Integration Of Business Processes Towards Industry 4.0 Through Agile Approaches

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Abstract:
This research aims to describe an approach to align organizational agility and information technology (IT) agility, which will integrate the various forms of agility that may exist in an organization with an emphasis on business and not only on technology. The method for this holistic integration will be aligned by the good practices of ITIL4, and the method will show an increase of efficiency in the different internal processes of the SEAT organization by optimizing them and generating value to the clients as ITIL's philosophy. An extensive search of the companies that lead theIndustry 4.0 was carried out to validate how other organizations perform (output), capturing the results (outcomes) of the customers. In the results, the method has been contrasted with the company "SEAT". In conclusion, the method follows an integrative systems approach where organizational change management (OCM) plays an important role, allowing to keep an updated control of macro processes and to have innovative policies of continuous improvement.

Keywords: ITIL, OCM, agility, industry 4.0, organizational strategy

I. INTRODUCTION

Throughout time, human beings have been constantly changing tools to produce their needs, the passage from the first to the third industrial revolution was marked by the passage from steam engines to the use of processors and internet resulting in more exponential technological growth, and now the fourth industrial revolution is linked to digital transformation; in particular, in industry 4.0, M2M communication protocols have gained prominence, especially in manufacturing industries, notablythe SECS/GEM communication protocols that have allowed machines to communicate with each other[1][2][3].

When talking about digital transformation, a set of terms appears that integrates the ways of doing business nowadays, and when a company does not adapt to change, it tends to disappear from the market, then it is important that the new companies that emerge in addition to those that already exist must face these external organizational changes, the strategic planning of the organization (business) and the strategic plan of information technology, must be aligned. An important factor of digital transformation in Industry 4.0 is organizational change management(OCM), which encompasses the entire organization to adjust to new emerging technologies [4]. When an organization adopts new technologies, it must consider what innovation it can bring to the business,perhaps a new way of doing business [5]. For example, a company that rents a hosting service for a website, changes its way of doing business, either by reducing infrastructure costs or personnel costs [6]–[8]. For large organizations the organizational cultural change can be a problem, but it must be worked and modified if necessary, so that in this way the culture of the company or organization can be inherited. On the other hand, changing the leadership style allows for greater confidence in senior management in order to have the initiative to perform the appropriate changes[9]–[12].

The implementation of modelsof industrial development allows to increase the level of integration and complexity of new processes, so system architects must work closely with all disciplines involved in the design of complex systems [13].

SEAT case: This company is a global reference in Industry 4.0. Not surprisingly, already in 2018, the Financial Times recognized this company as a European leader in digital transformation.This is the result of marking digitalization as a priority in the company's strategy. One of the latest developments is the launching of a pilot project for the reception of components by drone. Together with the Sesé Group, SEAT has this pioneering service which connects the Sesé

logistics center with the Martorell plant. This allows them to receive parts in only 15 minutes, instead of an hour and a half in comparison to the current process taken by truck transport[14].
Currently, business processes are sought to be optimized by leveraging technology through the adoption of digital transformation strategies [15]. Industry 4.0 supports agile and lean manufacturing, and thesefacilitate the implementation, the integration of this with lean manufacturing mainly improves cost competitiveness in the performance dimension; with agile manufacturing, it mainly improves flexibility, this implies that Industry 4.0 is the technology that allows the coexistence of two manufacturing systems and the overcoming of the dilemma between several competitive objectives[16], [17].
The article is organized as follows: section II describes in detail the Methodology used; section III presents the results obtained after implementing the process modeling for the sale of vehicles in a SEAT dealership; section IV details the conclusions of the research; and section V describes the limitations and recommendations.

II. METHODOLOGY

In this section it will be discussed the necessary elements that will be required to develop this research. It should be known that the digital transformation highlights a major organizational challenge focusing on a progressive strategy to develop innovations. See Figure 1. It is necessary to consider the new consumers, improve the leadership style to enhance the efficiency of processes for customer satisfaction and explore opportunities for the further improvement.[18], [19] .

