Quality assessment of work-life using Artificial Intelligence and Big Data

Gabriel Silva-Atencio, PhD ⓘ

Universidad Latinoamericana de Ciencia y Tecnología (ULACIT), San José, Costa Rica, gsilvaa468@ulacit.ed.cr

Abstract– In the digital era, the use of emerging technologies is increasingly taking a leading role in organizations, so it has become a critical element in business strategy, giving rise to this research, which identified the degree of influence that Artificial Intelligence (AI) and Big Data have to positively influence the performance of the worker in work activities assigned to the job function within the company. The approach of the study was quantitative, descriptive, exploratory, and cross-sectional, based on a sample of experts in the area of human talent management who possessed knowledge, experience, and expertise in the subject, being the survey, the tool used for data collection. In the conclusions obtained, a positive perception was observed in the contribution to the improvement of the employee's performance; however, it is necessary to establish processes and procedures by the company for the correct use of these tools. In conclusion, the use of AI and Big Data contributes to improving the performance of work activities in the work environment, becoming an increasingly necessary tool to add value and generate a competitive advantage for the company in this new era.

Keywords-- Artificial Intelligence, Big Data, Telework, Work-life, Self-learning, Automation process.

I. Introduction

Thanks to the constant technological advances, it is common to see the automation of tasks, virtual management, and teamwork, among others. This has allowed the execution of organizational processes to be faster, more efficient, and more effective, thanks to the evolution of business networks and the Internet, which have boosted remote and virtual work [1, 2].

The above has allowed workers to disengage from the traditional workplace; generating new affectations that are not perceived by the employer and the collaborator, since there is no supervision process for face-to-face work, leaving to the employer's expert judgment the level of efficiency and effectiveness in the fulfillment of work goals, based on the knowledge, experience, and expertise of the collaborator. Therefore, if the employer had a technological platform that would allow him to supervise and evaluate the behaviour of his collaborators, it would be possible to detect and recognize promptly any individual, group, or repetitive affectation, and even a knowledge database could be generated, to compile lessons learned, good practices or incidents that can be generated in the virtual workplace, being able to generate metrics, business rules for self-learning or individual or group performance evaluation criteria [3, 4].

The beginning of the digital era has brought rapid evolution and incorporation of emerging technologies in business processes, such as Artificial Intelligence (AI) and Big Data, which have allowed for optimization response times, reducing errors, improving budgets, and ensuring process quality [5]. Additionally, the use of these technologies can improve the quality of the employee's work life, since mechanical processes will be automated, facilitate the resolution of complex problems, provide autonomy in business decision-making, and promote the reuse of tasks [6]; this will achieve significant results in achieving business goals, which will then translate into benefits for the worker.

At the beginning of the year 2024, many organizations have technological platforms that store data in a distributed manner, which are sometimes managed as silos, which becomes a problem for the company due to the volume, speed, and reprocessing of data. Therefore, organizations must seek innovative processes through technological tools that allow them to connect and streamline the use of all their data sources, for which they must promote innovation, creativity, efficiency, and operational effectiveness through technology, to facilitate decision-making and meet market demands in real-time [7, 8].

However, the use of these emerging technologies can become a risk within the work environment, as it can affect the worker's perception of their job function; it is for this reason that the company must establish standards, processes, and procedures to protect data, infrastructure, and employees when incorporating AI and Big Data in their business processes [9]. The above will allow to properly establish the proper principles of transparency, visibility, and accuracy in the work function of the collaborator; establishing codes of conduct for the worker and the company in the proper use of technology, which will trigger fair and equitable conditions for employees [10].

Therefore, we propose a quantitative approach to a sample of two hundred professionals in the area of human talent, who possess the professional skills necessary for the design, selection, implementation, and monitoring of the work of workers virtually and remotely. Subsequently, the results obtained are contrasted with a bibliometric review of academic, scientific, and industry articles, to validate the reliability and veracity of the data.

II. Literature review

In the digital era, the use of emerging technologies is taking a leading role within organizations, due to the acceleration in the transformation of organizational processes with technological tools that seek to solve complex problems, facilitate decision-making, and obtain reliable, fast, and accurate results, allowing to achieve a competitive advantage in the short, medium and long term [11-13].

Reference [14] establishes that to achieve success in a digital acceleration process, a technological platform must be created that combines the advantages, benefits, and opportunities of different areas of computer science, with AI and Big Data being essential components of this system.

References [6, 15, 16] agree on the conceptualization of Big Data as the flow of unstructured data created by the environment, from social media posts and network traffic to the Internet of Things (IoT); which can be structured, stored, and analyzed in a relational database, surpassing the capacity of tables, rows, and columns in complexity and processing. The authors also agree that this technology is important because its analysis unlocks information and insights that go beyond human perception and the capacity of traditional database analysis. Reference [17] highlights the characteristics for the correct use of this technology: 1) volume, 2) speed, 3) variety, 4) variability, 5) veracity, and 6) value; however, depending on the environment, more characteristics can be incorporated, such as additional variables (known as the Vs of Big Data), which establish a competitive advantage for the company. References [18, 19] establish that Big Data, as data science, contributes to business strategy, using data capture through data lake structures, which allow systematizing, managing, and automating its processing, in an easy, fast, and efficient way for decision-making.

