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Diagnosing the Impact of Digital Transformation on the Human Talent of SMEs in Bogotá, Colombia

Diagnóstico del impacto de la transformación digital en el talento humano de las PYMES de Bogotá, Colombia

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Abstract

Through a structured survey and the research of available academic sources, this paper focuses on diagnosing the adoption of the Fourth Industrial Revolution (4IR) technologies by the human talent of Small and medium-sized enterprises (SMEs) in Bogotá. We identified the absence of an instrument that assesses the impact of new technologies on human talent concerning the required technical skills and the future of labor. An analysis model, a diagnostic instrument for these companies, is proposed based on three pivotal elements: impact, enablers, and perception, as a Minimum Viable Product (MVP). An incremental innovation based on existing organizational culture, transformation, and digital maturity models generates a *prototype* as an added value to rate and represent the analysis model results, which allows the assessment of the impact of digital transformation on these organizations. For this, crucial questions are analyzed to graphically view the entity's status regarding technology and human talent.

Keywords: Diagnostic instrument; Prototype; SMEs; Human talent; Digital Transformation.

Resumen

Este documento se enfoca en desarrollar, a través de una encuesta estructurada y la investigación de las fuentes académicas disponibles, el diagnóstico por la adopción de las tecnologías de la Cuarta Revolución Industrial (4RI) sobre el talento humano que labora en las Pequeñas y Medianas Empresas (PYMES) de Bogotá, lo cual permitió identificar la ausencia de un instrumento que valore la afectación sobre el talento humano en relación con las habilidades

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tecnológicas requeridas y el futuro del trabajo por la implementación de nuevas tecnologías. Se propone un modelo de análisis, instrumento diagnóstico para estas empresas, a partir de tres ejes: impacto, habilitantes y percepción, como Mínimo Producto Viable (MPV). Una innovación incremental sobre modelos existentes de cultura organizacional, transformación y/o madurez digital, en el que se genera como valor agregado un *Prototipo* para calificar y representar los resultados del modelo de análisis, el cual permite evaluar el impacto de la adopción de la transformación digital en estas organizaciones, esto se logra a través del registro de preguntas claves las cuales son analizadas para visualizar gráficamente el estado de la entidad frente a las tecnológicas y sobre el talento humano.

Palabras Clave: Instrumento Diagnóstico; Prototipo; PYMES; Talento Humano; Transformación Digital.

1. Introduction

Internationally, the fourth industrial revolution is redesigning the way of working in different companies. Colombia is no stranger to this global phenomenon, a process that has been accelerated by the unprecedented conditions of the COVID-19 pandemic, especially for SMEs. Those that survived showed a detriment in the evolution of business, sales, and demand; therefore, they were forced to reinvent themselves using technology to stay competitive. By 2019, there were about 1,620,000 companies in Colombia: 6,793 large companies, 109,000 SMEs, and 1,500,000 micro-enterprises (Economía Aplicada, 2019). According to the Departamento Administrativo Nacional de Estadísticas [DANE] (Colombian Statistics Department) and the Confederación Colombiana de Cámaras de Comercio [Confecamaras] (Colombian Association of Chambers of Commerce), Ministerio de Trabajo [Mintrabajo] (Labor Ministry), 2019; Economía Aplicada, 2019), SMEs represent more than 90 % of the national production sector, creating 35 % of the GDP and 80 % of jobs of Colombia. According to the Asociación Nacional de Industriales [ANDI] (Colombian Association of Businessmen) (2019), in 2019, 63.5 % of Colombian companies had a digital transformation strategy, and 57 % of large companies were partially ready to adopt it. In the case of SMEs, only 27.7 %, and in micro-enterprises, it dropped to 24.1 %..

Technologies provide organizations with the agility to offer new products and

services, improve the customer experience, and manage data and processes, but what about human talent? Do SMEs in Bogotá fully identify the impact of adopting 4IR technologies on their human talent? This research develops a diagnostic instrument to understand the challenges involved in the development and transformation of employment in the context of competitiveness in the market to remain current due to the adoption of technologies in SMEs in Bogotá. This adoption requires that human talent develop or acquire new skills very quickly, changing the quality of employment or reinventing the way of performing functions, among others. Additionally, an analysis prototype is developed from three pivotal elements: impact, enablers, and perception.

