DIGITAL TRANSFORMATION IN QUALITY MANAGEMENT SYSTEMS IN TECHNOLOGY COMPANIES, LINK WIRELESS CASE

TRANSFORMACIÓN DIGITAL EN SISTEMAS DE GESTIÓN DE CALIDAD EN EMPRESAS TECNOLÓGICAS, CASO LINK WIRELESS

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Abstract

This article is the result of an investigation developed at the Universidad Francisco José de Caldas in the 2019-2020 period that describes a model of digital transformation in quality management systems and its applicability in business areas, as is the case from Link Wireless.

Problem: in today's competitive world it is necessary for companies to be prepared to carry out efficient and effective processes, for which it is necessary to automate the different quality management systems through the implementation of digitization strategies, since these systems are driven by software enable organizations to meet industry standards.

Objective: to design the digital transformation model of the quality management system in technology companies applied to the Link Wireless company.

Methodology: to verify its applicability, a study with a qualitative, descriptive and exploratory approach was carried out, based on which a diagnosis was made where the initial

state of the quality management system was established as established by the ISO 9001 standard: 2015 and the company's technological capacity to design the best strategy to enhance its capabilities to digitize its processes.

Results: from the study it was possible to establish the map of the organization's processes required to face the current operating needs. In the same way, it was possible to establish the Link Wireless chain of work and the need to carry out digitization in the public, organizational and procedural aspects.

Conclusion: the evidenced digitization model is a potentiation of the tools that the organization has, from these methods it is possible to improve operational processes and management systems. The implementation of the aforementioned model was achieved progressively, giving continuity to the quality management system and improving the company's operating processes. In this sense, it was determined that complementing this model with an information management system under ISO 27001 allows us to guarantee greater information security, bearing in mind the risk approach.

Originality: the novelty of the study is that it is the first time that strategies aimed at the digital transformation of quality management systems have been formulated in the Link Wireless technology company.

Limitations: not enough information was obtained regarding the value chain and the management systems implemented in the Link Wireless company.

Keywords: Processes, digitization, quality, continuous improvement

Resumen

Introducción: el siguiente artículo es el resultado de una investigación desarrollada en la Universidad distrital Francisco José de Caldas en el periodo 2019-2020 que describe un modelo de transformación digital en sistemas de gestión de la calidad y su aplicabilidad en áreas de negocio, como es el caso de Link Wireless.

Problema: en el actual mundo competitivo es necesario que las empresas estén preparadas para efectuar procesos eficientes y eficaces, para lo cual es necesario automatizar los diferentes sistemas de gestión de calidad a través de la implementación de estrategias de digitalización, pues dichos sistemas impulsados por software permiten a las organizaciones cumplir con los estándares de la industria.

Objetivo: diseñar el modelo de transformación digital del sistema de gestión de calidad en empresas tecnológicas aplicado a la compañía Link Wireless.

Metodología: para verificar su aplicabilidad se llevó a cabo un estudio con enfoque cualitativo de tipo descriptivo y exploratorio, a partir de lo que se realizó un diagnóstico en donde se estableció el estado inicial del sistema de gestión de calidad conforme lo establece la norma ISO 9001:2015 y la capacidad tecnológica de la compañía para diseñar la mejor estrategia que potenciara sus capacidades de digitalizar sus procesos.

Resultados: a partir del estudio fue posible establecer el mapa de procesos de la organización requeridos para hacer frente a las necesidades de operación actuales. De la misma manera, se logró establecer la cadena de labor de Link Wireless y la necesidad de llevar a cabo la digitalización en el aspecto público, organizacional y procedimental.

Conclusión: el modelo de digitalización evidenciado es una potencialización de las herramientas con las que cuenta la organización, a partir de estos métodos es posible mejorar los procesos operativos y los sistemas de gestión. La implementación del mencionado modelo se logró efectuar de manera progresiva dando continuidad al sistema de gestión de calidad y mejorando los procesos operativos de la compañía. En este sentido, se logró determinar que complementar este modelo con un sistema de gestión de la información bajo la ISO 27001 permite garantizar una mayor seguridad de la información teniendo presente el enfoque de riesgos.

Originalidad: la novedad del estudio radica en que es la primera vez que se formulan estrategias orientadas a la transformación digital de los sistemas de gestión de calidad en la empresa de tecnología Link Wireless.

Limitaciones: no se obtuvo información suficiente respecto a la cadena de valor y a los sistemas de gestión efectuados en la empresa Link Wireless

Palabras clave: Procesos, digitalización, calidad, mejora continua

1. Introduction

In the current competitive environment, companies must be agile, flexible, resilient and possess dynamic capabilities, where the advent of advanced digital technologies makes it possible for companies to completely innovate the concept of quality management, from which it is possible to develop efficient processes through actions equipped with advanced digital technologies to manage quality in companies [1]. Digital transformation is a way to use cutting-edge technology to solve traditional problems and create new models for the organization of knowledge, revenue generation and innovation [2]. Thus, quality management systems have become an essential element with a set of digital tools. Hence, software-driven quality programs enable companies to meet regulatory requirements as well as compliance with industry standards. In this sense, the transition in the consideration of quality in organizations has been moving away from this term as a simple operational compliance issue and is now instituted as a vital strategic business initiative [3].

Digitization is defined according to Menshikova, Piunova and Makhova [4] as a process that allows organizations to make use of a wide range of relevant information to perform activities related to the product, process or service carried out in industries based on efficiency and quality. Under this premise, digitization also allows companies to have a connected environment throughout the value chain with which benefits are obtained among which are the improvement of processes through modeling and analysis, document, analyze and streamline complex processes at conceptual and logical level, allow business areas become more agile and effective, improve communication and collaboration, enable customer centricity and support the digital business transformation of organizations [5]. In digitalization issues, the concern that should guide the management committee is established, which is to integrate the digital in each of the dimensions of the company, all this guided by a fully digital transformation strategy [4], with this it will be discovered that this adopted digital revolution has profound consequences around two essential axes, modifying the business model and the organization of work. To carry out a digital transformation it is necessary to analyze both the sector in which it operates and the situation of the company, incorporate new tools such as Big Data, with which you get and manage more information about customers, or website with which you can interact directly with users [6].

Based on the above, it is necessary to analyze the digital transformation in relation to quality management in technology companies and particularly Link Wireless, because as mentioned, this is an organization that has managed to permeate the dynamics of the sector and likewise it is considered that its contribution is significant for the region. Thus, the main objective of this research seeks to design the model of digital transformation of the quality management system in technology companies applied to the company Link Wireless.

1.1 Literature review

Background

Regarding previous studies related to the established topic, there is the research by Menéndez [7] in which the purpose is defined as the elaboration of an adequate roadmap for the Digital Transformation in industrial companies of the utility sector, especially in TSOs, where a methodology with a qualitative approach is implemented, descriptive, based on secondary and primary documentary information, using interviews as the main instrument of information collection. Regarding the results of the study, when analyzing the digital maturity of a utility sector company, and especially of a TSO, the most important aspects to be analyzed are: digital culture, the use of disruptive technologies, operations, the relationship with stakeholders and new business models, the last three aspects being the most specific to this sector. In this sense, it was established that utilities companies needed new forms of revenue and decarbonization to survive, which raised digitalization as a key element

to achieve both. It was also mentioned the need to create a global change management plan for digital transformation, accompanied by small plans for each project or initiative and implementing plans based on the communication of the change in the organization, sponsorship and training plan.