Undoubtedly, data science, through Big Data, has become a technological platform that offers value, since it reduces the complexity in the analysis of complex problems, increasing the efficiency and effectiveness of organizational processes, through the optimization of response times; and causing an increase in worker productivity [20]. Therefore, Big Data becomes an important input for increasing labour productivity, since it allows not only the evaluation of performance but also provides a complete view of the behaviour of the environment.

Reference [21] emphasizes the contribution of Big Data in decision-making processes since it provides accurate information on individual and group performance of employees, staff turnover rates, risks due to possible labour-related issues, and the relationship between functional units of the company. References [22, 23] highlight the need to emphasize the use of Big Data in business environments, which allows for the collection, sorting, systematizing, and organizing of data to measure the performance of employees in the field of labour welfare, becoming an asset for the selection and evaluation of personnel, by the human talent area.

The second component within the digital acceleration strategy is AI. References [24, 25] conceptualize it as a discipline and a set of cognitive and intellectual capabilities expressed by computer systems or combinations of algorithms, whose purpose is the creation of machines that mimic human intelligence to perform tasks, and that can improve as they gather information.

Today, AI encompasses a wide variety of subfields. These range from general purpose areas, learning and perception, to more specific ones such as speech recognition, playing chess, proving mathematical theorems, writing poetry, and diagnosing diseases [26]. AI synthesizes and automates tasks that are in principle intellectual and are therefore potentially relevant to any domain of human intellectual activities; in this sense, it is a genuinely universal field [11].

The architecture of AI and the processes by which they learn, improve, and are implemented in some area of interest varies according to the intended utility focus, but generally speaking, these range from the execution of simple algorithms to the interconnection of complex artificial neural networks that attempt to replicate the neural circuits of the human brain and that learn through different learning models such as machine learning, reinforcement learning, deep learning, and supervised learning [27].

On the other hand, the development and application of AI in many aspects of everyday life have also led to the creation of new fields of study such as roboethics and machine ethics, which address aspects related to ethics in AI and are responsible for analyzing how advances in this type of technology would impact on various areas of life, as well as the responsible and ethical management that should be given to them, in addition to establishing what should be the correct way to proceed of the machines and the rules they should comply with [28]. Regarding its classification, AI is traditionally divided into weak artificial intelligence, which is the only one currently that deals with performing specific tasks, and general artificial intelligence, which would be an AI that exceeds human capabilities [29].

Reference [6] highlights the relationship between AI and Big Data, since they allow the capture, processing, storage, and availability of data, in a faster and more efficient way; guaranteeing the integrity, confidentiality, and availability of the information. References [26, 30] agree that the combination of both technologies contributes to the quality of the information obtained, to measure and evaluate the professional performance of a collaborator, since they allow the creation of a transactional data repository and an automatic processing model in real-time.

The purpose of the study is to evaluate the contribution of AI and Big Data in the quality of work life of people in the work environment, from the perspective of improving performance for the achievement of business goals, assigned to the job, where it is possible to determine the different capabilities of employees that can be improved by interacting with technology.

Reference [31] approaches the definition of quality of work life as the degree of physical, psychological, and social satisfaction and well-being that an organization's personnel have and experience in their work, their participation in teams, and their work environment; this definition states that the higher the quality of work life in the workplace, the greater the stability, effectiveness, efficiency, productivity, and business success. Reference [32] their study adjusted this concept to reflect the effects of the COVID-19 pandemic, indicating that the quality of work life requires attention and occupation by the worker and the employer since emerging technologies have taken over the repetitive tasks in the company, as a consequence the collaborator must learn to use technological tools to complement the value to the company. Reference [33] emphasizes the change in attitudes about the role of the office in post-pandemic times, highlighting the problem of the return to the traditional workplace, since the combination of remote work with the fulfillment of work objectives, through the use of technology achieved a great acceptance in the world of work.

Reference [34] emphasizes that human behaviour in the workplace has highlighted the degree of satisfaction and motivation of employees and their impact on the performance of daily work in companies, with satisfaction being the externalization of the worker's feelings, depending on their working conditions, while motivation is manifested by the force that exists in the person to satisfy a need, which pushes them to perform that action.

Reference [35] argues that the processes of selection, recruitment, monitoring, and evaluation of personnel will be led by technologies such as AI and Big Data, based on pre-established metrics for decision-making, obtaining a benefit in improving time and cost but affecting employee motivation and satisfaction. Reference [36] mentions that the acceleration of emerging technologies, the turbulence of the environment, and the complexity of creating value, cause companies to look for options to optimize their operation, making technology the way forward, but leaving aside the subjective evaluation of the human being.

References [37-39] state that the use of AI and Big Data is taking an increasingly prominent role in the company since it is being incorporated into the processes of selection and recruitment of personnel, thanks to the use of data trained with the parameters required for the job; however, it has not yet been incorporated in the processes of evaluation of the performance of employees, giving opportunity to scientific and field studies that wish to venture into this subject.

III. METHODOLOGY

The study had a quantitative approach, since it tested a hypothesis, based on numerical measurement and statistical analysis to test a theory [40], along with the development of the investigated object, looking for relationships and regularities between the research factors [41]. Additionally, a descriptive subcategory was established, which sought to identify the characteristics and properties of the phenomenon related to the factors that can positively influence worker performance through using AI and Big Data technologies in the Costa Rican business sector [42]. Then, to model the factors to be considered in the use of the mentioned technologies in the company, an exploratory type subcategory was taken into account to detail each element involved [43]. Finally, the cross-sectional type category was selected, due to the characteristics of the different individuals who participated in the study at a given time [44].