This diagnostic tool was applied to SMEs through electronic surveys with Likert scale-type questions Net Promoter Score (NPS), dichotomous, and multiple choice) about customer experience. It seeks to investigate the degree of knowledge of technological trends and their effect on the human business fabric, the possible scenarios and alternatives to take advantage of, retain, promote, and attract human talent, and their interests in frontier technologies and how they have been involved in them.

Below we present the theoretical framework with the primary theoretical and methodological references consider in the research. Subsequently, there is a brief discussion about the method and the context of the analysis categories, describing the instrument used and systematizing the results obtained from its application. These results allow proposing a diagnostic instrument grouped into three pivotal elements of analysis deemed relevant in the context of SMEs in Bogotá (perception, enablers, and impact), broken down into variables to recognize the impact of 4IR technological trends on human talent. Finally, the conclusions show the implications of the results.

Given that in the existing academic sources, there is no evidence of an instrument that helps SMEs recognize and assess the impact of technologies on their human tissue, this study's specific analysis model is introduced in response to this problem.

2. Theoretical Framework

The national and international literature was analyzed by searching academic data sources such as Google Scholar, Scopus, Dialnet, Redalyc, and Scielo. It is grouped into three themes: The first involves the context of the evolution and trends of digital transformation from the beginning of the industrial revolution to the era of knowledge management in Industry 4.0. The second is addressed from the perspective of associations and Colombian government agencies on the challenges and benefits of adopting frontier technologies for SMEs. The third describes the evolution of employment globally, from the beginning of the digitization of companies to the present, and its impact on human talent.

The digital transformation began in the 1980s when a technological revolution based on the accelerated increase in the capacity of microprocessors to store data and process information emerged as the beginning of digitalization. It later reached a new and most developed stage, 4IR, from the generalization of digital and cyber-physical products such as robotization, Artificial Intelligence (AI), automation, and technologies for handling large volumes of data (big data, internet of things, blockchain, and digital platforms) (Carvajal Rojas, 2017; Nava and Naspleda, 2020). Some trends in digital transformation have evolved into Internet of Things (IoT) technologies, implants in the human body, machines that work in a collaborative and coordinated manner, autonomous systems for decision-making and problem-solving with the ability to learn, virtual customer service advisors, 3D-printed artificial organs, and smart cities, among others. A seamless integration between humans, machines, and robots that harness the full human potential (Xiang and Kong, 2018; BANCOLOMBIA, 2019; Oztemel and Gursev, 2018) and achieves a reliable, dynamic, and real-time human-cyber-physical symbiosis that helps processes and, generally, improves the production system is critical for the success of Industry 4.0.

Digital transformation affects organizations, some more than others, with human talent being the most impacted resource, which is why it is essential. The country's

organizations are becoming aware that employees must be engaged in this transformation, emphasizing employee training (Ministerio de las TIC [MINTIC] (ICT Ministry), 2018; Goodrebels, 2016). Technology has changed how companies interact with consumers, who are more demanding and knowledgeable, and value immediate service through omnichannel and digital media that allow customizing products and services (Porter, 2015; Nagamachi and Mohd, 2015; Córdoba Roldán *et al.*, 2016). In 2016, ANDI created the Vice Presidency for Digital Transformation to turn Colombia and its entrepreneurs digital, promoting a change of mentality that facilitates the transformation of business models, helps to improve the quality of life of Colombians, and increases the productivity of companies thanks to the adoption of exponential technologies. The results of the Digital Transformation Surveys of 2018 and 2019 noted an increase in knowledge on the part of the companies about what the 4IR means, the use of exponential technologies, and the growth in the number of companies that have initiated a digital transformation strategy (Dinero, 2020; ANDI, 2019). They also revealed that some organizations already have talented workers specialized in technologies such as big data, artificial intelligence, IoT, and e-commerce, among others, and train their employees on these topics.

Digital transformation has changed the working world. Historically, its characteristics have constantly been changing. The Industry 1.0 worker performed manual labor, supported by hand-operated tools (1700-1960), while the Industry 2.0 worker used CAX tools (computer-assisted technologies), operating systems, and business information systems (1960-1970). The Industry 3.0 worker cooperated with robots, machines, and computer tools, also known as human-robot collaboration (1970-2000). Finally, Industry 4.0 workers are characterized by an automation-human symbiosis to improve the workforce capabilities Organización Internacional del Trabajo [OIT] (International Labour Organization) (2019); Hernandez *et al.*, 2020; Deloitte, 2017a; Dominik *et al.*, 2020; Serrano, 2016). Industry 4.0 brings significant challenges to improve workers'

quality of life, close the gender gap, and reverse the ravages caused by inequalities worldwide, among others, but also deepens uncertainties. It is considered that the workers likely to lose their jobs will be those who are least prepared to face digital transformation. Those who develop the skills required today will have the opportunity to apply for jobs in the near future.