On the other hand, there is the study of Cifuentes [8] in which the general objective is to implement technological and digital tools for optimal development of order and control processes in the logistics and commercial area of the company Chispa y Sabor in the city of Bogota, which is performed under a methodology with a qualitative approach, descriptive type, through the implementation of interviews and surveys applied both virtually and face-to-face. The results of the study indicate that technological and digital tools are crucial in a company, particularly because they allow to develop order and control processes in any area, regardless of its size or level. Regarding the implementation of the information system, it was possible to evidence an optimal development in the activities and structure of the logistics area of the company, as well as the facilities that this generated on the control of information and digital marketing, allowing managers to make decisions in the company, especially by the implementation of hardware, software, networks, procedures and people, achieving greater efficiency and productivity in the market.

Finally, there is the research of Grajales and Parrado [9] in which the general objective is to implement a Digital Media Plan for the company ACSE Tecnology towards the positioning of the brand in the market of Villavicencio, which is developed using the qualitative methodology, descriptive type, based on the canvas model, using the semi-structured interview as a research instrument. In this sense, the study was able to identify the existence of important variables that allowed making decisions and knowing that potential customers are those SMEs in expansion or enterprises that seek to improve their management while undergoing constant growth. Likewise, it was determined that building a marketing plan and digital design, promotes the sale of products and services offered by Acse Tecnology, which allows to take a periodic course of action and established in a chronological and orderly manner, in order to enable a suitable monitoring that shows the results through the number of interactions on the fan page, strengthening brand recognition at the municipal and regional level.

Theoretical basis

Digital transformation and the resulting business model innovation have fundamentally altered consumer expectations and behaviors, put pressure on traditional businesses, and disrupted numerous markets [10]. According to Ting [11] an autonomous future will increasingly require an operation-wide digital and sensing infrastructure that integrates data, smart devices at the edge, and bulletproof hardware and software that provide the required level of flexibility, adaptability, and resilience.

Digitalization is transforming society in a number of ways, bringing new opportunities and challenges for companies working in this dynamic environment, such transformation is pervasive, encompassing changes ranging from individual work tasks to new business models, new forms of relationships, the digitization of existing practices and novel technical solutions that deliver better customer value [12]. Solutions that incorporate digitized technologies are found in an increasing range of areas, such as big data analytics, automation, digital interfaces and connectivity, and have been shown to have both inter- and intra-organizational implications for operations management [13]. Conversely, those that are not able to adapt to the accelerated changes of digitization may face a variety of problems that can lead to the fall of organizational indicators in them [14].

Digital transformation refers according to Berbegal, Marimon, Casadesús and Sampaio [15] to the use of digital technology, not only to make things more effective or efficient, but to transform and implement new ways of doing, taking advantage of new possibilities and adapting them to the new emerging digital world, some of these new technological possibilities could be: mobility, big data, Internet of things, new artificial intelligence (AI) techniques such as deep learning or simply the ubiquity of the Internet, a list that could be much longer and could also be constantly growing. There are several reasons why digitization is shaping the role of quality management in organizations. First, many digitized solutions offer better technical quality with respect to products and services, which influences the direction of quality management. Second, digital technology has opened up new ways of interacting with the customer, which has created challenges in making use of real-time customer data and finding better ways to provide customer service. Third, support for quality management achievements in improving internal processes is now increasingly available through digital solutions. Fourth, quality management activities, like digitalization, are not limited to a specific function in an organization, but extend throughout the organization and its value creation processes. In line with this, it is important to understand the various roles that quality management can play in digitization initiatives.

According to Castellanos and Velásquez, digital transformation is one of the major trends associated with the evolution and modernization of companies around the world, which is linked to a significant technological investment for organizational purposes, i.e., under the premise of using new business models and innovative processes that enable the generation of value. In this regard, they establish that a digital transformation that can be perceived as successful, presents at least elements such as: "governance and leadership, people and operations, customer experience, data and analysis, technology integration and digital literacy" [16].

Based on the aforementioned factors, it is established that there are six phases of digital transformation: immobility, when organizations remain with the same processes, in a comfort zone; activation, which happens when organizations initiate a process of consideration

towards digitalization and experiment in the company with the aim of innovating; formalization, which takes place when initiatives materialize and change managers are presented that allow technology to be incorporated and processes to be improved; strategy, which reaffirms the need to make a contribution in the development of strategic plans associated with digital transformation; convergence, which seeks to support the organizational structure seeking to align the members of the organization to the new digital strategies; and innovation and adaptation, as a new process established where a constant transformation is generated and actions are carried out based on technological and market trends.

The digital change or transformation accelerated by Covid-19 is a global process of reconstruction of companies and organizations [17], it can be considered as a complete process ranging from the reinterpretation of the business plan to the development of new skills, resulting in new techniques and skills, all based on an entrepreneurial culture. The development of new skills, resulting in new techniques and abilities, all based on a culture of entrepreneurship. COVID-19 has brought years of change to the way companies in all sectors and regions do business. According to McKinsey's new global executive survey [18], which was administered online to 899 executives and senior managers from different regions and all specialties, it was found that their companies have accelerated the digitization of their customer and supply chain interactions and internal operations by three to four years. And the proportion of digital or digitally enabled products in their portfolios has accelerated dramatically. They even expect most of the changes to be long-lasting, so they expect to continue investing in digital transformation to ensure they remain in a process of constant innovation, as they recognize that strategies associated with quality based on digitization is a fundamental component in organizations in the short, medium and long term.

On the other hand, it is important to allude to quality management systems, where Ralea, Dobrin, Barbu and Tănase [19] state that throughout history and precisely since the middle ages there have been quality standards that have been a requirement for workers, because since this time laborers have been subject to inspections that established guidelines and standards related to the final product, It is even stated that although there have been changes around the history of quality management, the final objective has always been to deliver a quality product to the consumer, so that inspections have been present to ensure compliance with the standards or guidelines of the moment. According to Koskela, Tezel and Patel [20] quality methodologies have developed in correspondence with the evolution of the concept of quality, the focus has changed from an inspection orientation, through process control (statistical process control), to continuous process improvement and quality design in product and process.

According to Andrle [21] quality management is an ideology that focuses on satisfying customer needs; therefore, most organizations try as far as possible to meet or exceed

customer expectations in their daily activities and also in their long-term plan. In turn, management control is an important element in quality management systems, which is defined according to Ferrreira and Otley [22] as a systematic effort by an organization to compare performance with predetermined standards, plans or objectives in order to determine whether performance is in line with these standards and presumably to take any required corrective action.

Quality management systems integrate fundamental management techniques, resources and their implementation represents a challenge and support for top management. According to this source, successful quality systems could generate better products and services, as well as reduced costs, more satisfied customers and employees, and better financial results [23]. From the above, the idea behind implementing quality management systems is to ensure that adequate attention is paid to quality to result in an error-free transactional process and less room for customer complaints, while maximizing customer satisfaction [24].

From this perspective, the ISO 9001 standard of 2015 as the main tool currently available to Colombian organizations in terms of Quality Management Systems [25], in its most recent update of the quality standard of the International Association for Standardization that has been accepted by ICONTEC for application in Colombia, according to Fonseca [26] the 2015 edition of ISO 9001 adds a stronger open systems perspective (influence of the environment, dynamic environment, need for survival). This standard provides the international reference that allows companies to design, document and implement a Quality Management System that fits their conditions in order to increase their productive and organizational capacity and regularly provide the market with products and services that meet customer, legal and regulatory requirements [27]. Considering that this standard is the only certifiable standard of the ISO 9000 series, it is established that it provides a privileged position in terms of market recognition.

