Integrated Lean-BPM Service Model to Reduce Lead Time of Incorporation of New Employees in a SME of HR Services

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***Abstract*– The sector of services provided to companies is in a constant search for continuous improvement mainly due to problems presented in the performance of processes, quality of service and time management. The latter is a fundamental piece since the shortest time is always sought in hiring new collaborators to have greater flexibility and maintain a good relationship with customers, achieving a better competitive advantage. Therefore, the integrated Lean-BPM service model is proposed, which aims to reduce the lead time of new employees that is currently 6.22 days generated by poor time management. The mentioned model uses the following tools: standardized work, visual management, business process management and Kanban board, which are adjusted to the identified problems according to the literature review. After applying the method, a 12.88 % reduction was obtained to maintain the efficiency of the integrated model, and the improvement was confirmed by simulation, and similar results were obtained.**

Keywords—Lean, BPM, Lead Time, Kanban, Standardized work, Human Resources Services.

I. Introduction

At the Latin American level, the sector of services provided to companies is in constant search of continuous improvement, on improving service operations performance and service quality [1]. This research seeks to reduce the lead time of the incorporation of new employees, since poor time management in the processes can generate loss costs for said economic sector. In the case of Peru, the service sector provided to companies contributes 1.69% of the national GDP, and the service sector, in general, is the one that has generated the most jobs [2]. Additionally, within the business services subsector, administrative and support services activities showed a 3% growth compared to the February 2019 period [3]. However, by the end of the first semester of 2020, the activities of administrative and support services contracted by 30.46%, this is due to the restrictions that were presented and the lack of adaptation from face to face to virtual processes the companies themselves [4].

Some of the problems mentioned have been identified in another research. Such is the case of a construction company in England mentioned in [5], which had undergone significant expansion over the last 10 years, so it needed to measure and improve its processes to improve its competitive position. To analyze the existing processes, an understanding of how the current processes were performed was needed, which would be achieved through process maps or models, since these provide a means of communicating functions in a way that is more easily understood by people.

Therefore, this shows that the companies in the sector present issues that don't allow them to continue taking advantage of the continuous growth that they have presented over time.

Some problems identified according to the lack of adaptation in the sector are the following: high lead time in the selection process cycle, low performance in the service process, poor teamwork, no effective communication throughout the process, among others [1]. One of the problems mentioned has also been identified in other investigations from different countries and regions of the world. Such is the case of a construction company in Europe, a meta-analysis of lost time reveals that during the last 30 years almost 49.6% of the time was wasted in activities that do not add value [5]. Likewise, in a hotel company in Prague, a study was carried out to optimize the customer registration process ensuring a high level of services contributed to customers and minimize the time required to handle partial activities, which occurred due to a lack of communication with the client and between workers [6]. As mentioned above, it is shown that companies in the service sector have problems with time management in the various processes they present, so it is important to implement new tools for an optimal solution.

In this context, companies in the service sector must have adequate time management in the processes. For this, a case study was chosen that reflects the problems of the sector concerning the high lead time in the process of incorporating new collaborators. The lost times that were identified in the process are in re-sending a retired candidate, in the inadequate management in the evaluation by competencies, and in the lack of adaptation of the new personnel, which generate monetary losses of 5.67% of the profit net of the case study. Based on the above, to provide a solution to the problems described, an improvement model was developed combining the tools of Standardized Work, Visual Management, Kanban Board, and Business Process Management (BPM), all under the Lean-BPM methodology, it should be noted that these tools will be detailed and justified in later chapters. This model was developed based on the various case studies, with similar problems regarding time, found in the reviewed literature. This research offers a

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new integrated Lean BPM model to reduce the lead time of incorporation of new employees in an HR services SME.