The reduction in employment, especially in routine tasks, is associated with computers, robots, or platforms replacing labor; 44 % of the companies that reduced their workforce since 2008 did so by automating tasks (McKinsey Global Institute, 2011) and producing changes in the structure of the labor market (Autor and Dorn, 2013; Comisión Económica para América Latina y el Caribe [CEPAL] (Economic Commission for Latin America and the Caribbean) 2017; Acemoglu and David, 2011; Deloitte, 2017b). The workforce requires time to adapt to the transitions caused by the technologies that can replace it and to receive training in the new technologies.

Moreover, 36 % of Colombian companies are fully qualified, and 72 % will invest between 300 and 2,000 million Colombian pesos in digital transformation. The smallest enterprises are the least qualified.

The existing literature on digital transformation in SMEs does not identify its possible effects on the human talent of companies in Bogotá, the new skills necessary to implement frontier technologies, and the abilities to work in collaborative and virtual environments. These factors could result in labor displacement in operational and repetitive activities replaced by technology (The Millennium Project Global Futures Studies & Research, 2017; Goodrebels, 2016; Orellana Dauben, 2020) and the reallocation of production factors in SMEs in the capital city. The international literature has no evidence that these have been studied because they focus on research on the business context of the most developed countries.

The central hypothesis of this research is that according to national and international literature, the determinants of emerging technologies such as hyper-connectivity, hyper-automation, native cloud platforms,

artificial intelligence engineering, and decision-making with autonomous systems, among others, change the working conditions of human talent. These factors integrated into the business environment are not consistently recognized by the SMEs that carry on their business in Bogotá.

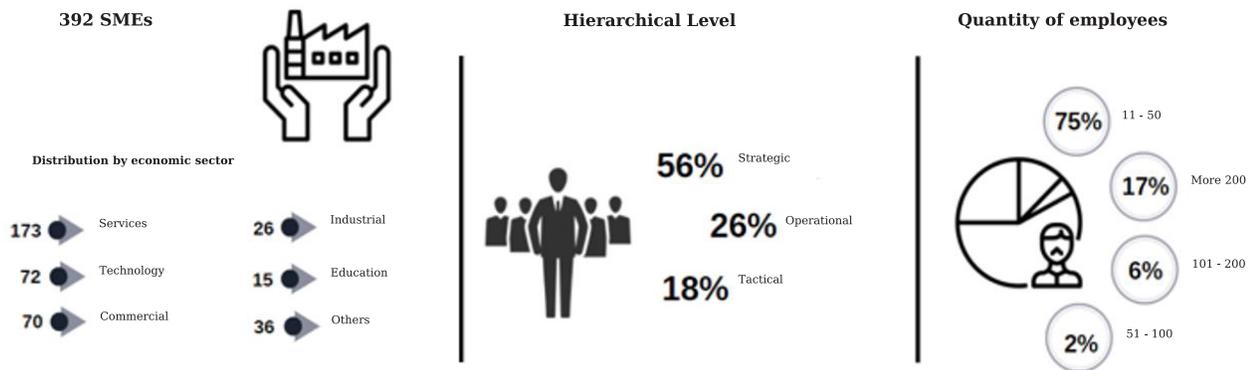
3. Materials and Methods

The research is mixed with documentary and field components from a triangular approach, integrating quantitative and qualitative elements worked on independently but simultaneously. The information is collected, analyzed, linked, and discussed, allowing for conclusion and identification from different points of view about the process through a strategy to meet the objectives set. It has a correlational explanatory scope. It seeks to identify the impact of digital transformation in SMEs in Bogotá on their human talent, understanding the cause-effect relationships associated with the transformation of work, technology, the 4IR, the rapid adaptation of human talent, labor displacement, the modification of working conditions, and the acquisition of new digital skills, among others.

The population under study were SMEs in Bogotá, with 41,062 small-sized and 11,851 medium-sized (Instituto Nacional de Contadores Públicos de Colombia [INCP] (National Institute of Public Accountants of Colombia), 2021). The sample was adjusted to a 95 % confidence level, with a margin of error of 4.931 %. A representative sample of 392 Bogota organizations underwent a structured interview with 24 questions to recognize the factors that impact organizations and their workers when implementing new technologies.