For this purpose, a sample of two hundred professionals in the area of human talent management was selected, who held management positions in public and private sector companies in Costa Rica for the year 2023; and their companies were at the time of the study performing remote work for their employees and used AI and Big Data technologies for the execution of some work tasks of the workers. The sizing of the sample was defined through the finite population model since at the time of the study the open database of expert professionals in the area was known, thanks to the information provided by the Promotora de Comercio Exterior (PROCOMER), Agencia Costarricense de Promoción de Inversiones (CINDE), Cámara de Tecnologías de Información y Comunicación (CAMTIC), Cámara de Servicios Corporativos de Alta Tecnología (CAMSCAT), Ministerio de Planificación (MIDEPLAN), and Dirección General de Servicio Civil (DGSC) [45]. Also, the type of sample selected was non-probabilistic and intentional, based on the database of experts in the area, to avoid biases and errors in the results obtained.

The collection instrument was a closed survey to identify the topic of study [46]. Therefore, being e-mail the distribution system, due to the benefits of time, cost, and ease to be answered; the scale selected was a 5-point Likert for the closed questions, some questions with the option of single or multiple choice to collect data for the research. Additionally, for the development of the survey, the scale used in Reference [47] was used as a basis, since the variables to be evaluated were similar to the object of the study, and from here it was adjusted to the needs of the research.

Then, the hypothesis testing was performed, through the analysis of results. Reference [48] mentions that the hypothesis is based on the assumption of the investigated object, being this assumption is the following:

> "The use of Artificial Intelligence and Big Data can contribute positively to the quality of work life of employees, through the improvement in the performance of the work assigned as company goals".

The objective was to test whether there was any degree of control or moderation of AI and Big Data technologies on the collaborator's job function performance, to promote a new approach in business strategy [49, 50].

IV. RESULTS

Once the bibliographic review was completed, the data analysis was carried out. Fig. 1 shows descriptive information on the distribution of the participating business sectors.
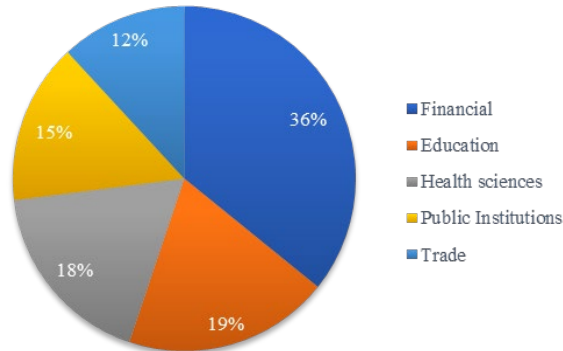

Fig. 1 Distribution of the business sectors participating in the study.

As can be seen in Fig. 1, 85% of the interviewees belonged to the private sector, with the areas of finance (36%), education (19%), health sciences (18%) and commerce (12%) being the most represented; and 15% to the public sector, giving us evidence of the use of emerging technologies in the company. Fig. 2, shows the perceptions of the interviewees, about the capabilities of the use of Big Data to improve performance in the job function; and increase the quality of the worker's work life in the company.
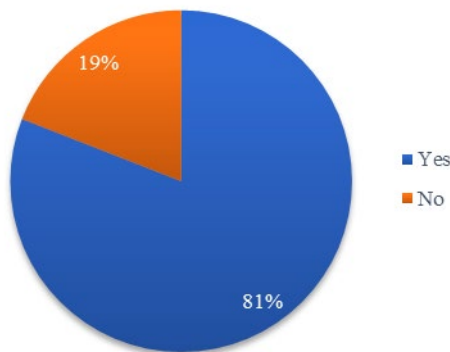

Fig. 2 Perception of capabilities in using Big Data to improve job function performance.

In Fig. 2, 81% of the interviewees have the perception that the use of Big Data can improve the performance of workers. However, 19% say that when using these technologies, the role and work function must be clear, both for the employee and for the use of technology, as it can become a potential rejection for its use in the company. Reference [51] highlights in their work, why people reject the use of technologies, the main finding being the lack of a roadmap for their proper and correct use.

Next, the perception of capabilities in using AI to improve performance in the job function is analyzed (see Fig. 3).
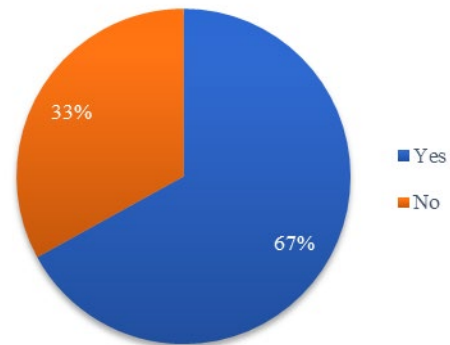

Fig. 3 Perception of capabilities in using AI to improve job function performance.

As shown in Fig. 3, 67% perceive that the use of AI can contribute to improving the performance of workers' work activities, being these tasks repetitive job functions, while 33% are unaware of the contribution that this technology can provide. Reference [52] identified that AI is progressively emerging as an important mechanism of innovation in human resources management, providing the ability to facilitate the transformation of employee performance in numerous responsibilities, but emphasize that to achieve this goal, it is necessary to be clear and improve the competencies of employees in the execution of their responsibilities and cultivate a culture of creativity within the company.