The company Link Wireless was founded on October 01, 2015 by Rodrigo Medina and Camilo Isaza in Colombia with the aim of participating in initiatives in technology [28], these projects were focused on bringing internet coverage to several cities in the country, a project that was executed for SENA, in an initiative that was extended to 11 regional offices of this entity in 10 different cities of the country with the installation of digital points, equipped with Wi-Fi free access for students, contractors, employees and visitors of the headquarters and a technological model that allows a broad portfolio of SENA services online, available on these computers as points of information and customer service, seeking to reduce the existing technology gap. All of the above was based on the reference framework of the LinkNYC project, which consisted of a network of "smart" kiosks with free Wi-Fi for the entire city of New York, USA, which replaced the city's public telephones, with the purpose of initiating a process of creating smart cities based on the multiple possibilities provided by Internet communication systems.

2. MATERIALS AND METHODS

The present project was carried out under the implementation of a qualitative, descriptive and exploratory approach, which was based on secondary information mainly through a systematic documentary review of the quality management system of the analyzed company. It is worth mentioning that the development of the research was structured under the stages described below in order to comply with the general objective.

2.1. Stage 1. Diagnosis of the current situation of the company: in this stage the current status of the company's quality management system in terms of compliance with ISO 9001:2015 and the technological capacity of Link Wireless to design the digitization strategy is defined.

A documentary review of the company's quality management system was conducted to determine its characteristics and structure, which should be taken into account in the digitization design. Taking into account variables such as:

- Characteristics and structure of the documented information necessary for the QMS.
- Availability needs and levels of access to QMS information.
- Necessary controls in the handling of the information.

Subsequently, information was collected from the organization's IT tools, which will be listed separately according to their classification into software and hardware, evaluating the quantity, capacity and characteristics of the material found that can be adjusted to the digitization needs of the quality management system.

2.2. Stage 2. Description of the digitization model: in this stage the strategy that could be best adapted to the characteristics and capabilities of the organization to digitize the processes of the Link Wireless quality management system was designed, in order to make maximum use of the software and hardware tools that the organization already has to enhance the current capabilities and ensure the lowest possible cost in the digitization project, once the diagnosis of the information was made, the way in which it would be digitized was determined. Based on the tools found in the diagnostic stage and the information management needs, the structure of the digitization plan for the quality management system was developed.

2.3 Stage 3. Identification of similar successful cases: in this stage a general analysis of the state of the art in digitization of quality management systems in companies of the technology sector was made in order to find the impact that digitization has had in the sector and thus support the results of this research by verifying documentation of references about implementation and applicability of digitization models, virtualization, teleworking and remote work related to quality management systems and the impact of their results in the reference companies.

3. RESULTS

3.1. Stage 1. Current diagnosis of the company

3.1.1. Process map

In order to know in detail the operation, processes and activities carried out in the organization, it is necessary to establish the construction of the process map, which is defined for this organization based on the current operational needs of the company and is divided into three groups:

- **Strategic processes**

The company carries out strategic processes where activities related to the direction of the organization, administration and management of resources are carried out. In this group, it is evident that the company seeks to carry out an interrelation of all the processes that are carried out within the company, through which value creation is sought. In this regard, it is possible to mention that the management area of the organization is concerned about carrying out adequate planning based on improvement strategies, especially with regard to internal communication, the development of communication with the client, marketing strategies, the constant review of systems and the design of study plans, among other elements.

- **Missional processes**

Processes linked to the product or service oriented to the client, where the activities that are part of the products and services offered are grouped. It is worth mentioning that the Digital Marketing processes are fundamental for the aforementioned company, particularly those in charge of the design and creation of advertising campaigns and Operations in charge of the technical and operational solution of the technological work equipment.

- **Support processes**

Composed of all other activities necessary for the operation of the business, such as commercial relations activities, accounting, finance and management systems. It is essential for the company to cover this process, since it allows to meet the needs or expectations of the users.

According to the above classification, the process map shown in figure 1 is proposed:

Figure 1 Link Wireless Process Map
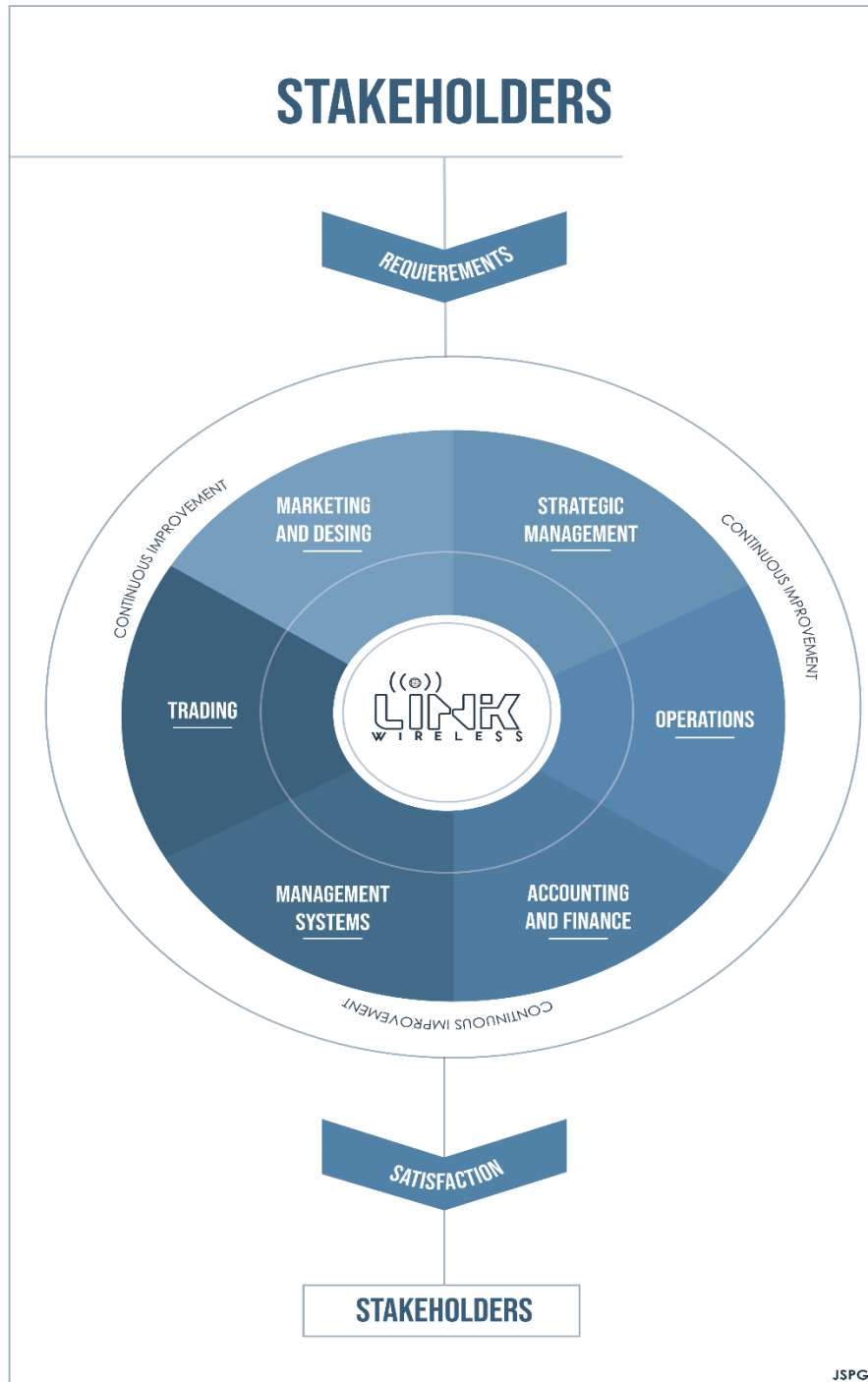
Source: author´s elaboration

3.1.2 Link Wireless company value chain

The term value chain refers to the various activities and business processes involved in the creation of a product or the provision of a service. According to [29] a value chain describes the range of activities required to produce a product or service from its conception, its different intermediate phases and the final delivery to the user. According to McGee [30] a value chain can consist of various stages of the life cycle of a product or service, including research and development, sales and everything in between. In this sense, it should be noted that successful companies create value with each transaction and particularly when these translate into customer satisfaction and profits for shareholders, thus, the generation of value is essential in companies, because the more value they generate, the better positioned they will be to obtain profits than those that produce less value.