The variables considered were the adoption of frontier technologies, the adaptation of workers to the transition to new technologies, highly qualified roles in technological trends, retraining and the acquisition of new skills, and the redesign of job positions.

A field diagnostic instrument, a survey, was applied as a structured electronic form. The first block of questions (1 to 5) characterized the type of companies that answered it, and

Figure 1. Characterization of companies surveyed in Bogotá

Source: Authors' own elaboration

the second block identified the factors that impact organizations and their workers when implementing 4IR technologies.

The analysis instrument considers the conditions that stand out in Latin America, such as labor displacement, the substitution of jobs, the redesign of current jobs, the time for retraining in new digital skills to face the unique challenges of digital transformation, and the creation of new positions or engagement of highly specialized resources in frontier technologies, making Colombia a country with better training and competitiveness in the region (Anzola Sarmiento, 2017; OIT, 2017).

4. Results

4.1. Characterizing the SMEs in the study group

The company group surveyed focuses on small- and medium-sized companies in Bogotá (Figure 1).

The analysis of results is grouped into three pivotal elements. One is called enablers, which includes factors such as the economic resources of companies, governance and strategy. The second is perception, which considers factors such as coordination and integration, change management,

and qualified personnel required to take advantage of technology; finally, impact involves actions on human talent and factors such as digital skills. The results obtained are presented in Figure 2.

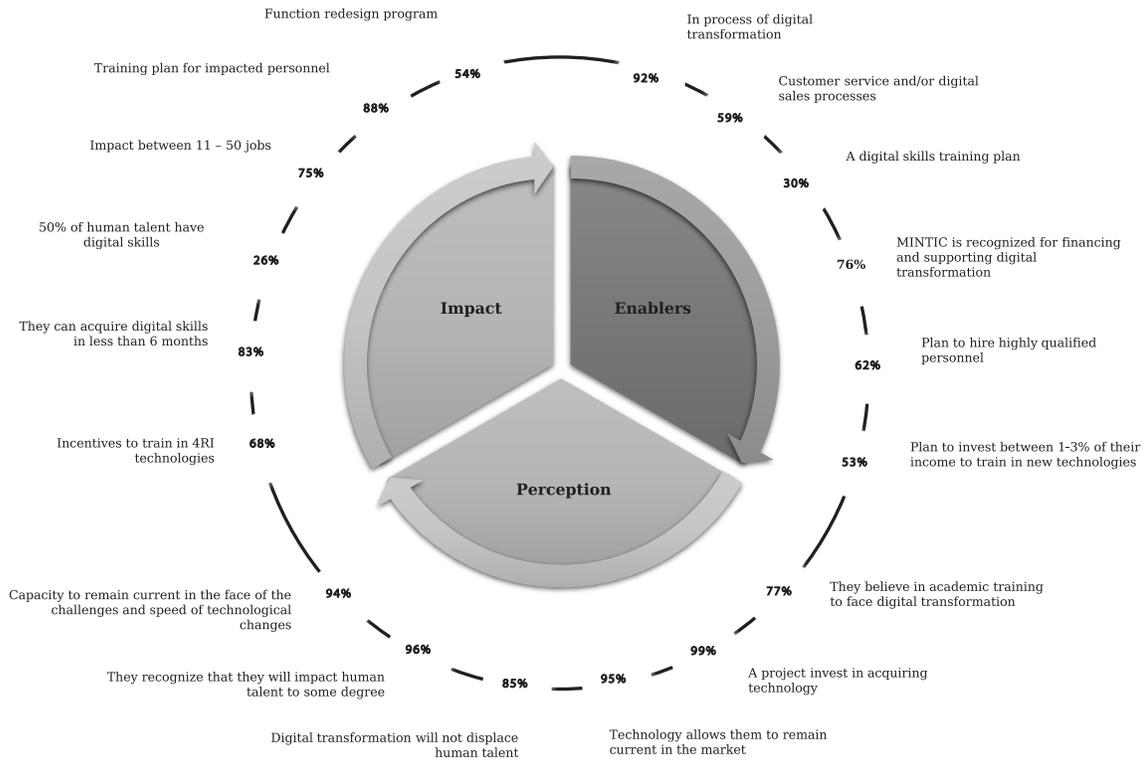
The detailed analysis of the impact results with the breakdown of the proposed subcategories is as follows.

