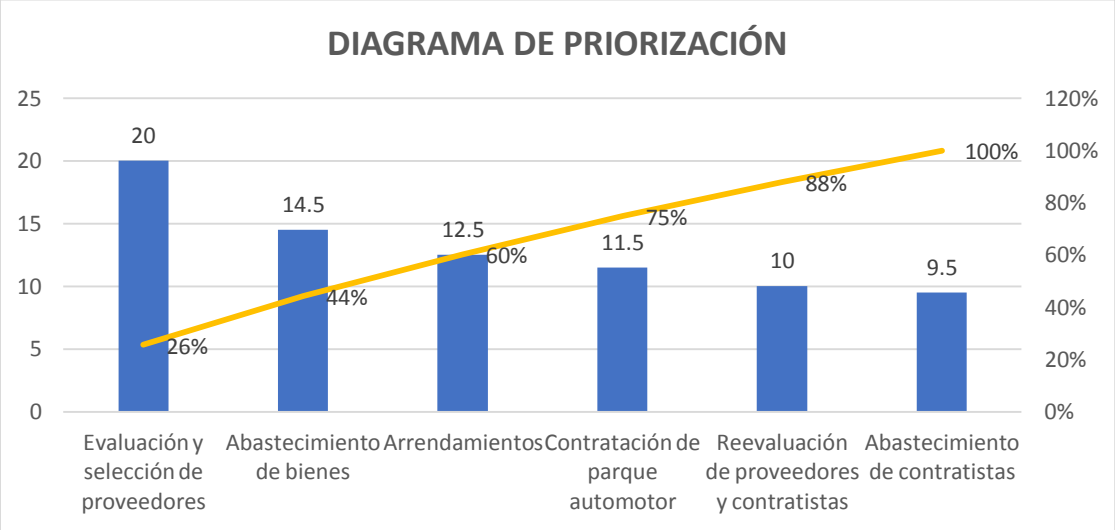
Fig 5. Area behavior graph



Source: The authors. 2021

It was observed that according to the previous analysis and results, the evaluation of suppliers, the supply of goods and the leasing of real estate were the components with the greatest repercussion in the face of the inconveniences since these are the most recurrent for the development of commercial activity of the company and considering that during the progress of the documentary development it was demonstrated that in these and the other procedures there was no official and / or updated documentation. A diagram was elaborated that established the fundamental areas to work in case of a new reorganization or problem. (See Fig. 6)