Next, in Fig. 4, the perception of the contribution of AI and Big Data is analyzed in six categories that can contribute to the improvement of job performance within the job function assigned to the job. Reference [53] identified that to achieve job satisfaction of workers and improve the performance of activities within the work environment, the competencies of 1) motivation, 2) communication, 3) working conditions, 4) job satisfaction, 5) leadership, and 6) collaboration should be encouraged.
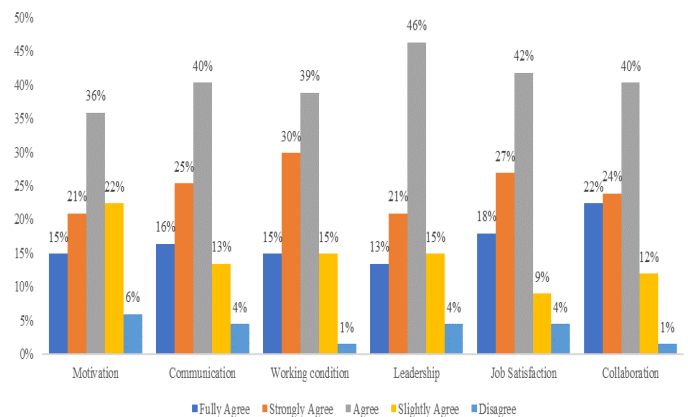

Fig. 4 Perception of the contribution of AI and Big Data in improving workers' professional skills.

In Fig. 4, the findings highlight the following perceptions of how AI and Big Data technologies contribute to the improvement of professional competencies, between the levels

22nd LACCEI International Multi-Conference for Engineering, Education, and Technology: *Sustainable Engineering for a Diverse, Equitable, and Inclusive Future at the Service of Education, Research, and Industry for a Society 5.0.* Hybrid Event, San Jose – COSTA RICA, July 17 - 19, 2024.

4

of agree and strongly agree: 1) Motivation, 72% of respondents indicate that technologies promote motivation for skills development, 2) Communication, 82% agree they improve communication skills in the workplace, 3) Working conditions, 84% that they promote improvements in working conditions, 4) Job satisfaction, 87% that they are an input to promote job satisfaction, while in 5) Leadership, 81% indicate that they facilitate and promote leadership, and finally 6) Collaboration, 87% mention that they are tools that promote teamwork. In short, the interviewees agreed that the use of AI and Big Data promotes the improvement of the professional competencies of workers for the development of the tasks assigned to the job function. Reference [54] identified that the use of AI and Big Data, not only complements the job task but also creates new skills and abilities for the worker within the company since it facilitates the acquisition of new knowledge, experiences, and expertise. Finally, in Fig. 5, a perception survey was conducted on how the use of these technologies contributes to the improvement of the work environment in the workplace.
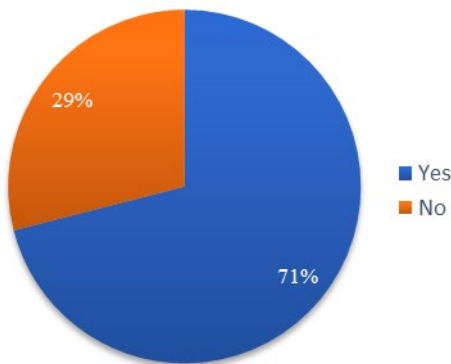

Fig. 5 Perception of work climate improvement through the use of AI and Big Data.

The result (Fig. 5) shows a positive perception of the improvement of the work environment (71%), through the incorporation of these technologies. Reference [55] mentions that the incorporation of technologies substantially improves the capacity for communication, collaboration, teamwork, and leadership in the work environment.

V. DISCUSSION

The objective of the research was to identify the degree of agreement of the experts interviewed, for which the proposed hypothesis was tested using the correlation coefficient. Reference [56] indicates that correlation is a mathematical model that provides information on the intensity, degree, and direction between studied variables, in this particular, if two variables coincide with the same order, we will be in the presence of a positive correlation; while its intensity is reflected using the coefficient that ranges between 0 and 1, being 1 the representation of greater intensity in the relationship.

Additionally, this type of test is characterized by being non-parametric, since it tests a hypothesis associated with a population of quantitative data, as long as there is some doubt about the hypothesis and the distribution in the population [57], this being the scorn study conducted, since it determined the degree of agreement among the interviewees, based on their perception and opinion, the more significant the difference in the mean ranges, the greater the agreement among the interviewees, and the more equal the mean degrees, the lower the agreement.

Also, the nonparametric test used was Spearman's rank correlation between two variables. Reference [58] mentions that this coefficient measures the degree between several variables. Therefore, it is used to test hypotheses of no association between two populations. It is assumed that the n pairs of observations (x_i, y_i) are randomly selected and, therefore, the hypothesis of no association between populations implies a random assignment of the n ranks in each sample. Each random assignment represents a sampling point associated with the experiment, and a subscript value can be calculated for each. Fig. 6 presents the rejection region for a two-tailed (bilateral) test.
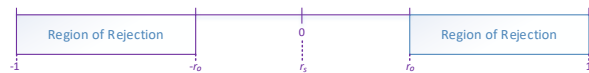

Fig. 6 Rejection region for two-tailed tests.