4.2. Actions on human talent

The analysis shows that 54% of the companies surveyed consider redesigning the functions of the positions with the implementation of technology. In comparison, 41% still do not know if they will redesign positions or what other actions should be taken. Besides, 88% plan to train the employees holding the positions to be impacted, 18% will be relocated, 7% will redesign the functions of the position, and only 2% will be dismissed or are still unclear about what to do. 75% of SMEs consider it will impact between 11 and 50 jobs.

From the results obtained, it can be deduced that SMEs will take actions consistent with the realities of technological change due to the 4IR, favoring the training of human talent and adjusting the functions and performance of daily activities to adapt. However, a proportion of employees will be adversely affected.

Figure 2. Summary of the most relevant results of the applied instrument



Source: Authors' own elaboration.

4.3. Digital skills

All organizations recognize that their employees have the digital capabilities or skills to leverage the digital transformation in their company; 26% consider that more than 50%, and 30% know that between 21% and 50%. In addition, 68% of the entities surveyed think about encouraging staff to be trained in new technologies.

These results suggest that the entrepreneurs of SMEs in Bogotá trust their employees to take on the challenges of digital transformation, and therefore they will maintain their workforce. They are even willing to invest in training to retain them and create incentives for them to be trained and certified on digital transformation needs.

The percentage of confidence in the academic training of employees to face the challenges of digital transformation is 77%; additionally, 83% of the entities indicate that their work teams can acquire new digital skills in less than six months.

The detailed analysis of the enablers results with the breakdown of the proposed subcategories is as follows.

4.4. 4IR technologies

It has been identified that the primary skills required by human talent when implementing digital transformation are those aimed at frontier technological trends, such as cloud services (84%), IoT (48%), and data analytics (35%). Furthermore, 92% of the companies that participated in the survey are in the process of adopting the transformation in the short term, which is consistent with the fact that 59% of the companies have implemented customer service or digital sales processes.

4.5. Governance and strategy

For the sample, the most recognized institutions for their support and financing of digital transformation are the MinTIC, with 76%, the Servicio Nacional de Aprendizaje

[SENA] (National Training Service), with 63 %, and the Ministerio de Ciencias [MinCiencias] (Ministry of Sciences), with 32 %. Only 30 % have a digital skills training plan for their employees, and 51 % will involve between one and five employees. Likewise, 62 % of the organizations surveyed plan to hire highly qualified personnel, while 97 % will retain them, showing employers' high commitment to and appreciation of highly qualified human resources. The SMEs in Bogotá that participated in the research do not gauge the effect of the digital transformation on human talent management due to the low percentage of training and the concentration of knowledge in personnel highly qualified in new technologies, which has a high turnover in the market.

4.6. Economic resources

The analysis showed that 53 % of the sample would allocate between 1 % and 3 % of their income to train employees in new technologies, 31 % between 4 % and 5 %, and only 13 % would allocate more than 5 %. Similarly, 37 % consider investing between 4 % and 5 % of their income in this training, while 76 % have the financial capacity to develop a digital transformation plan in the short term.

The detailed analysis of perception results with the unfolding of the proposed subcategories is as follows.

4.7. Qualified personnel

The percentage of confidence in the academic training of employees to face the challenges of digital transformation is 77 %; 85 % do not think that digital transformation displaces or replaces labor. Besides, 50 % of the SMEs in Bogotá will affect between 1 and 5 employees. The companies under study, 80 % of which have an essential technological base because they are in the financial services, technology, and commercial sectors, are not evaluating the changes that digital transformation can have in human talent and the 4IR technologies they will adopt in the short term such as cloud services (84 %), IoT (47 %), and data analytics (35 %).

4.8. Change management

In this regard, 99 % of SMEs surveyed will invest in acquiring technology, of which 54 % plan to invest more than 6 % of their income. Likewise, 95 % recognize that their organizations' technology will allow them to remain current in the market for the next five years, while 75 % consider that due to the COVID-19 pandemic, the company's implementation of new digital solutions was introduced or accelerated.

4.9. Coordination and integration

Concerning this variable, 96 % of the companies analyzed recognize that technologies will impact human talent to some degree since 7 % will not take any action to adopt technological trends. The result of the NPS (0 %) on using an instrument to identify the impact is given by the ignorance or application of this type of tool and the benefits it can offer. When contemplating the companies that have defined a training plan in digital skills for employees, 53 % of companies in the services, technology, and commercial sectors with a technological base to develop their mission are interested in the instrument. In addition, 94 % of the sample, between the operational, tactical, and strategic levels, believe they can stay current in the face of the challenges and speed of technological changes.