II. Literature Review

The articles included and selected in the literature review are categorized according to the gaps identified by different authors in the high lead time of the processes. The classifications presented in the case studies are as follows:

A. Standardized Work

This tool is well Known and applied in industries that constantly seek continuous improvement, as defined by Liker and Meier [7]. Standardized work is important, especially in a culture of continuous improvement (CI) because it provides the basis for evaluation, which means that future results will improve the standard. In addition, the goal is to write the best currently known method of conducting operation in any workplace, considering occupational health and safety, quality, ergonomics, and accuracy, and then train all the employees [7]. For this reason, in some investigations, it has been possible to verify that this tool and its components were key for the implementation of intelligent technologies, helping to have a better order and that the staff has the proper training to be able to develop the activities more fluently.

However, few articles were found regarding the use of the Standardized Work tool in the business services sector, despite the fact that the improvements of said tool in similar industries had been mentioned. That said, there is a need to validate and spread the use of the Standardized Work tool in the business services sector to optimize and standardize learning processes.

B. Visual Management

Visual Management (VM) applications have become an important lean management practice for continuous improvement and are receiving increasing interest from academics [8]. This tool allows both staff and bosses or managers to have easier access to the different activities and, in turn, to be understandable, thereby also contributing to continuous improvement. Some examples of using the following [8]: flow charts, test and control boards, labels, signs, and signs to reduce quality problems. In the studies that have been able to implement Visual Management, although it could be successfully implemented, it has been possible to identify that there was some type of limitation either due to skills or access to technology or due to lack of training in the management of a software [9]. Likewise, it is advisable to take this tool hand in hand with other lean practices that help reduce the complexity of the procedures and gain experience for better development of Visual Management [8].

However, few articles were found regarding the application of Visual Management in the business services sector, despite the fact that the improvements of said tool in similar industries had been mentioned. That said, there is a need to validate and spread the use of Visual Management in the business services sector to allow easy and quick understanding of the processes.

C. Kanban Board

The Kanban methodology applies to various areas of a company, it is also versatile, and its guidelines follow just in time (JIT) systems. One of its variants is Rolling Kanban which is defined as a visual planning method that depends on the production of product groups and variants, where the preparation time is reduced between products from the same family and at the right time must be considered for the difference between the products of different families [10]. Studies have used this methodology to effectively overcome some significant limitations and problems in the production process [10]. In contrast, others have applied it to improve the performance of the feeding system of a part of production [11]. But both have been able to demonstrate the best time management such as the necessary product sizes per family. With this, it was possible to increase productivity, minimize time, and the staff is better adapted to the rhythm of the companies.

However, few articles were found regarding the use of the Kanban Board tool in the business services sector, despite the fact that the improvements of said tool in similar industries had been mentioned. That said, there is a need to validate and spread the use of the Kanban Board tool in the business services sector to reduce time and improve performance.

D. Business Process Management

At the heart of this discipline are business processes, the coordinated set of activities that people (users) perform to achieve business intelligence and company goals [6]. BPM has been more successful in industrial sectors that process information, even though it emerged from engineering principles [12]. BPM was chosen for ease of representation of processes and accessibility for non-experts [5]. Likewise, this discipline consists of four main components: process strategy, process model, process execution, and process performance [13]. New challenges such as increasing competition and a dynamic environment have been placed on business operations management in companies striving to take part. In this sense, BPM is seen as a stimulating subject for the organization of business processes, managing and creating knowledge as a critical resource for entrepreneurship and modernization in companies [14]. From the initial BPM initiative in some cases, it can be concluded that it was quite useful in identifying the main objectives for improvement, combined with Lean thinking and the implementation of continuous improvement framework [5].

However, few articles were found regarding the use of the BPM tool in the business services sector, despite the fact that the improvements of said tool in similar industries had been mentioned. That said, there is a need to validate and spread the use of the BPM tool in the business services sector to improve business performance results based on design, execution, control and optimization of business processes of an organization.

III. METHODOLOGY

A. Model Basis

This research work is based on Standardized Work, Visual Management, BPM, and Kanban Board techniques through the Lean BPM methodology. This methodology aims to optimize procedures and increase efficiency and effectiveness by constantly improving processes. Likewise, it supports business processes by using methods, techniques, and software in the design, execution, control, and analysis of operations that involve humans, organizations, applications, documents, and other sources of information.