According to [11] the management, automatization and optimization of the value chain (assets and supply chain) are fundamental for all process industries. From raw material supply to product delivery and consumption, process manufacturers must respond quickly and efficiently to market changes and shifts in demand. Digitization and integration of data and applications along the value chain enables optimization, because data and applications are distributed across organizational silos, an integrated supply chain approach generally requires a business initiative to stimulate collaboration and information sharing.

A value chain includes the activities that take place within a company to deliver a valuable product or service to the marketplace; each stage of the value chain adds more value to products and services and can be viewed as a tool to visualize a company's productivity by identifying the myriad discrete activities involved [31]. Currently, value chain optimization relies on qualified subject matter experts using simple linear models that can be poorly maintained. As enterprise-wide integration becomes a reality, companies can achieve automated value chain optimization with automated data-driven models and work processes enabled by the cloud and machine learning to deliver significant business agility and results. The value chain focuses primarily on market collaboration strategy, where it emphasizes the linkages between production and marketing activities [32].

Link Wireless's process management is focused on the added value shown in the system structure defined in Figure 2, which will be measured with indicators of effectiveness (value perceived by the client and business profitability) and efficiency (process improvement and cost reduction), subject to the company's quality management system.

The value chain of the aforementioned company has primary activities such as the different operations and the marketing and design part, which are directly related to the company's product, generate value and allow the organization to obtain positive financial results. Regarding commercial strategies, design, support and content management, it is important to

mention that the company must necessarily reinforce these aspects, as they are essential factors in the digitization strategies and even more so if it acts under the premise that this company is linked to the technology sector.

Likewise, from the information associated with the company, it is identified the need to load the documentation of the management system and the formats corresponding to the traceability of each of the processes and services handled by the company in such a way that it can only be edited by the personnel responsible for each operation and the alteration of the documents and the loss of information can be foreseen. For this, it will be necessary to set and clearly define the type, availability, access and control of the information, in order to guarantee its security, all this framed in the risk approach presented by NTC ISO 9001, as one of the pillars of quality management together with the process approach.

It is important that in the value chain the internal logistics of the company is taken into account, where the importance of achieving an optimal inventory control, control and testing of the quality of the products or services offered by the company is considered. In this regard, it is possible to mention that Link Wireless does have control over the services it offers in the wireless technology sector, as it has been concerned about complying with the security and quality mechanisms of its products and services.

From this perspective, it is important to note that the company has been dedicated to seek and make an ideal combination of robust Wi-Fi solutions with digital signage solutions, because inside it is considered that providing a service with immediate solutions is essential in its value chain, so that the mix between innovation and technology are a very important factor to achieve these solutions, allowing them to ensure the operation of their products or services properly and especially when it comes to providing guarantees to end customers.

On the other hand, the type of integration that the company manages is based on a vertical integration, where it is established that other companies are required to achieve adequate supply or supply of materials and inputs, however, this has been concerned to institute close links with all manufacturers that are included in the processes and solutions made by the organization, allowing Link Wireless to achieve better performance in terms of prices, warranties, facilities and other aspects that are involved in each project, so that these positive links allow you to always have the full support of the same.

On the other hand, the company has a trained engineering team, specialized and certified in each of the activities and technological services that the company offers, which in turn allows it to meet customer satisfaction from the operational processes and at the same time generates the possibility of giving an added value to its customers in the market, providing efficient technical solutions that guarantee them to obtain a superior quality in their projects.

Figure 2 Link Wireless value chain.
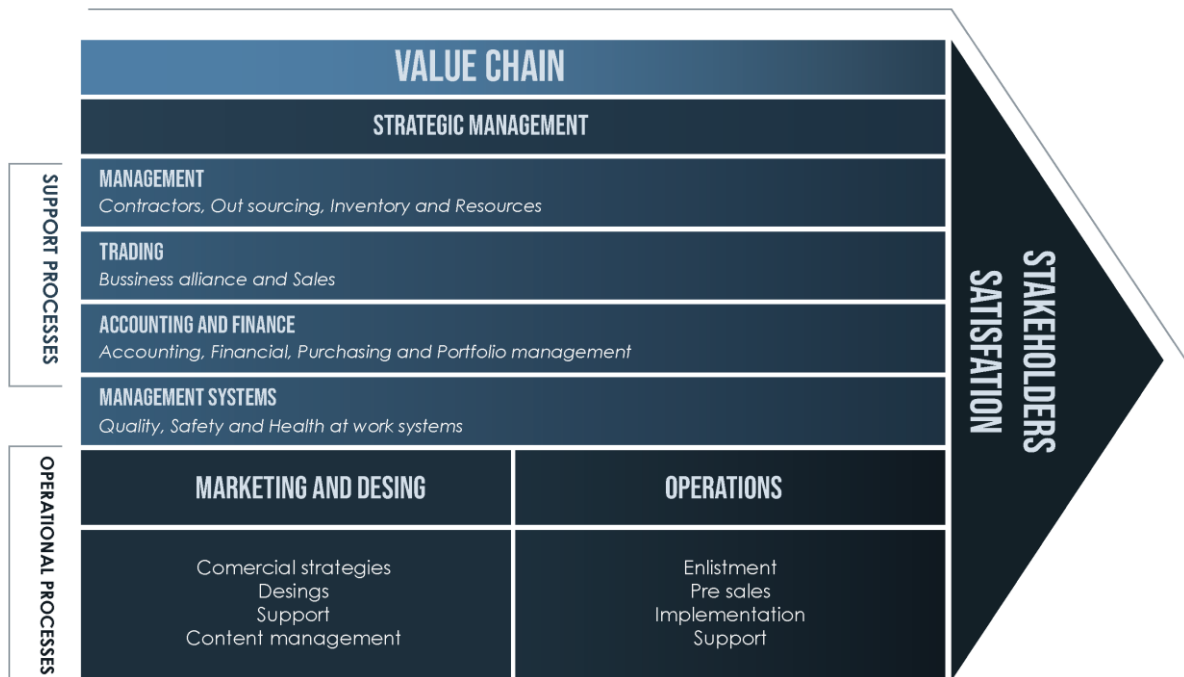
Source: author´s elaboration

3.2 Stage 2. Description of the digitalization model

In this stage, the design of the strategy that could be best adapted to the characteristics and capabilities of the organization to digitize the processes of Link Wireless' quality management system was carried out, in order to make maximum use of the software and hardware tools that the organization already has to maximize the current capabilities and ensure the lowest possible cost in the digitization project, once the diagnosis of the information was made, it was determined how it would be digitized. Based on the tools found in the diagnostic stage and the information management needs, the structure of the digitization plan of the quality management system was developed.

The increase in digitization has influenced various business activities, including the business models of companies, by enabling various new forms of cooperation between companies and generating new product and service offerings, as well as new forms of business relationships with customers and employees. At the same time, this digitalization has put pressure on companies to reflect on their current strategy and explore new business opportunities systematically and at an early stage [33]. According to Gray and Rumpe [34] a digitization model refers to a pattern that is based on the ability to convert existing products or services into digital variants and thus offer advantages over tangible products, e.g. easier and faster distribution.