In grouping results for the perception element, one aspect evaluated was processes. The strategic ones will be the most impacted, with 50 %, followed by support (39 %) and missionary processes (31 %). Finally, the least impacted would be evaluation and control, with 19 %.

5. Discussion

5.1. Possible necessary alternatives for human talent

According to the analysis of the instrument, it can be identified that in order to strengthen the trust in human talent, it is necessary to increase knowledge of frontier tools and technologies, especially cloud services, IoT, Business Intelligence (BI), Business Analytics

Table 1. Grading prototype of the diagnostic instrument for the impact of technology on human talent

	0 -20 pts	21 -40 pts	41 -60 pts	61 -80 pts	81 -100 pts		
IMPACT	Actions on human talent	Strongly disagree	Disagreement	Neutral	Agree	Strongly agree	RESULT
	How many jobs will it impact?				75		65
	Do you consider redesigning the functions of the charges with the implementation of technology?			65			
	What do you plan to do with the people in the jobs to be impacted?			55			
	Digital skills	Strongly disagree	Disagreement	Neutral	Agree	Strongly agree	RESULT
	Would it create an incentive for employees to be trained and certified in the digital transformation needs that the company requires?			50			60
	What % of employees do you consider have digital skills or abilities to leverage the digital transformation of your company?				70		
	What is the expected time for human talent to retrain and acquire new digital skills?				60		
PERCEPTION	Qualified personnel	Strongly disagree	Disagreement	Neutral	Agree	Strongly agree	RESULT
	Are you satisfied with the academic training of your employees to face the challenges of digital transformation?					70	70
	How many employees does your company have?			60			
	Do you think that digital transformation will be able to displace or replace labor?				80		
	Change management	Strongly disagree	Disagreement	Neutral	Agree	Strongly agree	RESULT
	What % of your income will you use to acquire technology?				65		60
	Did you incorporate or accelerate the implementation of new digital solutions due to the COVID-19 pandemic?				61		
	In the next 5 years, do you think that your company's technology will allow you to remain current in the market?			54			
	Coordination and integration	Strongly disagree	Disagreement	Neutral	Agree	Strongly agree	RESULT
	Would you use an instrument that helps you identify the impact on human talent due to the adoption of digital transformation?			50			50
Is your company able to stay current, to the challenges and speed of technological changes?			45				
Which of the following are the processes that will be affected by the digital transformation to be implemented in your company?				56			

ENABLERS	4IR technologies	Strongly disagree	Disagreement	Neutral	Agree	Strongly agree	RESULT
	Are you implementing or planning to implement digital transformation in your company in the short term?					98	80
	What technological trends or digital solutions do you plan to implement in the short and medium term?			60			
	Do you have customer service and/or digital sales processes?				81		
	Governance and strategy	Strongly disagree	Disagreement	Neutral	Agree	Strongly agree	RESULT
	Which of the following government entities and instruments that support and finance digital transformation in companies do you know?				70		68
	Do you have a defined digital skills training plan for your employees?			41			
	Have you thought about hiring highly qualified personnel or with specific training in any digital solution?					90	
	Do you consider retaining highly qualified human talent in digital transformation?				72		
	Economic resources	Strongly disagree	Disagreement	Neutral	Agree	Strongly agree	RESULT
	What % of your income will you allocate to educate or train your employees in the new technologies implemented or to be implemented?			50			40
	Do you have the financial capacity to develop a digital transformation plan in the short term?		30				
Source: Authors' own elaboration.							

(BA), big data, AI, and Robotic Process Automation (RPA).

Any change due to companies adopting new technologies creates uncertainty and even fear as it modifies how people perform their work. However, the results of this study show that employers intend to maintain their workforce. Therefore, they should consider improving their communication with employees, including these issues, so they can feel at ease and adhere to training to expand their knowledge and acquire new skills.