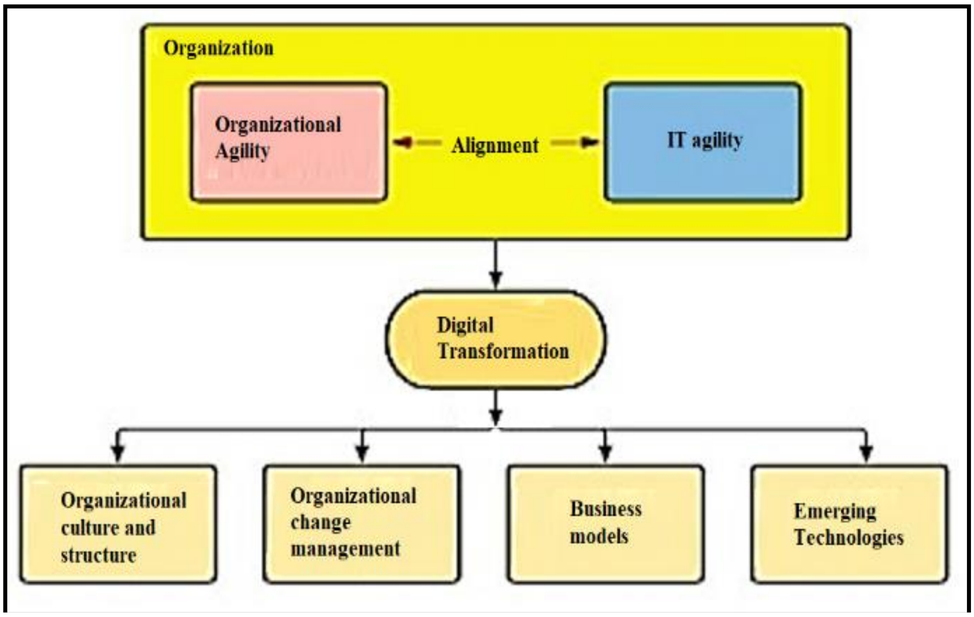


Fig. 1. Organization and Process Integration Approaches

Digital transformation includes the following components: organizational culture and structure, change management, business models and emerging technologies [20], [21].

Applying the methodology described
Organizational culture and structure: Continuous training of staff in the operationaland collaborative tools. The factory currently employs about 11,000 people in different facilities and shifts. Organizational change management: Use of Lean Production methodology. This model is focused on reducing any type of waste to ensure that production flows are as lean as possible. Business Model: “Defined”where each activity isdistinguished. Now the daily production is around 1800-2000 cars per day, and they are delivered by road, rail, and ship to72 different countries. Emerging technologies: Artificial intelligence, virtual reality, robotics, and bigdata[22].

Findings on the failures of digital transformation initiatives.
Absence of an overall strategy, without clear, known and common objectives, which also include financial objectives focused only on the technological factor. Evidence of a reactive culture where it should be a proactive culture. Preference in the processes (Outputs) and not in the business (Outcomes). Watermelon effect. Absence of training programs for new work methods. Seeing IT as a technological support instead of a strategic partner. See Figure 2.

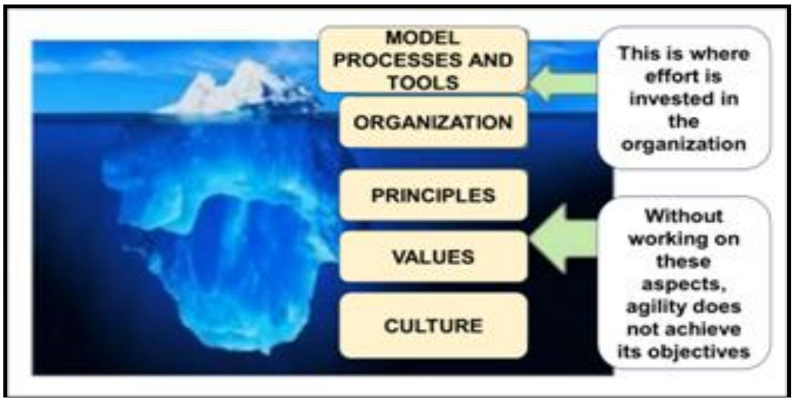


Fig. 2. Common digital transformation failures

What to do to avoid failures in digital transformation initiatives?

- Establish a common strategy plan and promote visibility to communicate within the entire organization (keep it simple, practical and encourage visibility – ITIL4 Guiding Principles).
- Consider Organizational Change Management (OCM).
- Align organizational agility and IT agility.
- Include innovation practices and agile ways of working (Frameworks)
- Address the aspect of organizational culture and matrix structures.
- Encourage innovative leadership and teamwork.
- Progress incrementally (continuous improvement).
- Promote the development of multiple skills in the new ways of working and emerging technologies - training.
- Establish systems that cover the organization from end to end.