The digitization of quality management helps you to deliver consistently high quality products in shorter timeframes, while optimizing costs and efforts. Automating end-to-end quality management processes, including control, planning and improvement, will enable you to easily monitor quality throughout the production lifecycle. Complete visibility into operations will help you proactively identify problems, analyze and uncover root cause, and optimize product performance early in the development cycle.

The disciplines of quality management and documentation are intrinsically connected [35]. A company is quickly confronted with thousands of documents in which, for example, standard operating procedures, work instructions and policies are defined and results are recorded, which requires an automated system to provide facilities for it in these types of procedures [36]. The documentation of audits and corrective and preventive actions (CAPA) means that the flow of documents only keeps growing, which makes it even more necessary to implement digitization at the organizational level and even more so when it is an organization that has a vertical integration system that requires it to have information regarding allied companies.

With an automated system, risk management is integrated into all processes [37], more importantly, it is a driving force in the process of corrective and preventive actions, within the investigation and root cause analysis. This gives organizations an advantage in prioritizing responses to adverse events and various situations presented in the enterprise [38]. The risk elements identified during these processes provide objective evidence that drives risk-based thinking and decision making. Without automation, risk would not be intrinsically linked to these processes.

The information documented by Link Wireless can be classified into two groups: reference, made up of guiding and strategic documents such as policies, manuals, instructions, general communications, and registration, made up of formats, evidence and other documents that require the filling out or saving of information continuously during the development of the organization's activities and that is specific to each process. Based on this classification, the availability of reference information for the entire organization must be guaranteed, while ensuring its integrity and control, while registration information requires a greater degree of control over availability and access.

Based on the above, it is necessary to state that it is important for the company to have current digitalized systems that allow it to have an automated classification of the documentation and data that are essential to carry out the various organizational activities. In this sense, it is evident that the documented reference information that the company has can be classified into three groups: public, organizational and procedural, the first group brings together all the documented information that can be consulted by all stakeholders of the company as organizational policies, portfolio of services, etc.

- Organizational: this information is of interest to all the company's collaborators and of value to the business, whose sensitivity requires a certain level of confidentiality that cannot be exposed to the public, such as commercial strategies, operational strategies, work plans, budgets, etc.
- Procedural: it is information specific to the detail of the company's processes and procedures, part of the know-how whose privacy is important and is the responsibility of each process leader. The documented registration information can be digitized under the following classification.
- Shared edition: corresponds to joint records that are composed of information from two or more people who are part of the same process.
- Storage: corresponds to information repositories that gather process evidences, work orders, minutes, formats and other documents that are part of the traceability of the company's processes, products and services.

According to the above classification of information and under the established digitalization models, its management can be structured as shown in table 1:

Table 1. Availability, access and control of information

TYPE	AVAILABILITY	ACCESS	CONTROL
QMS Manual	All the staff	Query	Editing by the person in charge of the GIS under the approval of the management
Quality politics	All the staff	Query	Editing by the person in charge of the GIS under the approval of the management
Documented information on processes (formats, records, evidences)	Responsible for the processes	Edition	Protection against information alterations
	Boss of the area	Query	Control and validation, veracity of the records
	Quality Manager	Query	Validation of information traceability
Procedures	All the staff	Query	Version validation and change control

Source: author´s elaboration

Automation in the enterprise and integrated quality management software can boost production capabilities and optimize them in the long term, as this provides the foundation

for digitizing the end-to-end manufacturing or operations execution cycle [39], establishing vital machine-to-machine interaction, and at the same time can enable access to accurate information when needed [40]. Such an integrated system will further drive proactive quality management across all domains or processes [41], including quality process standardization, process compliance, personnel and skills qualification, production process and configuration verification, and process inspection. The result of an aggressive M&A strategy can provide the company with a series of disparate quality processes in its global locations, because in addition to improving various dimensions of quality in the business process, it can generate a rapid response to marketing and achieve the development of a successful and beneficial digitization model.

3.2.1 Digitization plan based on tools

Table 2. Classification of tools

HARDWARE	SOFTWARE
Physical servers in the organization	Gmail email with administration and own domain of the organization
Laptops for all staff	Licensed remote team management tools (Team Viewer)
Mobile devices with access to online information (personal cell phones)	Licensed Equipment Monitoring Tools (PRTG)
Firewall for perimeter protection of the organization's communications network	Suite Office on all computers in the organization
Personalized network structure according to the needs of the organization	Public IP's for online service configuration

Source: author´s elaboration

Based on the organization's diagnosis of the needs for digitization of the QMS and its information, and taking into account Table 2 corresponding to hardware and software tools, the following tools are identified as possible components of the digitization model.

3.2.2 Software

Software is a key and vital tool in the development of a digitization model, as it allows to quickly and efficiently perform various processes in different areas of the organization. It is worth mentioning that using one type of software is not enough to ensure maximum efficiency, since it is important that it adapts to the constant needs and new business and operational conditions [42], so it is necessary to take into account its evolution and improve this element in order to carry out operations with the support of efficient software, avoiding the maintenance of obsolete systems.

As a platform for document information management, access control and availability, Link Wireless Gmail was selected because, given the current circumstances of teleworking, it is the tool that allows greater coverage and flexibility for this modality of work. For document creation and editing, Suite Office will be used as the basic tool for the digitalization of documented information. According to the needs of organizational control and those of the quality management system, the PRTG tool can be used as a source of continuous monitoring of the devices inside and outside the organization, the work team and its use as a source of data for process indicators.

Team Viewer provides another collaborative work tool that allows two people to work and support each other in the development of team activities and processes, which implies having the advantage of managing links between workers, allowing them to develop various activities in which support is required, so it is also a software tool that should be taken into account for the digitization model.

3.2.3 Hardware

The digitization process involves the design and establishment of a digital operating system, from which it becomes a necessity to have suitable hardware to carry out the software implementation in an optimal way. Thus, it can be understood that the hardware allows to establish the operational structure of digitization in an organization [43].

In this sense, the relevance of having different servers and equipment that allow to carry out the activities in an adequate way is raised, so the following elements are proposed:

- Physical servers: their use is multiplatform since on the one hand they provide space in the Link Wireless "private cloud" as an information storage bank, backup and in turn host the centralized remote monitoring program PRTG.
- Laptops: will be the means of work between employees and the digitized quality management system.
- Mobile device: presents an additional tool for the collaborator to the extent that he/she can use his/her cell phone, tablet or other device to capture and upload information to the digitized QMS.