5.2. Activities or processes to be transformed

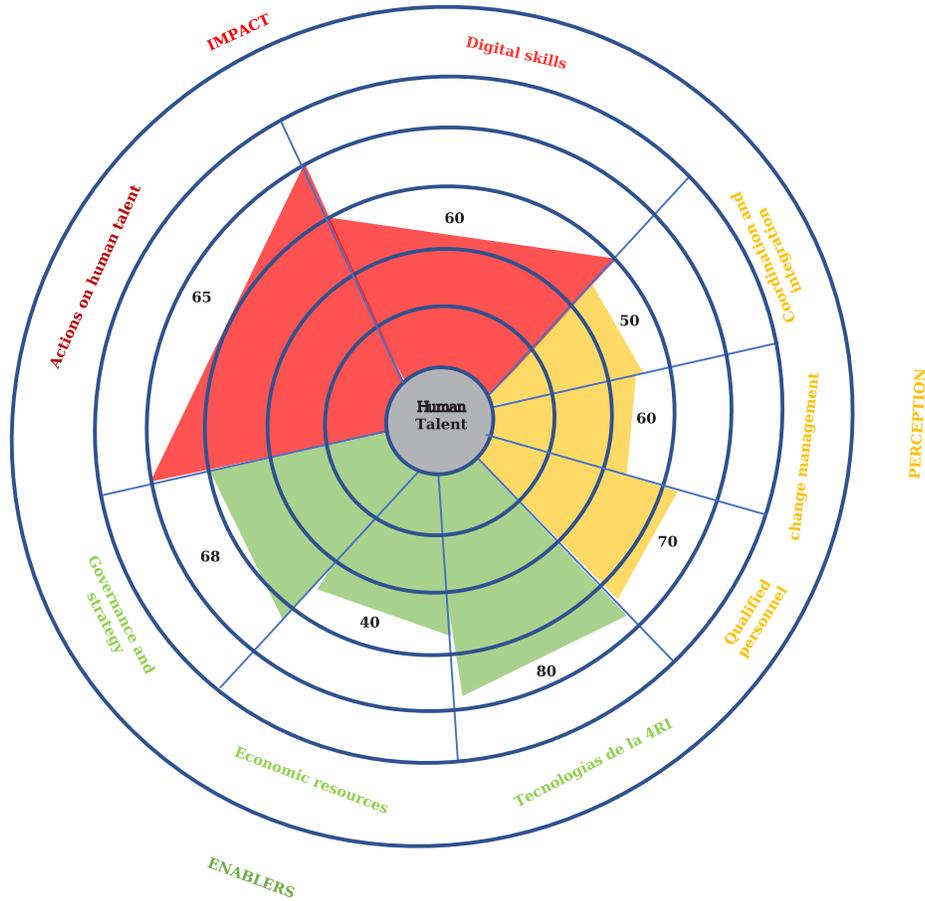
According to this study, the processes that new technologies will transform are strategic and support processes. Nonetheless, the

reference literature states that technologies most likely affect operational, repetitive, and extensive data volume management processes.

As part of our results, an improvement to the analysis instrument is proposed by changing the grading scheme for all the evaluation elements in the interviews to allow the results to be compared between companies (Table 1).

The preceding is a contribution to SMEs regarding incremental innovation in the organizational culture assessment models. It explicitly shows companies the implications for their human tissue in different dimensions such as training time, required training, the adaptation of human talent, the recruitment and hiring of highly qualified personnel, impacted processes, the redesign of functions

Figure 3. Prototype of the schematic of results of the diagnostic instrument for the impact of technologies on human talent



Source: Authors' own elaboration based on the correlation of organizational culture assessment models.

due to technological changes, State financing instruments and entities, the promotion of training programs, professional growth, and learning of new technologies. This prototype is represented as a schematic for viewing results (Figure 3).

6. Conclusions

The research study conducted in Bogotá intends to contribute to understanding the reality of SMEs. The analysis did not show an instrument that allows evaluating, measuring, or assessing how human talent is affected by the implementation of 4IR technologies, which is why we propose a diagnostic instrument to recognize the different elements in this context.

According to the McKinsey Global Institute (2011), companies seek to restructure their processes to reduce the number of employees during economic recessions, which occurs the most in large companies than in small enterprises. This condition is reaffirmed in part by the population subject to this study. They are highly interested in improving their processes with technologies without displacing their human talent, which is limited, given that 75 % have between 11 and 50 employees, and their absence would impact companies' management.

Moreover, 90 % of the SMEs studied consider implementing new technologies in their short-term strategy, which impacts more than 50 % of the employees. There is an imbalance between the training plans

established by the companies and the resources available to implement them, which do not have a particular scope for some employees. It is necessary to promote training on new technologies in SMEs through incentives from companies, government entities, academia, and technology parks.

Based on the research results, the following variables are put forward to strengthen and delve into additional aspects for analyzing the impact of technologies on human talent in the context of SMEs in Bogotá, with additional factors that enrich future research. These variables complement the improvement that unifies the grading scheme with the new factors and their unfolding (Table 2). We also propose improving the Perception and

Enabling element, adding to the latter the subcategory “Skill Development for the 4IR” and its unfolding (Table 3).