Suppose that the alternative hypothesis is that the correlation between x and y is positive. In that case, the null hypothesis (H_o) His rejected for large positive values of rs, the upper tail of Fig. 6. Similarly, if the correlation is intended to be proven to be negative, H_o is rejected for large negative values of rs, the lower tail. Thus, a null hypothesis of no association is posed against the alternative of an association between the ranks (two-tailed test) or positive (or negative). For a two-tailed test, Ho is rejected if rs $\leq$ ro or rs $\geq$ ro, these reflect the test statistics for an upper or lower tail respectively, Table 1 presents the interpretation of the correlation coefficient.

TABLE 1
Interpretation of the correlation coefficient

Coefficient	Interpretation
From 0 to 0.20	Correlation practically null
From 0.21 to 0.40	Low correlation
From 0.41 to 0.70	Moderate correlation
From 0.71 to 0.90	High correlation
From 0.91 to 1	Very high correlation

Table 2 summarizes the most significant negative or positive correlations, in general terms, according to Alzina's classification [56], ranging from null to low correlations. For their interpretation, we proceed to review the positive correlations since they constitute the interest of the research, as the main findings in the relationships between the dependent and independent variables.

TABLE 2
Results of Spearman's correlations independent variables

Dependent Variable		Hypothesis Testing Model	Independent Variables	
		Spearman's	Level of influence at the moment of using Big Data for job-related activities according to job position	Level of influence at the moment of using Artificial Intelligence for job-related activities according to job position
Question	The use of technology allows for to improvement of the performance of the worker according to the function and job description.	Correlation Coefficient (Bilateral) Sig.	0,72	0,8
		Sig.	0,3	0,4
		N	200	200

From the dependent variable, the interpretation of the positive associations with the independent variables is performed, where the p-value associated with the statistic to contrast the null hypothesis obtained was 0.6 and 0.8, respectively; therefore, the interrelation between the variables has a high correlation, and the hypothesis can be accepted.

Undoubtedly, the hypothesis test ratifies the results obtained, evidence that the use of AI and Big Data can contribute to the improvement of employee performance. Reference [59] mentions that the technologies of the fourth industrial revolution (AI, Big Data, Cloud Computing, and IoT) provide a wide range of effects on the performance of workers, therefore, these components must properly recognize the attitudes that workers should adopt, that is, it is necessary to examine the attitudes of workers to various variables, such as importance, intention to use, belief in improvement, effectiveness of use and negative cognition; each of these variables plays a role in determining how the performance of workers will change.

VI. CONCLUSIONS

The use of emerging technologies, such as AI and Big Data, represent innovative tools, that offer advanced functionalities that allow the transformation of large volumes of data into information, being able to solve complex problems for the human being, almost in real-time, since they are supported by the use of mathematical algorithms that, together with the computing power, simplify and facilitate the decision-making of the collaborator and the company. Therefore, by studying this phenomenon in the worker's work environment, these tools become a vehicle to boost efficiency and effectiveness, to obtain continuous improvement in work activities in the work environment.

In the findings, a positive and generalized perception of the interviewees was identified, of how the use of AI and Big Data can contribute to the professional competencies of workers to improve their performance. An important aspect to highlight is that, in the researcher's opinion, since society is immersed in the digital era, where the use of technology goes beyond the work environment and invades the daily life of the individual, it could generate a bias in the results obtained, since the participants may take for granted the need to use technology for daily activities in the work environment, as it is very common in the era, we are living in.

It is for this reason that one of the practical recommendations for organizations is to establish standards, processes, and procedures for the proper use of these technologies, for this it will be necessary to promote and encourage the process of training and support to company personnel to make them aware not only of the correct use of technology but the impact it can have on productivity and work relations in the activities assigned to their job function.

Undoubtedly, the use of new technologies is becoming a mandatory issue for human beings, since it is an imperative frenzy to be connected to the Internet to receive information. However, an important aspect that must be considered by organizations is the establishment of processes and procedures that provide a guideline and guidance, both for the work and the company, in the correct use of technology and data collection for decision-making. Additionally, the lack of legislation regulating data management and AI creates a gap in the establishment of this roadmap, opening an opportunity for future lines of research in this area.

Additionally, it is important to recommend to organizations that, when considering the use of emerging technologies in business processes, they should consider the impact within the organizational culture, because if an employee resist adopting a technology that automates their processes, then the expected results will not be achieved, since companies are made up of people and technologies should be seen as their work tools. In the future, the most powerful concern will be related to governance and regulation, but first, we need to share knowledge with people, to understand data privacy education, AI limits and platforms; and how information is being used.

However, due to the possible social and ethical implications that could be generated by the subject matter of the study, it is proposed that future researchers develop complementary studies that delve deeper into this topic in the workplace, with possible topics to be addressed being privacy concerns, algorithmic bias and the impact on occupational safety.

REFERENCES

[1] M. F. Zaeh, J. Moesl, J. Musiol, and F. Oefele, "Material processing with remote technology revolution or evolution?," Physics Procedia, vol. 5, pp. 19-33, 2010, doi: https://doi.org/10.1016/j.phpro.2010.08.119.

[2] C. Carraher-Wolverton, "The co-evolution of remote work and expectations in a COVID-19 world utilizing an expectation disconfirmation theory lens," Journal of Systems and Information Technology, vol. 24, no. 1, pp. 55-69, 2022, doi: https://doi.org/10.1108/JSIT-05-2021-0085.