B. Proposed Model

As shown in Figure 1 the development of the proposal begins with the analysis of the problem, in which the following tools are used: Analysis of KPIs, VSM, Pareto Diagram, and a Tree of objectives. This is to measure the current times of the company in the case study, identify problems, raise their root causes, and establish objectives.

Second, an intervention is carried out, which consists of the use of the following tools: Standardized work and Visual management, since the first provides a structure and a standard routine to follow the work, while the second to be able to focus on the most important thing and provide information in real-time. To do this, [8] was taken as a reference, in which these tools are used simultaneously to distribute the workload equitably, assign responsibilities and managers can supervise the process. Subsequently, improvements in the processes will be detailed and implemented using the BPM tool, which aims to provide the best, aggrandized, and complete understanding of these processes and determine problems and deficiencies in the company's operations. For the use of the BPM tool, [6] was taken as a reference, in which it will be modified to reduce the processing time and improve the service level. Finally, there is the Kanban board tool, which allows you to organize in several columns a period in which the activity takes place, such as a day or workweek, as they do in the case of [10], in which preparation times are reduced. In addition, it also has a positive effect on the performance of the process as mentioned in [11].

Finally, the validation will be carried out, which consists of the implementation and re-evaluation of indicators before and after the proposal. In this way we will be able to compare the improvement of the respective KPIs and the impact regarding costs. The mentioned model will be developed in 3 stages according to the methodology used.

C. Model Components

1) Component 1: Problem Analysis

Component 1 is made up of KPIs to measure the company's current situation in the personnel selection process. Likewise, the VSM tool was used to graphically visualize the entire process and identify the activities whose duration times could be part of the problem. Once this tool had been developed, and the process problem identified, the Pareto chart was used to determine the most relevant causes. Finally, the objectives tree defined the evaluation criteria to solve the main problem.

2) Component 2: Intervention

This component includes a standardized business tool application, which aims to reduce the waste of time generated by a poor process structure, implementing a standard routine. The implementation begins with identifying operational failures that occurred in selecting the company for the case study and then standardizing the activities that require more time. Next, the standardized activity is recorded through documents shown in the validation chapter. Finally, the visual management tool is applied to maintain concentration on these standardized activities and to be able to compare the expected performance with the real one.

Second, we proceed to implement the BPM tool, which begins with the modeling of the process for which the Bizagi software is used, which helps us with graphical notation. This part aims to better understand how the current situation works. Afterward, measurement and analysis of the activities are carried out for a subsequent improvement proposal. Then a new proposed model is then implemented, correcting the errors identified in the previous analysis. Finally, an evaluation of