Figure 3 Diagram of digitization model
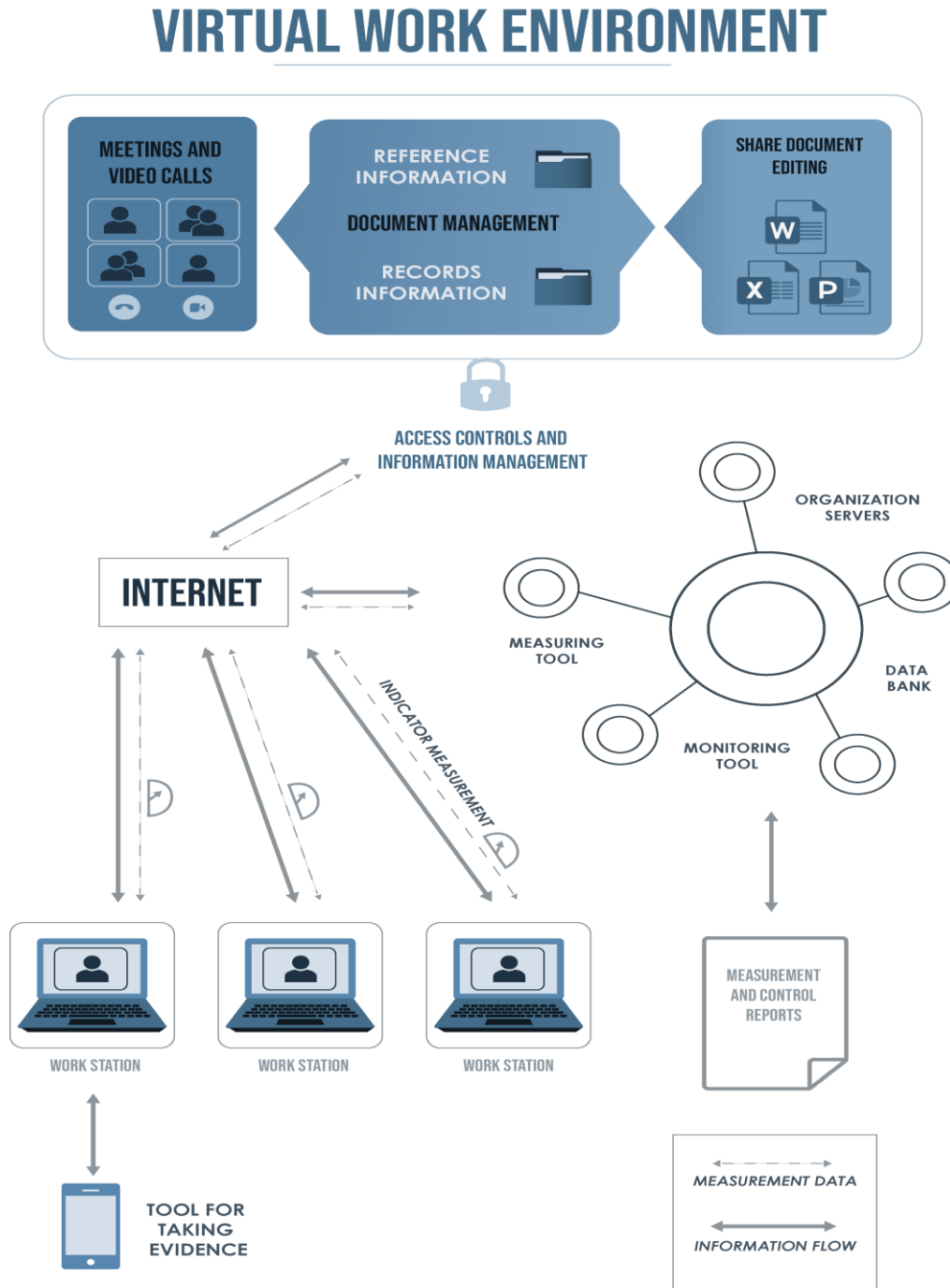
Source: author´s elaboration

As shown in Figure 3, the integration of the tools provides a digital work system with monitoring components and tool availability indicators (PRTG), collaborative work for the development of joint processes and procedures (Team Viewer), Link Wireless server database and Google Drive, the latter being the main tool for the digital management of the QMS according to the structure and classification of digitized information described in the information digitization model.

Investing in high quality hardware can lead to negative situations and waste of time in organizations. Making use of fast-growing technologies with the right hardware can lead to a smooth organization [44], because it is likely that in the absence of appropriate hardware companies will stop in their processes and even reflect on the final results of the same. So it is important not only to take advantage of technology, but also to know which are the most important technological solutions.

3.3. Stage 3. Identifying similar success stories

The top priorities of executives are changing dramatically as planning takes place in an uncertain future, transformation is accelerating, and there is now a greater focus on transformation that is associated with customer relationships and partnership opportunities [45]. The pace of this process has accelerated as a result of the Covid-19-derived health crisis, thereby introducing major changes in CEO priorities in companies [46] From this perspective, we find various research and applications referring to the digital transformation in recent times and to the technological revolution as a determinant of quality management systems in them.

On the one hand, there is the study by Singh and Kumar [47] in which the importance of Industry 4.0 technologies in the manufacturing industry is recognized. So the research empirically examines the critical success factors for Implementation of this technology in the Indian automobile manufacturing industry. This work was developed from the systematic review of the published literature addressing the critical success factors, likewise the application of a survey was carried out to automobile manufacturing companies in Indian corporations. The research findings demonstrate its usefulness for automotive manufacturing companies, which are in the implementation phase or planning to implement 4.0 technologies in the future, it is worth mentioning that the key findings of the study validate aspects such as: significant effects on the performance outcome generated by the use of data; it is also confirmed that legal aspects significantly affect three performance measures (operational, product and economic); collaboration and teamwork affect operational performance measures and responsiveness. In this sense, it is evident the wide portfolio of possibilities that by implementing this technology allows the digitization of information and

interconnectivity of technological tools based on the internet of things to build information structures that allow the improvement in the availability of data for decision making and complete information systems similar to the quality management system model that is the subject of this article. Cloud computing is a model that allows access to a set of computational services (networks, servers, storage, applications and services) in a convenient manner when needed. This is because they can be rapidly provisioned and released with minimal administrative effort and interaction on the part of the service provider. Consequently, technology, services and applications are taken and turned into utilities that are put at the service of users whose subsequent adoption is critical for organizations and users. Systems and storage can be used on demand, evaluating costs based on past usage records, allowing agile scalability of resources, virtualizing systems [48]. The cloud services most purchased by companies are those related to office services (word processing, spreadsheet, database management, email client, calendar and presentation manager) at 65.7%, followed by software as a service services (e.g. Salesforce, financial software, accounting, Enterprise Resources Planning ERP) at 48.6% and information processing services (virtual machines) at 44%; the least purchased service is virtual desktop services at 20% [49] being a scaling alternative for the model intended to be used in the case study.

In the Colombian context, there is a study by Pacheco [50] which, although it does not show a real application to the company and an execution that allows obtaining data on its success in the company, it does establish a design regarding digitalization in an important sector for the country. The objective of this study is to propose the design of the implementation of the fourth industrial revolution in the manufacturing sector in Bogota, for which it uses a qualitative methodology with a descriptive scope type, for which the literature is used as a source of information and the survey as a primary source. As for the results of the research, it identified various trends in the adoption of industry in the manufacturing sector in different countries through the systematic review of literature, where it was determined that developed countries have achieved great benefits through the implementation of industry technologies, such as increased profitability in their organizations, positioning of organizations, strengthening of industrial processes and cost reduction. Likewise, the study found that Latin American countries are evidently in a nascent stage of embracing this industry. In the same way, it was found that in Bogota they know the term industry in a global way, but there is a significant gap in understanding in detail the aspects related to technologies, which leads to a lack of knowledge of the advantages of using them, in addition to the lack of investment in SMEs.

On the other hand, the case of digital transformation in the company Carvajal Tecnología y Servicios [51] is found as an example on the subject, since it is considered the largest technology integrator in the country, with more than 40 years of experience in sectors such as public, health and private, which throughout the pandemic has been characterized by its interoperability and management of secure and quality information. This company has

pointed out the importance of adapting adequately to the fourth industry revolution, looking for ways to use new technological tools that allow the digital reinvention of the company, which is sought from the improvements offered to customers or users in terms of their experience and contact with the company, from the reduction of service times and/or transaction costs, so in summary it is considered that the digital reinvention should not only depend on technology, but the appropriate process to be carried out in the organization.

Finally, there is the company Alsus Group [52], which emerged as an entrepreneurial idea in 2006 and has specialized in the implementation of innovative projects related to information technologies and telecommunications, in addition to seeking quality in the development processes based on the international quality model. This company in the technology sector has chosen to incorporate innovative methods supported by information systems developed from international quality parameters, which has allowed them to increase productivity and competitiveness of customers, with a highly trained team committed to the growth of the company from an integral perspective.