[3] D. Jeske, "Monitoring remote employees: implications for HR," Strategic HR Review, vol. 20, no. 2, pp. 42-46, 2021, doi: https://doi.org/10.1108/SHR-10-2020-0089.

[4] S. N. Abelsen, S.-H. Vatne, P. Mikalef, and J. Choudrie, "Digital working during the COVID-19 pandemic: how task–technology fit improves work performance and lessens feelings of loneliness," Information Technology & People, vol. 36, no. 5, pp. 2063-2087, 2023, doi: https://doi.org/10.1108/ITP-12-2020-0870.

[5] J. Park and H. Bae, "Big data and AI for process innovation in the industry 4.0 era," Applied Sciences, vol. 12, no. 13, p. 6346, 2022, doi: https://doi.org/10.3390/app12136346.

[6] Y. Duan, J. S. Edwards, and Y. K. Dwivedi, "Artificial intelligence for decision making in the era of Big Data–evolution, challenges and research agenda," International journal of information management, vol. 48, pp. 63-71, 2019, doi: https://doi.org/10.1016/j.ijinfomgt.2019.01.021.

[7] D. Teece and S. Leih, "Uncertainty, innovation, and dynamic capabilities: An introduction," California management review, vol. 58, no. 4, pp. 5-12, 2016, doi: https://doi.org/10.1525/cmr.2016.58.4.5.

[8] A. S. Spencer and B. A. Kirchhoff, "Schumpeter and new technology based firms: Towards a framework for how NTBFs cause creative destruction," International Entrepreneurship and Management Journal, vol. 2, pp. 145-156, 2006, doi: https://doi.org/10.1007/s11365-006-8681-3.

[9] A. Todolí-Signes, "Making algorithms safe for workers: occupational risks associated with work managed by artificial intelligence," Transfer: European Review of Labour and Research, vol. 27, no. 4, pp. 433-452, 2021, doi: https://doi.org/10.1177/10242589211035040.

[10] J. Howard, "Algorithms and the future of work," American Journal of Industrial Medicine, vol. 65, no. 12, pp. 943-952, 2022, doi: https://doi.org/10.1002/ajim.23429.

[11] A. K. Tyagi, T. F. Fernandez, S. Mishra, and S. Kumari, "Intelligent Automation Systems at the Core of Industry 4.0," pp. 1-18, 2021, doi: https://doi.org/10.1007/978-3-030-71187-0_1.

[12] J.-S. Payraudeau, A. Marshall, J. Dencik, and S. Ballou, "The Virtual Enterprise: enterprise transformation enabled by strategic digital acceleration," Strategy & Leadership, vol. 49, no. 6, pp. 23-31, 2021, doi: https://doi.org/10.1108/SL-10-2021-0099.

[13] C. Scarlat, G. D. Stănciulescu, and D. A. Panduru, "COVID-19 Pandemic as accelerator: Opportunity for digital acceleration," Journal of Internet and e-Business Studies, pp. 1-14, 2022, doi: https://doi.org/10.5171/2022.296375.

[14] M. M. Rathore, S. A. Shah, D. Shukla, E. Bentafat, and S. Bakiras, "The role of ai, machine learning, and big data in digital twinning: A systematic literature review, challenges, and opportunities," IEEE Access, vol. 9, pp. 32030-32052, 2021, doi: https://doi.org/10.1109/ACCESS.2021.3060863.

[15] H. E. Pence, "What is big data and why is it important?," Journal of Educational Technology Systems, vol. 43, no. 2, pp. 159-171, 2014, doi: https://doi.org/10.2190/ET.43.2.d.

[16] S. Sagiroglu and D. Sinanc, "Big data: A review," in 2013 international conference on collaboration technologies and systems (CTS), 2013: IEEE, pp. 42-47, doi: https://doi.org/10.1109/CTS.2013.6567202.

[17] R. Chiang, V. Grover, T. Liang, and D. Zhang. "Special Issue: Strategic Value of Big Data and Business Analytics." https://doi.org/10.1080/07421222.2018.1451950 (accessed.

[18] P. P. Khine and Z. S. Wang, "Data lake: a new ideology in big data era," in ITM web of conferences, 2018, vol. 17: EDP Sciences, p. 03025, doi: https://doi.org/10.1051/itmconf/20181703025.

[19] N. Miloslavskaya and A. Tolstoy, "Big data, fast data and data lake concepts," Procedia Computer Science, vol. 88, pp. 300-305, 2016, doi: https://doi.org/10.1016/j.procs.2016.07.439.

[20] M. H. ur Rehman, V. Chang, A. Batool, and T. Y. Wah, "Big data reduction framework for value creation in sustainable enterprises," International Journal of Information Management, vol. 36, no. 6, pp. 917-928, 2016, doi: https://doi.org/10.1016/j.ijinfomgt.2016.05.013.

[21] S. Mohanty, M. Jagadeesh, H. Srivatsa, S. Mohanty, M. Jagadeesh, and H. Srivatsa, ""Big Data" in the Enterprise," Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics, pp. 1-24, 2013, doi: https://doi.org/10.1007/978-1-4302-4873-6_1.

[22] S. Y. Guo, L. Y. Ding, H. B. Luo, and X. Y. Jiang, "A Big-Data-based platform of workers' behavior: Observations from the field," Accident Analysis & Prevention, vol. 93, pp. 299-309, 2016, doi: https://doi.org/10.1016/j.aap.2015.09.024.