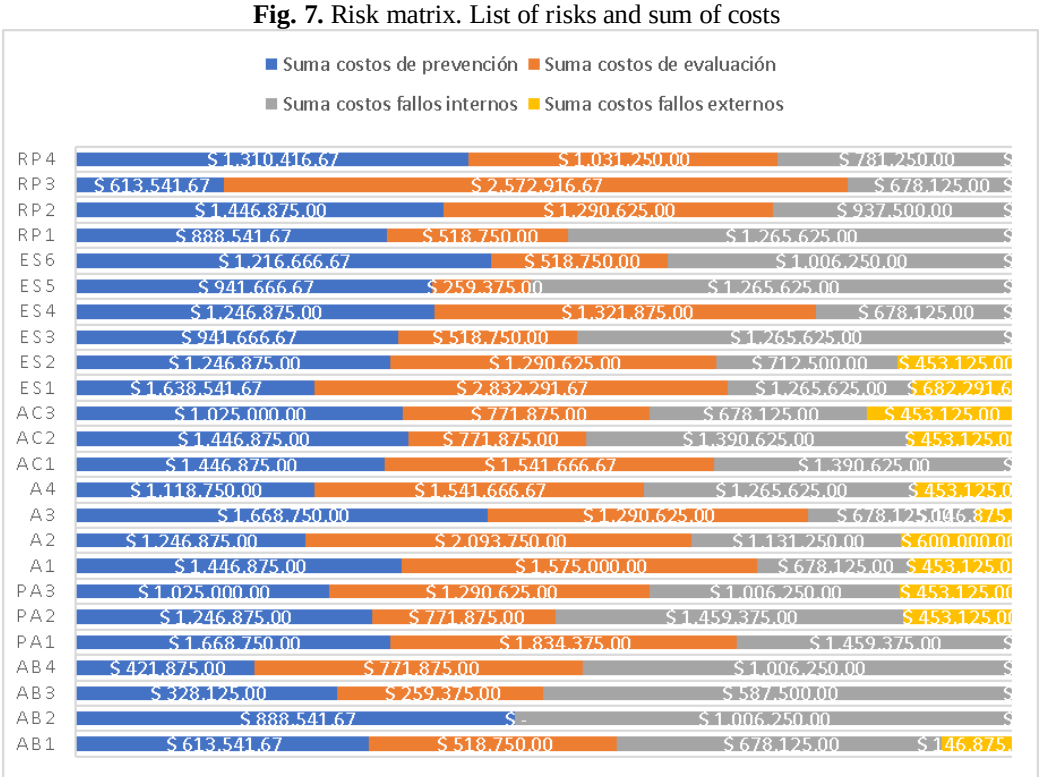
Fig. 6. Process prioritization graph



Source: The authors. 2021

Finally, taking all the information from the different quality tools, matrices and graphs used for the correct diagnosis and mitigation of the department's difficulties, a cost analysis was used "to evaluate the profitability of the benefits (company profits) versus the cost (problems) in the project proposal" [26] Due to the critical information and the confidentiality of the company, the net profit generated by the company was not provided (See Fig. 7).

Fig. 7. Risk matrix. List of risks and sum of costs



Source: The authors. 2021

The transversality of the goods supply processes in all types of organizations was evidenced and as these are the main component for proper performance the greater importance of mobilization for a company whose commercial activity is the assembly and provision of services for the installation of mobile and / or electronic devices. In addition to the direct relationship between the level of independence of the areas and the results of the company compared to processes or activities that require agile and direct interaction between the different divisions.

The project carried out not only reduced costs greater than $80,000,000, but it also reduced times by a total of 5 days for the critical processes that were developed under the new methodology. It allowed greater clarity of the functions of the supply area, eliminating unnecessary tasks that generated reprocesses or bottlenecks, have an easier way to evaluate performance and record historical behaviors, as well as establish a map that allows a timely response to problems that may arise.

The linkage of human capital during this project allowed to give a response of greater coverage to the problems that arose since there was an administrative approach as well as an individual one. In this way it was possible to improve the flow of information, reducing the accumulated workload and the normal stress of the exercise of their functions causing better performance.

IV. DISCUSSION

In contrast, the project carried out by Risco and Quintanilla in the "Standardization of processes to improve productivity in the supply area of the Neovet S.A.C. Callao 2017" [27] presents a more quantitative approach. The organization of its analysis was in a growth stage however, it presented reprocesses, bottlenecks and excess time in the development of its activities because the methodology of the area did not it was standardized.

The authors through direct observation, collected and analyzed the primary information then they generated a dependency organization chart and flow charts for each sub-process. In contrast, in the present project where the interview was used as the basis for the first data analysis, flow diagrams were designed, in addition to the Vester matrix and the Ishikawa diagram to define and prioritize the risks in each department. The importance of the flow chart is evident as a fundamental tool for the diagnosis of a process, however, due to the need for a greater qualitative approach, more emphasis was placed on closeness with officials for the collection and analysis of the base information.

Once the primary information was processed, the authors carried out an activity similar to that elaborated in this project, delimited the documentation handled for that moment prior to the new proposal, later, the efficiency and effectiveness of the orders was calculated, and a time analysis was carried out for define the model interval through the methodology of return to zero and the activity diagram. Due to the global condition owing to the COVID-19 virus in the present study the duration on site was not calculated. The time technique with experts allowed to establish the standard cycle in a virtual way and by means of a comparison the state of the organizations was determined, both the one studied and that of the specialists. This generates a benchmarking approach when analyzing the behavior of the organization compared to others.

Finally, for the evaluation of the impact in Neovet SAC the calculation of efficiency and effectiveness, the activity diagrams and the study of times with return to zero were elaborated again to establish the difference in duration and number of orders placed successfully. In contrast, in the impact analysis developed, the difference in the company's cycles compared to the standard calculated with the estimates of the experts and a cost analysis was verified through a PEF matrix, prioritization matrix and inherent risk matrix, which allowed to give an economic estimate considering the possible causes of each risk through an organized list. This study made it possible to give a value for both the economic effect and the time effect in the event of various difficulties in the operation.

V. CONCLUSION

Companies that experience exponential growth in a relatively short period of time may be overwhelmed by the new demand generated, being absorbed by it and isolating other relevant aspects.

The supply and supplier evaluation processes, due to their great transversality and significance, represent a fundamental component in the correct performance of organizations.

Linking human capital in restructuring processes is key to giving a broader approach to the different problems and thus providing responses with greater coverage and impact.

Reprocesses, unnecessary activities, bottlenecks and the lack of knowledge or involvement of human capital on a smaller or larger scale may not appear to be a significant cost in the short and medium term, however, in the long term they represent a critical component.

Organizational culture is an undervalued component in relation to its influence on the performance of a company since poor communication or interaction between related areas can extend processes over time to underestimated limits.

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