We recommend evaluating the bank of questions presented in this section through various instruments, such as the group of experts, focus groups, or the survey of SMEs, to ratify or adjust the prototype of the diagnostic instrument. In addition, the functional prototype or minimum viable product (MVP) should be designed and developed in a second phase and tested in SMEs to continue iterating the proposed instrument in the face of technological trends and their direct or indirect effect on human talent to take advantage of, retain, empower, or attract it.

Table 2. Impact variables and their unfolding to strengthen and deepen the diagnostic instrument

Actions on human talent	
IMPACT	Human talent thinks that they will be laid off or lose their job due to the adoption of 4RI technologies or their lack of knowledge in managing them.
	New jobs will be created by implementing 4RI technologies.
	4RI technologies help improve working conditions.
	Human talent functions will be outsourced to manage the needs of the new technologies to be implemented (outsourcing, temporary services).
	People are constantly trained in the technological changes adopted.
	Skill Development for the 4IR.
	Human talent has time in their workday to update and train.
	The development of digital skills is facilitated at times outside of working hours.
	Apply the acquired digital skills to improve or innovate in the development of work activities.
	New digital skills increase knowledge to create new products, business models, innovate in processes that generate higher profits .
	The development of new digital capabilities allows a rapid response to changes in the environment and customer needs.
	Digital skills.
	The company's human talent is open to acquiring new digital skills.
	Learn about the digital skills required by jobs impacted by the adoption of 4RI technologies.
	Generates added value in professional and personal development by training human talent in digital skills.
	He considers that greater knowledge and training of human talent in digital skills allow the organization to stay and be competitive.

Source: Authors' own elaboration.

Table 3. Perception and enablers variables and their breakdown to strengthen and deepen the diagnostic instrument

PERCEPTION	Qualified personnel
	There are personnel with the experience and knowledge in the organization to implement the 4RI technologies.
	It will link experts, consultants and others to transfer knowledge to human talent in new technologies.
	It will develop projects for the adoption of new technologies with accelerators, startups, technology parks.
	Qualified personnel will be hired to manage the 4RI technologies.
	It will train human talent in such a way that it is recognized as highly qualified in the technologies and skills of the 4RI.
	Change management
	The organization facilitates spaces (virtual, workshops, time, etc.) for human talent to develop skills in 4RI technologies.
	The senior management is committed to accompanying and promoting the adoption of new digital and collaborative ways of working.
	Each of the affected areas is directly involved to articulate the technological changes to be implemented
	The culture of the organization transforms and adapts to changes in technology.
There are managers, sponsors, facilitators who transfer knowledge in the areas and mitigate resistance to change.	
	Coordination and integration
	The areas of planning, communications, human talent, technology and leaders of human talent participate in the adoption strategy of technological changes.
	The expectations of operational efficiency in the processes are satisfied, with the adoption of technology
	Involves end customers, allies or other external actors, in the value generation analysis for the 4RI digital solutions to be implemented.
	The innovation and technology of the 4RI to implement contributes to the SDGs (sustainable development goals).
ENABLERS	4IR technologies
	The knowledge and experience of human talent allows you to leverage the implementation.
	The selected technology responds to market demands and changes in the business environment.
	New and better technologies are continually being adopted to get the job done.
	There is resistance to the implementation of technologies that make changes in the workplace.
	The adoption time of the technologies is adequate for the development of skills by human talent.
	Governance and strategy
	They integrate universities, communities of practice or others for the development of current digital skills in the market.
	There is a training plan in the technologies to be implemented for current employees.
	Recognizes as incentives, the promotion of positions, recategorization, salary increases, among others, to human talent that acquires an expert level in 4RI technologies.
	Consider that technological innovation allows you to have a competitive advantage and/or create new business models or venture into new markets.
	Is willing to make technological changes on a recurring basis to stay competitive.
	Economic resources
	Has its own financial resources to implement and maintain 4RI technologies.
	It will use traditional financing through banks to acquire technology.
The development of projects to acquire new technologies would be done through government entities by calls, tax reduction by ACTI.	
I would be willing to use non-traditional financing mechanisms to obtain resources for the acquisition of new technologies (crowdfunding, sharktang, NGOs, fundraising, among others).	
Authors' own elaboration based on the correlation of organizational culture assessment models.	

7. Conflict of interests

The authors state no conflict of interest.

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