4. CONCLUSIONS

- The technological revolution is an inevitable phenomenon nowadays and in turn, digitization has become an essential element both inside and outside companies, since technological transformation allows innovation processes in quality management systems in organizations, so it is essential to guide them towards these transformation processes in order to achieve a better relationship with users, while it is possible to provide a better experience and satisfaction with the services or products offered.
- It is undeniable that the health emergency has become an accelerator towards virtuality, which has triggered a massive use of technology in all organizational processes, so companies must adapt to their environment in which technology is the most important tool. It is necessary to identify, interpret and use technology in the most optimal way possible and according to the needs of the company, in order to turn it into an advantage and take advantage of the key tools that it provides, using them to improve the value chain of companies in general and their different operational and commercial processes.
- The digitization model evidenced is a potentialization of the tools available to the organization taken as a case study, but the methodology and scheme can generate applicability in companies of similar size that seek to digitize their management systems and even operational processes that can be virtualized from their existing technological tools.

- The implementation of this model was carried out progressively giving continuity to the company's quality management system and operational processes by working remotely during the months of mandatory quarantine.
- This model can be complemented with an information management system under ISO 27001 to ensure greater information security, taking into account the risk approach, which is one of the fundamental pillars of ISO 9001.

REFERENCES

[1]   S. Lee, D. Lee, Y. Sung, "The quality management ecosystem for predictive maintenance in the Industry 4.0 era". *International Journal of Quality Innovation*, vol. 5, no 4, 2019, doi: https://doi.org/10.1186/s40887-019-0029-5

[2]   G. Petana, C. Rosa, "Digital Transformation and the Impact in Knowledge Management. *Scitepress- Science and Technology Publications*, pp.180-187, 2020,doi: https://doi.org/10.5220/0010134001800187

[3]   M, Javaida A, Haleema R, Pratap R, Suman "Significance of Quality 4.0 towards comprehensive enhancement in manufacturing sector". *Sensors International*. vol 2, pp.1-13, 2021, doi: https://doi.org/10.1016/j.sintl.2021.100109

[4]   M. Menshikova, Y. Piunova , M. Makhova. Transformación digital en el sistema de gestión de la calidad", Conferencia internacional 2019. In Conferencia internacional 2019 "Gestión de la calidad, transporte y seguridad de la información, tecnologías de la información", pp. 42-46, 2019, doi: https://doi.org/10.1109/ITQMIS.2019.8928438

[5]   S. Schrauf, P, Berttram. Industry 4.0. How digitization makes the supply chain more efficient, agile, and customer-focused: PWC, pp.1-32, 2016. [Online], Available: https://www.pwc.ch/en/publications/2017/how-digitization-makes-the-supply-chain-more-efficient-pwc-2016.pdf

[6] I.A. Guerra "La transformación digital de la empresa", tesis Universidad de Cantabria, pp. 1-29, 2017. [Online], Available: https://repositorio.unican.es/xmlui/bitstream/handle/10902/13402/ALONSOGUERRAIVAN.pdf

[7]   M. Menéndez, "Análisis del proceso de transformación digital de una empresa industrial del sector Utility" Universidad Pontificia Comillas, Madrid, pp.1-120 jun.2019. [Online], Available:
https://repositorio.comillas.edu/xmlui/bitstream/handle/11531/36347/TFM%20-%20Menendez%20Botella%2C%20Marta.pdf?sequence=2&isAllowed=y

[8] A. Cifuentes, "Implementación de herramientas tecnológicas y digitales para optimizar los procesos de orden y control del área logística y comercial de la empresa Chispa y Sabor" Fundación Universitaria Empresarial de la Cámara de Comercio. Bogotá D.C, pp. 1-64, 2019. [Online], Available:
https://bibliotecadigital.ccb.org.co/bitstream/handle/11520/23911/Angie%20Natalia%20Cifuentes%20Mogoll%c3%b3n..pdf?sequence=1&isAllowed=y

[9] M.C Gama, P. Parrado "Plan de Medios Digitales para la empresa ACSE Tecnology en Villavicencio" Universidad Cooperativa de Colombia, Villavicencio pp. 1-43, 2019. [Online], Available from:http://hdl.handle.net/20.500.12494/12945.

[10] P. Verhoef, T Broekhuizena, Y. Bartb, A. Bhattacharyaa, J. Qi Dong, N. Fabian y M. Haenlein "Digital transformation: A multidisciplinary reflection and research agenda". *Journal of Business* Research, vol 122 pp. 889-901, ene.2019, doi: https://doi.org/10.1016/j.jbusres.2019.09.022

[11]   Ting J. Digital Transformation in Process industries. Digital Customer Experience, Digital Platform Center, Yokogawa Electric International Pte. Ltd, vol. 64, no 1, pp.1-6, 2021.

[12]   F. Vacas, Transformación digital: del lifting a la reconversión. CEF   no 10, pp. 135-143, 2018, doi: https://doi.org/10.51302/tce.2018.199

 [13]   J.M Briand, Digitalización de los sistemas de Calidad y HSE- BlueKanGo, 2019. [Online], Available from:
https://cdn2.hubspot.net/hubfs/2302063/Guides%20et%20rapports/2018/ES/2018_ES%20Guide_Digitalisation%20HSE%20Qualit%C3%A9.pdf.

[14] Y. Morales. Digital Business como herramienta estratégica de Marketing para incrementar la demanda de las Mipymes del sector calzado de Bogotá. Universidad Cooperativa de Colombia, Bogotá D.C, pp. 1-31,2019. [Online], Available from: http://hdl.handle.net/20.500.12494/15713

[15] J. Berbegal, F. Marimon, M. Casadesús, P. Sampaio. Proceedings book of the 3rd International Conference on Quality Engineering and Management. In International

Conference on Quality Engineering and Management, pp. 605-613,2018. [Online]. Available http://hdl.handle.net/10174/28976.

[16] D.P Castellanos, D.M Velasquez, Plan de mejora para la transformación digital en una empresa de telecomunicaciones. Universidad Externado de Colombia, pp.1-83, 2018 [Online]. Available https://bdigital.uexternado.edu.co/bitstream/handle/001/764/ALA-Spa-2018-
Plan_de_mejora_para_la_transformaci%F3n_digital_en%20una_empresa_Trabajo.pdf;jsessionid=F1CB12AFE2F474AB6787572C59467189?sequence=1

[17]   H. Nachit, L. Belhcen, Digital Transformation in Times of Covid-19 Pandemic: The Case of Morocco. SSRN Electronic Journal, pp.1-17, 2020. http://dx.doi.org/10.2139/ssrn.3645084.

[18]   Mckinsey y Company, pp.1-9, oct. 2020 [Online]. Available from: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever.

[19]   C. Ralea, O.C Dobrin, C. Barbu, C. Tanase. Looking of the future: digital transformation of quality management. In Proceedings of the 13th International Management Conference; Bucharest, Romania, vol 13.pp. 121-132, 2019.

[20]   L. Koskela, A. Tezel, V. Patel. Theory of Quality Management: its Origins and History. In F.R. PCaH, editor. Proc. 27 Annual Conference of the International. Group for Lean Construction (IGLC); Dublin, Ireland. pp. 1381-1390, 2019,doi: https://doi.org/10.24928/2019/0259

[21]   Andrle SJ. Total, Quality Management in Public Transportation. Transit Cooperative Research Program, no 3, pp.1-39, oct.1994.