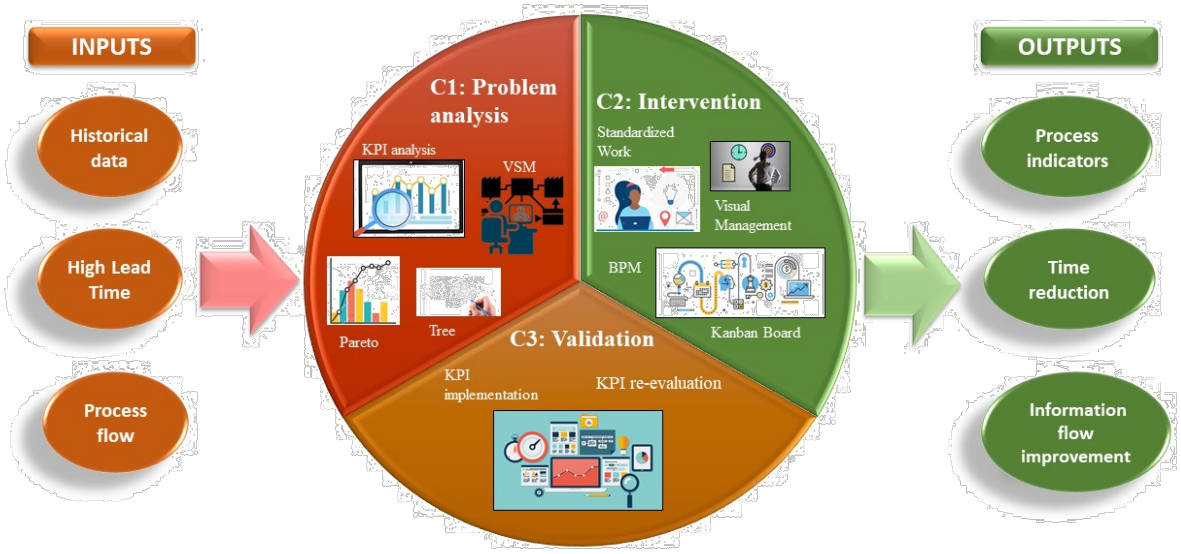

Fig. 1. General view of the Service Model

improvements is made based on KPIs to measure the increase or decrease of said indicators.

Finally, the Kanban board tool is used with the objective of programming familiar processes of the recruitment service to correct the inadequate management of the workload. It is essential to mention that applying the standardization of the process is critical to the Kanban tool to work correctly. The implementation begins with identifying the tasks to be carried out for the incorporation of new collaborators; then a weekly Kanban board is placed to be able to keep a daily control. Subsequently, the results obtained will be evaluated, and the most qualified collaborators will be interviewed to get more precise information. Next, an additional board will be implemented for the difficulties encountered in the first step. Finally, the results obtained with the other board will be re-evaluated to implement a final modified board according to the process that allows an integrated use practically and simply.

3) Component 3: Validation

This component consists of the implementation of the new indicators to measure the performance of the company according to the proposed improvement proposals; then we proceed to the re-evaluation of said KPIs using simulation software. The latter aims to analyze with greater clarity and precision the possible results obtained by the simulation since said software can improve processes in real situations and make predictions of different scenarios.

D. Indicators

- Lead Time: This allows you to measure the duration of the entire personnel selection service process.

Objective: Reduce the Lead Time of the entire process by 10%

$$LT = \sum(Duration\ of\ each\ process\ and\ timeouts)$$

- Time in the evaluation by competencies: It allows calculating the duration of the activity Evaluation by competences.

Objective: Reduce the duration of the activity Evaluation by competencies by 30%

$$\sum(Time\ of\ competency\ assesment\ activities)$$

- Time to resend a candidate: Allows you to calculate the time lost in resending a candidate.

Objective: Reduce the time lost in resending a candidate by 85%

$$\sum(Time\ of\ activities\ from\ reception\ to\ review\ list)$$

- Delays index: It allows calculating the percentage of improvement in the time to resend a candidate with respect to the hours of a work shift.

Objective: Reduce total delay time by 85%

$$Delays\ index = \frac{\#hrs\ used\ to\ resend\ a\ candidate}{\#lead\ time} x100$$

IV. Validation

For the pilot plan developed for this research, each of the mentioned tools of the Lean-BPM methodology was used. This plan was carried out in an SME service company, which presents three areas focusing on the one with the greatest economic impact, personnel selection. In this, a high lead time of 6.22 days was presented with an increase of 11.34% compared to the previous year, which will be used as a reference.

A. Initial Diagnosis

Initial case study results show the technical gap regarding the high lead time of the selection process. Currently, the SME has a lead time of 6.22 days, which generates loss costs equivalent to 5.67% of total costs. Within the high lead time, the most important aspect is the time wasted in resending a retired candidate with 64.07% of relevance, whose direct cause is the lack of identification of the re-entry applicant.