ITIL 4 methodology focused on services.

Figure 3 shows ITIL approach focused on services.

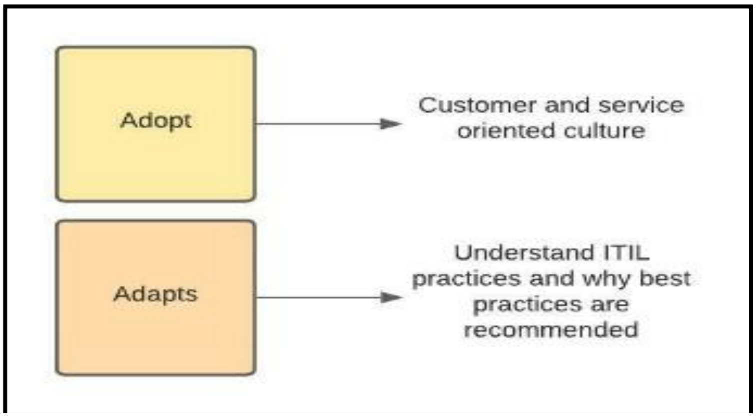


Fig. 3. ITIL Approach

Fig.4. ITIL Guiding Principles

Guiding principles
Defined as recommendations that can guide an organization under any type of circumstance, regardless of changes in its objectives, strategies, types of work or management structure. See figure 4.

Service Value System (SVS)
ITIL SVS will describe how all the components and activities of the organization will be able to operate as a system and therefore enable the creation of value. See figure 5.

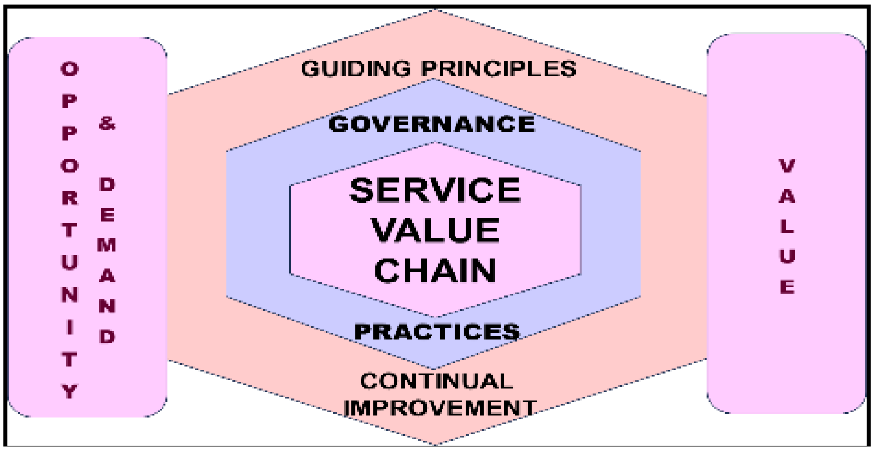


Fig. 5. Service value system, Source [23].

Inputs: Opportunities are the options or possibilities that add value to some group of stakeholders. Demands are the needs or desires for products or services.
Outputs: Is the value in terms of the perceived benefit, usefulness, and importance of something.

Service Value Chain (SVC)
For service management to work properly, it must operate as a system and the core element of SVS is the service value chain, where it provides us with an operational model that describes the key activities that are required to satisfy the demand and enable the realization of value through the creation and management of products and services[23]–[26].
Plan: Ensures a shared understanding of the vision, current state, and direction of improvement for the four dimensions and all products and services.
Improve: ensure improvement in all CVS activities.
Link: Ensure adequate communication of the requirements of the participants.
Design and transition: Ensure that products and services satisfy the requirements of stakeholders related costs, quality, and time to market.
Purchasing/Construction: Ensure that service managers are available when and where required and perform the required specifications.
Deliver and support: Ensure the adequate proper delivery of services according to the specifications and the expectations of the partners involved. See Figure 6.