[23] M. Nocker and V. Sena, "Big data and human resources management: The rise of talent analytics," Social Sciences, vol. 8, no. 10, p. 273, 2019, doi: https://doi.org/10.3390/socsci8100273.

[24] J. Finlay and A. Dix, "An introduction to artificial intelligence," 1996, doi: https://doi.org/10.1201/9781003072485.

[25] I. E. Suleimenov, Y. S. Vitulyova, A. S. Bakirov, and O. A. Gabrielyan, "Artificial Intelligence: what is it?," Proceedings of the 2020 6th International Conference on Computer and Technology Applications, pp. 22-25, 2020. https://doi.org/10.1145/3397125.3397141.

[26] H. Benbya, T. Davenport, and S. Pachidi, "Artificial intelligence in organizations: Current state and future opportunities," MIS Quarterly Executive, vol. 19, no. 4, 2020, doi: http://dx.doi.org/10.2139/ssrn.3741983.

[27] M. Haenlein and A. Kaplan, "A Brief History of Artificial Intelligenge: On the Past, Present, and Future of Artificial Intelligence," Sage Journals, 2019, doi: https://doi.org/10.1177/0008125619864925.

[28] D. Purves, R. Jenkins, and B. J. Strawser, "Autonomous machines, moral judgment, and acting for the right reasons," Ethical Theory and Moral Practice, vol. 18, pp. 851-872, 2015, doi: https://doi.org/10.1007/s10677-015-9563-y.

[29] H. Lu, Y. Li, M. Chen, H. Kim, and S. Serikawa, "Brain intelligence: go beyond artificial intelligence," Mobile Networks and Applications, vol. 23, pp. 368-375, 2018, doi: https://doi.org/10.1007/s11036-017-0932-8.

[30] F. A. Csaszar and T. Steinberger, "Organizations as artificial intelligences: The use of artificial intelligence analogies in organization theory," Academy of Management Annals, vol. 16, no. 1, pp. 1-37, 2022, doi: https://doi.org/10.5465/annals.2020.0192.

[31] P. Bhende, N. Mekoth, V. Ingalhalli, and Y. V. Reddy, "Quality of Work Life and Work–Life Balance," Journal of Human Values, vol. 26, no. 3, pp. 256-265, 2020, doi: https://doi.org/10.1177/097168582093938.

[32] G. R. Shinde, S. Majumder, H. R. Bhapkar, and P. N. Mahalle, "Quality of Work-Life During Pandemic," 2022, doi: https://doi.org/10.1007/978-981-16-7523-2.

[33] B. Boland, A. De Smet, R. Palter, and A. Sanghvi, "Reimagining the office and work life after COVID-19," 2020. [Online]. Available: http://dln.jaipuria.ac.in:8080/jspui/bitstream/123456789/3224/1/Reimagining-the-office-and-work-life-after-COVID-19-final.pdf.

[34] M. D. Tamunomiebi and C. Oyibo, "Work-Life Balance and Employee Performance: A Literature Review," European Journal of Business and Management Research, vol. 5, no. 2, 2020, doi: https://doi.org/10.24018/ejbmr.2020.5.2.196.

[35] N. A. C. Abdullah, N. Zakaria, and N. Zahoor, "Developments in Quality of Work-Life Research and Directions for Future Research," SAGE Open, vol. 11, no. 4, p. 21582440211059177, 2021, doi: https://doi.org/10.1177/21582440211059177.

[36] S. Majumder and D. Biswas, "Fundamentals, present and future perspectives of quality of work life," Proceeding of First Doctoral Symposium on Natural Computing Research: DSNCR 2020, pp. 271-279, 2021, doi: https://doi.org/10.1007/978-981-33-4073-2_26.

[37] A. Arslan, C. Cooper, Z. Khan, I. Golgeci, and I. Ali, "Artificial intelligence and human workers interaction at team level: a conceptual assessment of the challenges and potential HRM strategies," International Journal of Manpower, vol. 43, no. 1, pp. 75-88, 2022, doi: https://doi.org/10.1108/IJM-01-2021-0052.

[38] J. Howard, "Artificial intelligence: Implications for the future of work," American Journal of Industrial Medicine, vol. 62, no. 11, pp. 917-926, 2019, doi: https://doi.org/10.1002/ajim.23037.

[39] Y. E. Fukumura, J. M. Gray, G. M. Lucas, B. Becerik-Gerber, and S. C. Roll, "Worker perspectives on incorporating artificial intelligence into office workspaces: Implications for the future of office work," International Journal of Environmental Research and Public Health, vol. 18, no. 4, p. 1690, 2021, doi: https://doi.org/10.3390/ijerph18041690.

[40] M. Dzul. "Los enfoques de la investigación científica." Universidad Autónoma del Estado de Hidalgo. https://repository.uaeh.edu.mx/bitstream/handle/123456789/14905 (accessed 2023).

[41] J. Creswell and C. Poth, Qualitative inquiry and research design: Choosing among five approaches. https://books.google.co.cr/books?hl=en&lr=&id=DLbBDQAAQBAJ&oi=fnd&pg=PP1&dq=Qualitative+inquiry+and+research+design:+Choosing+among+five+approaches&ots=-hw357HWTu&sig=jwNliUB8h-we2ydoO1g-bRh3KqQ&redir_esc=y#v=onepage&q=Qualitative%20inquiry%20and%20research%20design%3A%20Choosing%20among%20five%20approaches&f=false: SAGE Publications, 2018.