[22]   A. Ferreira, D. Otley. "The design and use of performance management systems: An extended framework for analysis". Management Accounting Research, vol. 20, no 4, pp. 263-282, 2009 doi: https://doi.org/10.1016/j.mar.2009.07.003

[23]   K. Hendricks, V. Singhal. Firm characteristics, total quality management, and financial performance. Journal of Operations Management, pp. 1-17, 2001, doi: https://doi.org/ 10.1016/S0272-6963(00)00049-8

[24]   Z. Karimi, Quality Management Systems and Organizational Performance: A Theoretical Review in Kenya's Public Sect or Organizations. Science Journal of Business and Management, vol.4, pp. 150-155, 2016, doi: https://doi.org/ 10.11648/J.SJBM.20160405.12

[25]   T. Fontalvo, E. De la Hoz. Diseño e Implementación de un Sistema de Gestión de la Calidad ISO 9001:2015 en una Universidad Colombiana. vol. 11, no 1, pp.35-44, 2018, doi: http://dx.doi.org/10.4067/S0718-50062018000100035.

[26]   L. Fonseca. ISO 9001 Quality Management Systems through the Lens. Quality access to success, vol. 16, no 148, pp.54-59, 2015.

[27]   López K, Roa Á. Desarrollo de un sistema de gestión de calidad en la compañia tecnologica predictiva Kontrolar T. P. K Ltda. bajo los lineamientos de la NTC ISO 9001:2015, Universidad Libre, Bogotá D.C, pp.1-261, 2016.

[28]   Wireless L. Link Wireless, 2020 [Online], Available: https://www.linkwireless.net/nosotros/.

[29]   N. Nutz, M. Sievers. Guía general para el desarrollo de cadenas de valor. Como crear empleo y mejores condiciones de trabajo en sectores objetivos: Organización Internacional del Trabajo, pp. 1-31, 2016.

[30]   J. McGee. value chain. In Wiley Encyclopedia of Management. 3rd ed, John Wiley & Sons, vol.12, pp.5, 2014.

[31]   M. E Libera, J. Belmonte "Ideas and Opportunities for Entrepreneurship through the Value Chains". *Revista Ingeniería Solidaria*, vol.11, no 18, pp.115-122, 2015, doi: https://doi.org/10.16925/issn.1900-3102

[32] D. Kumar, PV. Rajeev, "Value Chain: a conceptual framework". *International Journal of Engineering and Management Sciences*, vol.7, pp. 74-77, 2016

[33]   M. Rachinger, R. Rauter, C. Müller, W. Vorraber y E. Schirgi. "Digitalization and its influence on business model innovation". *Journal of Manufacturing Technology Management*, vol.30, pp. 74-77, 2018, doi: https://doi.org/10.1108/JMTM-01-2018-0020

[34]   J. Gray, B. Rumpe. "Models for digitalization". *Software & Systems Modeling*, vol.14, pp.1319-132, 2015, doi: https://doi.org/10.1007/s10270-015-0494-9

[35]   J. Pereira, "El control de calidad en los planes de digitalización", *Revista PH 95*, 2018. doi: https://doi.org/10.33349/2018.0.4226

[36]   A.E. Sánchez, "La gestión de documentos como estrategia de innovación empresarial*", Revista Venezolana de Información, Tecnología y Conocimiento*, vol.11, no 2, pp.25-50, 2014

[37]   D. Winkler, M. Sabou, S. Biffl. "Improving Quality Assurance in Multidisciplinary Engineering Environments with Semantic Technologies" Quality Control and Assurance - An Ancient Greek Term Re-Mastered, pp.379-398, feb. 2017, doi: https://doi.org/10.5772/66222

[38]   M. Trimbak, J. Bagi. "Quality improvent through authomation of product design process in a manufacturing organization". *International Journal for Quality Research*, pp.505-5014, ene. 2011.

[39]   K. Žídek, V. Modrák, J. Pitel y Z. Šoltysová. "The Digitization of Quality Control Operations with Cloud Platform Computing Technologies". *Industry 4.0 for SMEs*, pp. 305-334, ene.2020.

[40]   T. Gorensek, A. Kohont. Conceptualization of digitalization: opportunities and challenges for organizations in the Euro- Mediterranean area. International Journal of Euro-Mediterranean Studies, vol. 11, no 2, pp. 93-115,2018.

[41]   Hans M, Birch A, Gremyr I, Martin J. Digitalisation and quality management: problems and prospects. Production Planning and Control. vol. 32, no 12, 2021.

[42]   A. Carvalho, P. Sampaio, E. Rebentisch, J. Oehmen. Technology and Quality Management: a review of concepts and opportunities in the Digital Transformation. In Conference: International Conference on Quality Engineering and Management, sept. 2020.

[43]   N. Mohd, S. Mat, R. Anak, S. Ayub. Digitization of Records and Archives: Issues and concerns. International Journal of Academic Research in Business and social sciences, vol.8, no 9, pp. 170-178, 2018.

[44]   M. Andreessen. How Software is powering the Hardware Renaissance: The state of sftware monetization pp, 1-19, 2020. [Online], Available: https://www3.thalesgroup.com/hardware-to-software/pdf/report.pdf

[45]   G. Rodriguez, G. Bribiesca "Modelo de Transformación Digital en las Empresas". In XXXII Congreso Nacional y XVIII Congreso Internacional de Informática y Computación de la ANIEI; Puebla, pp.1-8, oct.2019.

[46]   CEIB. La transformación digital. In Actividad enmarcada en las reuniones preparatorias del XIII encuentro empresarial iberoamericano, en el marco de la XVII cumbre iberoamericana de jefes de Estado y de Gobierno de Andorra; Madrid, pp.1-98, 2021. [Online], Available: http://www.andi.com.co/Uploads/INFTD.pdf

[47]   M.S. Bhatia, S. Kumar. "Critical Success Factors of Industry 4.0 in Automotive Manufacturing Industry". *IEE Transactions on Engineering Management,* pp.1-15, sept.2020, doi: https://doi.org/ 10.1109/TEM.2020.3017004

[48]   P. Palos, A. Reyes, R. Saura. "Modelos de Adopción de Tecnologías de la Información y Cloud Computing en las Organizaciones", vol.30, no 3, junio. 2019, doi: http://dx.doi.org/10.4067/S0718-07642019000300003.

[49]   S.M. Fierro, R. Medina, Procesos de Transformación digital para un proveedor de servicios cloud en Colombia, Gerencia Estratégica de Tecnologías de la Información, Universidad Externado de Colombia, Bogotá D.C, pp.1-117, 2019. [Online] Available: https://bdigital.uexternado.edu.co/bitstream/handle/001/2454/ABCBA-spa-2019-Proceso_de_transformacion_digital_para_un_proveedor_de_servicios_cloud_en_Colombia?sequence=1&isAllowed=y

[50]   Pacheco A. Propuesta de Implementación de la Industria 4.0 en el sector manufacturero de Bogotá. Universidad Católica de Colombia, Bogotá D. C, pp.1-72, 2020. [Online] Available: https://repository.ucatolica.edu.co/bitstream/10983/25322/1/PROPUESTA%20DE%20IMPLEMENTACI%C3%93N%20DE%20LA%20INDUSTRIAL%204.0%20EN%20EL%20SECTOR%20MANUFACTURERO%20DE%20BOGOT%C3%81.pdf

[51]   Carvajal Tecnología y Servicios. Los retos de la reinvención digital, 2020 [Online] Available: https://www.carvajal.com/index.php/los-retos-de-una-reinvencion-digital/.

[52]   La Patria. Alsus Group, con el software de la innovación, 2014 [Online] Available from: https://www.lapatria.com/negocios/alsus-group-con-el-software-de-la-innovacion-129191.