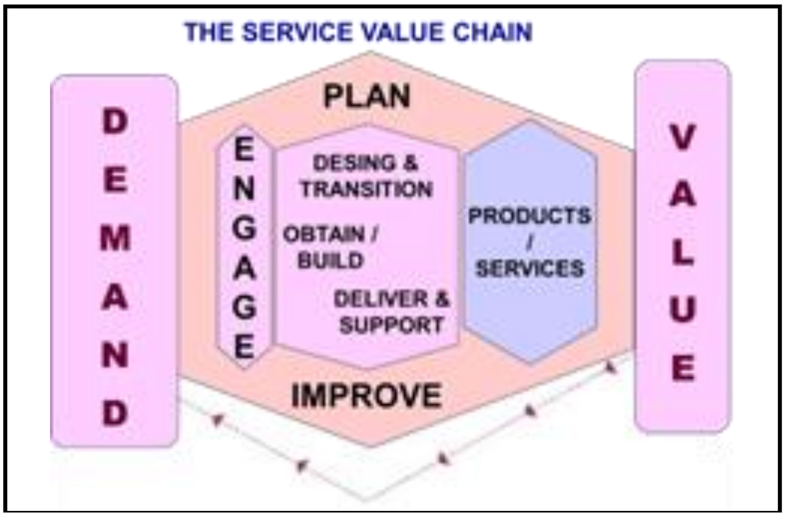


Fig. 6. Service Value Chain. Source [23].

Table I shows the convergence of agility with ITIL 4.

TABLE I. CONVERGENCE BETWEEN AGILITY AND ITIL 4

Agile manifesto	**Guiding principles of ITIL4**
Individuals and Interactions on processes and tools.	Keep it simple and practical. Start where you are.
Software running on comprehensive documentation	Focus on value. Think and work holistically.
Collaboration with the customer on contract negotiation	Focus on value. Collaborate and promote visibility.
Respond to changes on following a plan	Progress iteratively with feedback. Keep it simple and practical.

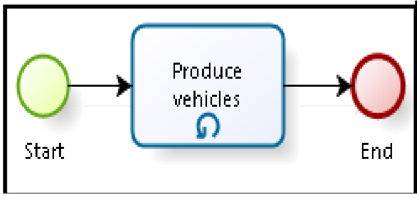
BPMN review in SEAT Production Process development framework.

The use of BPMN notation to model processes means that the product delivered should be considered a valuable artifact with the standard BPM method. BPMN activities are divided into tasks, threads, initiation activities and transactions [27].

BPMN Tasks.

A task is the most specific level of a process. For example, the Figure 7 shows a task with a loop, since it represents the daily production of vehicles within the SEAT company, in addition, the characteristic of sub-process could be included to this task since it would have to be defined in detail how the production of vehicles is carried out. Subprocess are a subset of regular task types that promote simplicity, for example the Figure 8 shows that the subprocess is repeated in sequence that it is related similarly to a loop task when in collapsed view.

There are many other forms of activity representation within the BPMN notation, more of these forms of task representation will be shared in the results section.



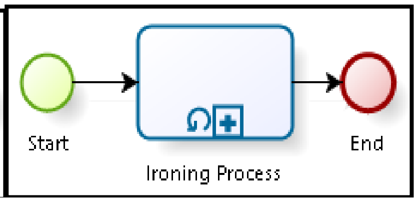


Fig. 7. SEAT Vehicle Production **Fig. 8.** SEAT Vehicle Ironing

Task Supervision

Artifacts.

Artifacts visually represent situations that describe the current process and are frequently used to represent tasks or processes. They are classified into artefacts of groups, annotation, and data object artifacts. The resulting data objects represent as how many days of the process to be collected or stored. The processes generate data and are stored in repositories for later use. BPMN diagram is determined to store the data to track and increasing its organization and efficiency. See Figure 9.