[42] D. A. Grimes and K. F. Schulz, "Descriptive studies: what they can and cannot do," The Lancet, vol. 359, no. 9301, pp. 145-149, 2002, doi: https://doi.org/10.1016/S0140-6736(02)07373-7.

[43] T. Rockmore, On constructivist epistemology. Rowman & Littlefield Publishers, 2005.

[44] K. A. Levin, "Study design III: Cross-sectional studies," Evidence-Based Dentistry, vol. 7, no. 1, pp. 24-25, 2006/03/01 2006, doi: https://doi.org/10.1038/sj.ebd.6400375.

[45] G. Liu, M. Feng, Y. Wang, L. Wong, S.-K. Ng, T. L. Mah, and E. J. D. Lee, "Towards exploratory hypothesis testing and analysis," 2011 IEEE 27th International Conference on Data Engineering, pp. 745-756, 2011, doi: https://doi.org/10.1109/ICDE.2011.5767907.

[46] R. Hernández-Sampieri and C. Mendoza, Metodología de la investigación: Las rutas cuantitativa, cualitativa y mixta. http://www.biblioteca.cij.gob.mx/Archivos/Materiales_de_consulta/Drogas_de_Abuso/Articulos/SampieriLasRutas.pdf: McGraw-Hill, 2020.

[47] Z. Lv and L. Qiao, "Analysis of healthcare big data," Future Generation Computer Systems, vol. 109, pp. 103-110, 2020/08/01/ 2020, doi: https://doi.org/10.1016/j.future.2020.03.039.

[48] A. H. Toledo, R. Flikkema, and L. H. Toledo-Pereyra, "Developing the research hypothesis," Journal of Investigative Surgery, vol. 24, no. 5, pp. 191-194, 2011, doi: https://doi.org/10.3109/08941939.2011.609449.

[49] Y. Himeur et al., "AI-big data analytics for building automation and management systems: a survey, actual challenges and future perspectives," Artificial Intelligence Review, vol. 56, no. 6, pp. 4929-5021, 2023, doi: https://doi.org/10.1007/s10462-022-10286-2.

[50] J. Canals and F. Heukamp, "The future of management in an AI world," 2020, doi: https://doi.org/10.1007/978-3-030-20680-2.

[51] S. Laumer and A. Eckhardt, "Why do people reject technologies: a review of user resistance theories," Information Systems Theory: Explaining and Predicting Our Digital Society, Vol. 1, pp. 63-86, 2012, doi: https://doi.org/10.1007/978-1-4419-6108-2_4.

[52] F. Olan, R. B. Nyuur, E. Arakpogun-Ogiemwonyi, and Z. Elsahn, "AI: A knowledge sharing tool for improving employees' performance," Journal of Decision Systems, pp. 1-21, 2023, doi: https://doi.org/10.1080/12460125.2023.2263687.

[53] W. Pedrycz, B. Russo, and G. Succi, "A model of job satisfaction for collaborative development processes," Journal of Systems and Software, vol. 84, no. 5, pp. 739-752, 2011, doi: https://doi.org/10.1016/j.jss.2010.12.018.

[54] F. Caputo, V. Cillo, E. Candelo, and Y. Liu, "Innovating through digital revolution: The role of soft skills and Big Data in increasing firm performance," Management Decision, vol. 57, no. 8, pp. 2032-2051, 2019, doi: https://doi.org/10.1108/MD-07-2018-0833.

[55] K. A Youssef Al-Attar, A. F. Hani, and S. E. Rajab, "The impact of the use of communication and information technology in the work environment on social interaction," Journal of Environmental Science, vol. 52, no. 4, pp. 1-20, 2023, doi: https://doi.org/10.21608/jes.2023.186824.1453.

[56] R. B. Alzina, "Metodología de la investigación educativa," vol. 1, 2004. [Online]. Available: https://books.google.co.cr/books?hl=en&lr=&id=VSb4_cVukkcC&oi=fnd&pg=PA3&dq=alzina+Metodolog%C3%ADa+de+la+investigaci%C3%B3n+educativa&ots=PwyyRljwDQ&sig=fWHLdhnNKN1rMLH08ORdPVwlTEg&redir_esc=y#v=onepage&q=alzina%20Metodolog%C3%ADa%20de%20la%20investigaci%C3%B3n%20educativa&f=false.

[57] J. Levin and W. Levin, "Fundamentos de estadística en la investigación social," México, Oxford, 2001. [Online]. Available: https://idoc.pub/documents/levin-fundamentos-de-estadistica-546gwkzo3wn8.

[58] M. G. Kendall and B. B. Smith, "The problem of m rankings," The annals of mathematical statistics, vol. 10, no. 3, pp. 275-287, 1939. [Online]. Available: https://www.jstor.org/stable/2235668.

[59] S. Hahm, "Attitudes and performance of workers preparing for the fourth industrial revolution," KSII Transactions on Internet and Information Systems (TIIS), vol. 12, no. 8, pp. 4038-4056, 2018, doi: http://doi.org/10.3837/tiis.2018.08.027.

22nd LACCEI International Multi-Conference for Engineering, Education, and Technology: *Sustainable Engineering for a Diverse, Equitable, and Inclusive Future at the Service of Education, Research, and Industry for a Society 5.0.* Hybrid Event, San Jose – COSTA RICA, July 17 - 19, 2024.

8