B. Validation Design and Comparison with the Initial Diagnosis

The procedure for the validation of the model is as follows: To begin, specific information was requested from the company such as the number of candidates requested for each position by each client, the time of the activities carried out in the selection process among other data of the last 2 months. However, since the company had returned to work in september, data was only available for the first week of october. For this reason, a data collection was carried out in person for the remaining 3 weeks to complete that month. These data would be entered in the Arena simulation software, to verify that the use of Lean-BPM tools provides an improvement in their selection processes. As a result, it is expected to reduce the lead time to 5.6 days and, consequently, reduce loss costs.

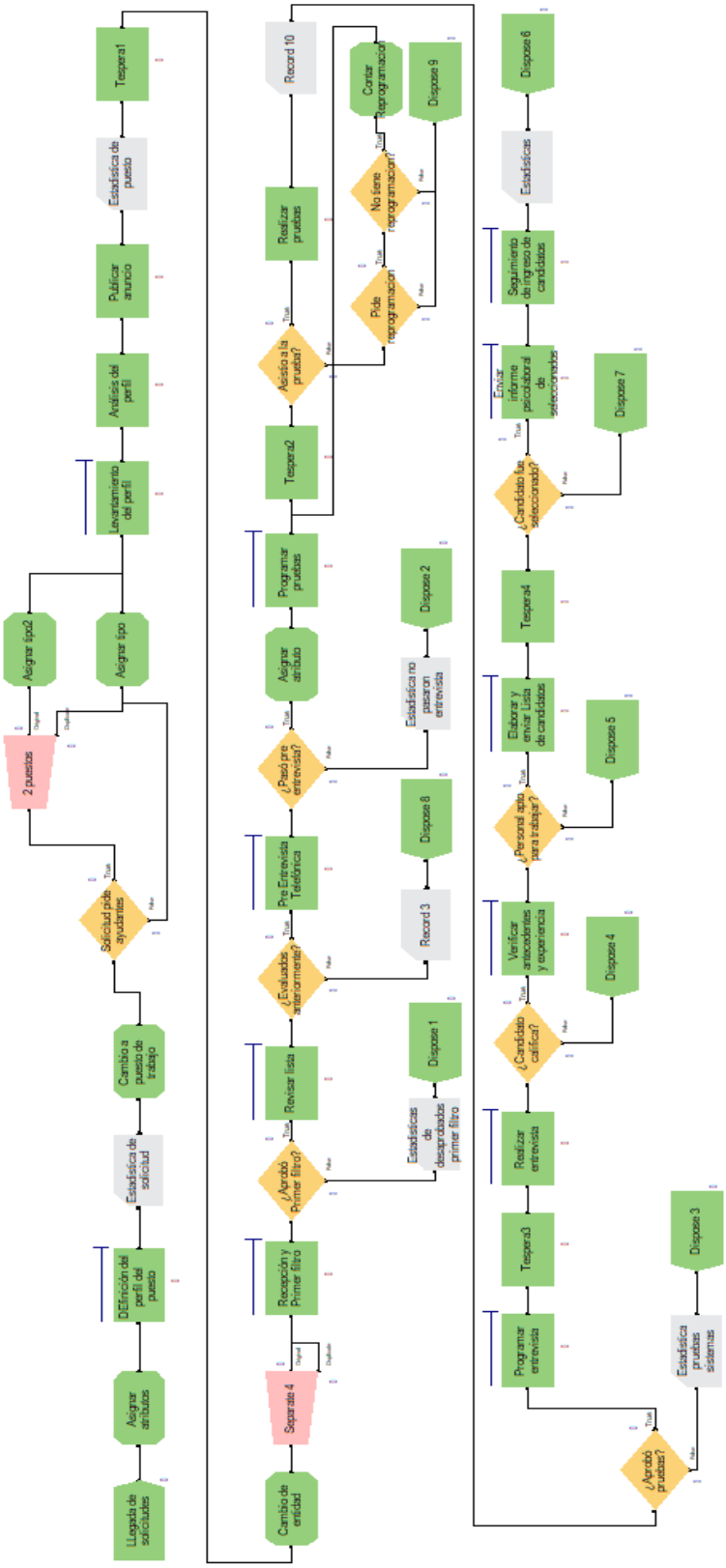

Fig 2. Representation of the improve system

Then, the indicators and what is expected to be obtained are shown in table I.