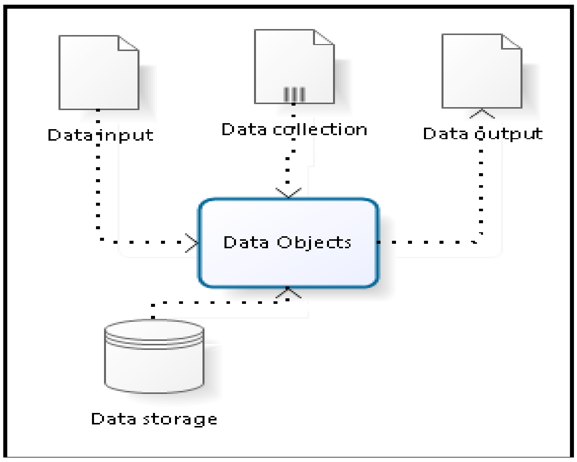


Fig. 9. Types of Data Objects for Data Storage

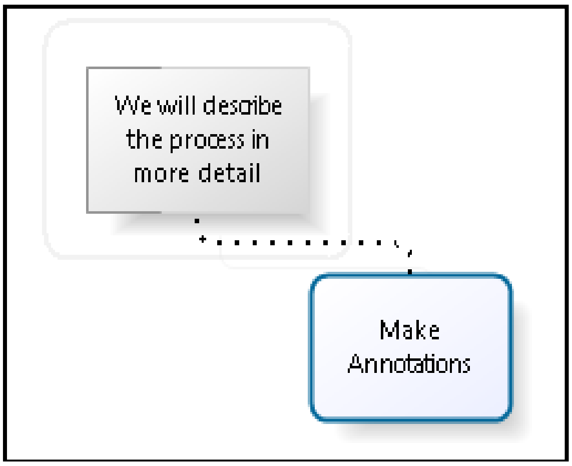


Fig. 10. Annotations for the description of a process

The notation type artifacts describe in detail the business process; for these artifacts, all required annotations need to be added to make the BPMN more readable. See the Figure 10.

Groups can organize tasks or processes that have importance in the overall process. Use groups to better organize the BPMN diagram and increase its usefulness to the organization. The following image illustrates a set of activities that are clustered under the name of assembly. See the Figure 11.

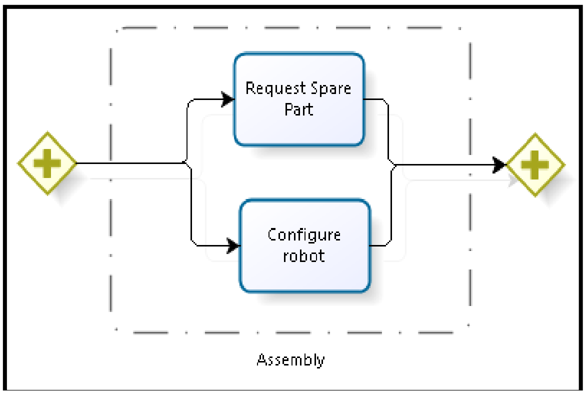


Fig. 11. Task group organization

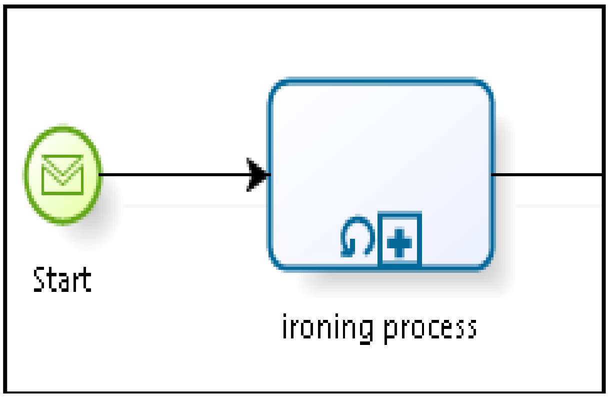


Fig. 12. Start event for Ironing. process.

Initial events: indicates the code of an event, that are characterized by capturing information, such as receiving messages and can generate continuous process, and usually contain an icon in the middle to define the initiator of the event. For example, a initiation event that contains an envelope icon indicates that a message arrives and generates the start of a process. See the Figure 12.
Intermediate events: located between the initial event and the final event, these events are characterized by a double line circle, and it can catch or throw information, they are connected to objects through a directional flow, determining if the event is catching or throwing. See Figure 13.
Intermediate events: Located between the initial event and the final event, these events are characterized by a double line circle, and can catch or throw information. See Figure 13.
Final events: feature a single thick black line; They are characterized by not presenting continuity in the flow [28]. See Figure 14.

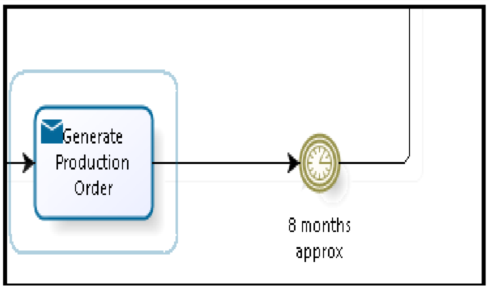


Fig. 13. Intermediate event to Determine the wait time.

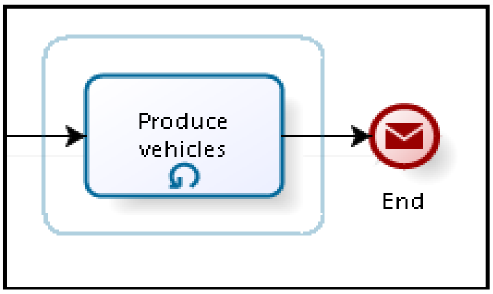


Fig. 14. End Event, E Notification

Exclusive gateway: An exclusive gateway where if there is no stock the production order is generated, as shown in Figure 15.

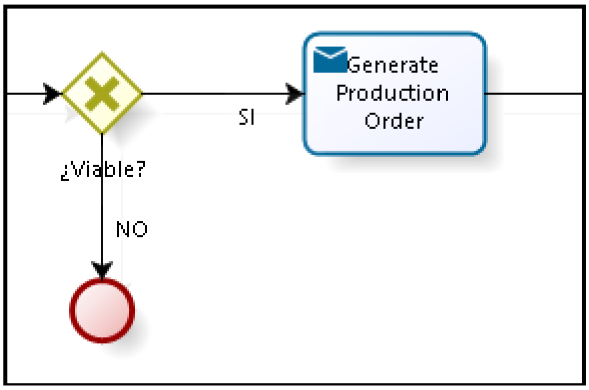


Fig. 15. Generate Production Order

III. RESULTS

This section will present the results obtained after implementing the process modeling for the sale of vehicles in showroom of the company SEAT, what is expected to optimize the time of customer attendance since they arrive at the showroom requesting for a car with any specification until they obtain it, bypassing sub-processes of monetary transfer, however, considering its execution time.

Once the car with the specific characteristics has been requested, the duration of the process will depend on available stock in the showroom inside storage area.

First, the order is analyzed by the seller to check if the car requested with these characteristics is in the local stock. If the answer is negative, the seller will consult via computer systems if other showrooms in the region have a model with the same or very similar characteristics to deliver it to the customer or otherwise try to agree with the customer for different one. If there is no solution, the seller should verify in the different vehicle storage showrooms if there is a model that has the same or very similar characteristic that was ordered previously.

Figure 16 describes the flow for a sale of the car or the manufacturing, this decision is based on the existence of the respective stock. It is specified that its manufacture will take 8 months until the car obtains the quality certificate and leaves ZP8 (Montreal Workshop) ready to be delivered, this diagram represents the AS IS model of the process.

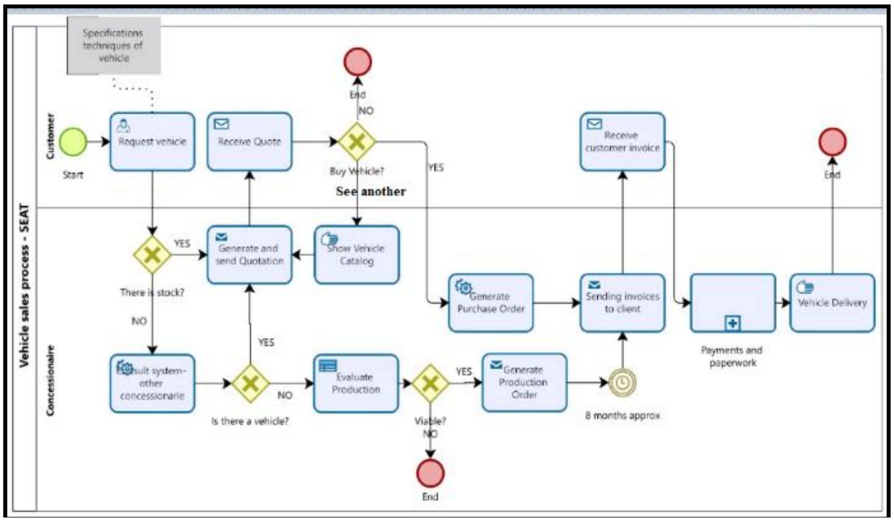


Fig. 16. AS IS model of the Vehicle Sales process SEAT case.