TABLE I. INDICATORS RESULT

Indicator	Current	Expectations
Lead Time	6.22 days	5.6 days
Time in the evaluation by competences	12.98 hours	1.95 hours
Time to resent a candidate	7.28 hours	5.1 hours
Delays index	34%	5.1%

C. Improvement – Proposal Simulation

Arena simulation software was used to model the current and proposed situation. The main activity evaluated in the selection process was testing, as it was the main cause of the company's lead time increase. For the simulation of the current situation, the data was requested from the company for the last 2 months as mentioned in the previous chapter, while for the modelling of the proposed model, the respective changes were made in certain activities that would take time variable to a constant.

80 repetitions were performed to simulate one working day (7.5 hours). A simulation of the process is shown in Figure 2.

The above tools were implemented and the results obtained are presented in Table II, where a comparison is made between the current situation and the actual situation.

TABLE II. INDICATORS CURRENT vs IMPROVED SITUATION

Indicator	Current	Improved
Lead Time	6.22 days	4.49 days
Time in the evaluation by competences	12.98 hours	1.38 hours
Time to resent a candidate	7.28 hours	5.23 hours
Delays index	34%	4%

Thanks to the proposed execution model and well-established KPIs, a significant decrease in the Lead Time, at 12.88%. This is due to the reduction of time in the secondary indicators: time in the evaluation by competencies and time in sending a candidate again. Finally, the last indicator decreased from 34% to 4%.

V. DISCUSSION

The implemented model focuses on the area of attraction and development of human talent, which has 3 workers who oversee the various activities in the selection process, of which the following stand out: the evaluation by competencies and reviewing the list since These 2 activities will serve as a reference for the indicators. Likewise, for the improvement proposal, use is made of tools of the Lean-BPM methodology, hoping that this will meet the objectives set.

As a result of the implementation of the aforementioned model, the lead time for the incorporation of new collaborators was reduced by 12.88%, which was initially 6.22 days. Suárez-Barraza et al. [1] also focused on reducing the time of the selection process using lean tools, which resulted in an average of 4 days at the end of the implementation. Therefore, it can be asserted that the result obtained in the present investigation is in accordance with the optimum point.

It should be noted that what has been achieved in this investigation can serve as a more current indicator for future investigations or case studies that cover the topic of reducing Lead Time in the selection process of new personnel, since in our case only one could be found. mentioned reference.

VI. CONCLUSION

The applied tools of the Lean BPM methodology allowed to reduce the Lead Time of the personnel selection process of a Human Resources Management company from 6.23 to 4.49 days, which represents a variation of 12.88%. This has been obtained by simulating the process with the improvements that could be identified.

In summary, it was possible to meet the objectives set out above, highlighting the indicator of time to send a candidate again, since a reduction of 89.38% was achieved concerning the current situation. This is due to the use of the standardization of work and visual management tools, which helped to identify which activities could be improved to speed up the identification of the retired candidate and thus save time.

Likewise, the application of the BPM tool was very useful to be able to identify the activity that causes the delay in the process of evaluation by competencies, since by using the tool, it was possible to monitor each activity, evaluate the times and compare them with those of the year passed thus proposing the expected indicators for the improvement proposal.

Finally, the present investigation will be useful for future investigations, since at the beginning the most difficult thing was to find similar studies that help direct the investigation. Likewise, this would be a contribution for those companies in the service sector provided to other companies that seek to solve

problems such as those identified in this investigation: the lack of identification of the re-entrant applicant, poor use of digital tools and inadequate management of the workload. All this focused on reducing the Lead time of the selection process of new collaborators, this through the use of Lean BPM methodology tools, such as standardized work, visual management, BPM and Kanban Board.

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