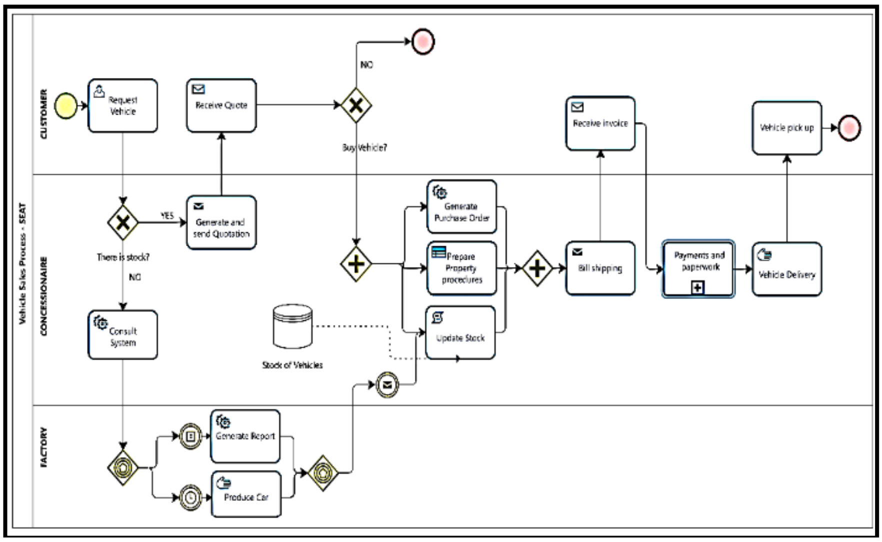


Fig. 17. TO BE model of the Vehicle Sales process SEAT case

In the diagram shown in Figure 17, represents the optimization of the AS IS process, this process represents the TOBE model where customer service times are reduced, and the results of the analysis of more specific data of all the resources involved in this process. See Table II and Table III

TABLE II. TIME RESULTS FOR AS IS MODEL.

NAME	Time min	Time max	Avg. time	Total time
PLWHA	15	173	52.39	52389

TABLE III. TIME RESULTS FOR TO BE MODEL.

NAME	Time min	Time max	Avg. time	Total time
PLWHA	10	64	37.49	27595

According to Table III, customer would wait between 10 and 64 minutes to be served.The expected time for a customer to be served is 37 minutes, 49 seconds.

IV. CONCLUSIONS

The sales macro-process was implemented including a continuous improvement cycle and the support of a process optimization for the development of tasks and functions.
When the ITIL methodology and the BPMN tool were developed for the vehicle sales process in a showroom, different improvement opportunities were generated; these opportunities are interpreted by the showroom managers as internal or external to the process. Internally, the process is documented step by step, which allowed the possibility to analyze it in depth part by part to find critical points or areas for the development of improvements such as the inclusion of after-sales service and compensation in case of customer dissatisfaction. At an external level, the fact that the BPMN methodology is applicable to every one of the macro-processes of the SEAT Company was raised, given that the systematization of these is evident and therefore they can be redesigned and modeled according to the parameters of the methodology, which allows to maintain an updated control of the macro-processes and to have an innovative policy of continuous improvement.

V. LIMITATIONS AND SUGGESTIONS

Access: The present study required access to organizations such as SEAT and documents of the same company where an email was sent to request some information such as diagrams of their software used as the GepromLegato scale, similar articles where they study the organization at the strategic level but due to confidentiality it was not possible to obtain this information, however, it was possible to diagram one process of the many that make up the organization [29].
Longitudinal effects: The time available to investigate a problem and measure change in this case for the SEAT sales process was limited by the stability over time, in most cases very limited, of the project assignment. It is recommended to express these limitations in the research report or in a future scientific article.
The new technologies brought about by the fourth industrial revolution generated Industry 4.0, and this is the result of the introduction of technologies such as: cloud computing, artificial intelligence, internet of things (IoT), robotics (industrial robots), 3D printing, among others, to industrial and manufacturing processes. To automate and connect the entire production line in the so-called Smart Factories. Leading to machines working without human interference, incorporating RPA, RSO under an agile approach with the values of anticipation and adaptation. Industry 4.0 will continue to evolve and transform the way goods and services are produced and delivered, this digital transformation in the future will cover any aspect of human activity and we must be prepared and apply with great creativity and innovation these challenges-opportunities.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Author Percy De-La-Cruz and author Enrique Chalco have made the main contribution; author Hugo Vega and author María Puelles have made the methodological and content corrections; author Adegundo Cámara, author Ernesto Cancho and author Gisella Maquen contributed with binding background; all authors had approved the final version.

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