

The Future of Work, Changes, and Needs Arising from Technological Development According to Higher Education Institutions (HEIs)

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DOI: [10.36348/sb.2024.v10i02.005](https://doi.org/10.36348/sb.2024.v10i02.005)

| Received: 22.11.2023 | Accepted: 01.01.2024 | Published: 29.02.2024

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Abstract

This research focuses on the impact that technology is currently having and will have on the development of people's work activities worldwide, as well as the analysis of the skills necessary for optimal performance expected of workers in their respective organizations, according to estimates from Higher Education Institutions in Chihuahua, Mexico. The main objective is to understand the expectations that companies and Higher Education Institutions (HEIs) in the city of Chihuahua, Mexico, have regarding the skills needed for the future of work and to compare them with the results presented in the World Economic Forum (WEF) Future of Jobs Report 2023. Based on the hypothesis that the degree of correlation between global expectations for future skills and those of Chihuahua would be low, a survey was conducted with 10 educational institutions on the topic. Among the main results, it was found that there is a 60% match in the top 10 skill groups sought both globally and in Chihuahua. Skills such as "Technology Design and Programming," "Emotional Intelligence," "Reasoning, Problem Solving, and Ideation," and "Systems Analysis and Evaluation" were identified as crucial for companies worldwide but not as important locally. Finally, the results presented will enable companies, the government, educational institutions, and the workforce in Chihuahua to understand the coordination needs to achieve the necessary training for developing future work skills that are important globally.

Keywords: Future of Work, skills, future skills, automation, artificial intelligence, employment.

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INTRODUCTION

Currently, technologies such as Artificial Intelligence and Automation are reshaping the human workforce into new roles, creating a need for new skills. This research aimed to understand the expectations of Higher Education Institutions in the city of Chihuahua, Mexico, regarding the skills required for the future of work and to compare them with the results presented in the World Economic Forum (WEF) Future of Jobs Report 2023. Hypothesizing that the degree of correlation between global expectations for future skills and those of Chihuahua would be low, a survey was conducted with 10 educational institutions on the subject. Among the main findings, a 60% match was identified in the top 10 skill groups sought both globally and in Chihuahua. Skills such as "Technology Design and Programming," "Emotional Intelligence," "Reasoning, Problem Solving, and Ideation," and "Systems Analysis and Evaluation" were recognized as crucial for

companies worldwide but not as significant locally. This research aims to present results that will enable companies, government, educational institutions, and the workforce in Chihuahua to develop the future work skills that are important globally.

The constant, permanent, disruptive, and exponential change is a phenomenon to which both new and old generations will inevitably have to adapt. Technology plays a central role in the modernity that humanity is experiencing, where virtually all aspects of life are related to technological development.

Klaus Schwab (2016), founder of the World Economic Forum (WEF), has warned of a shift in the era of digitization, which he calls the Fourth Industrial Revolution. What sets this fourth revolution apart from the previous three is the fusion of technologies and their interaction in the fields of digitization, biology, and physics. The increased connectivity and convergence

generated by the fourth industrial revolution have a strong impact on the labor market Eberhard *et al.*, (2017). This fourth revolution differs from the previous three in that current technology not only aims to replace physical work or assist humans in their work but goes beyond that by having the potential to replace cognitive work and human labor in general Hirschi, (2018).

Schwab warns that humanity is entering a period of transformation due to economic development, where changes are historical in terms of their scope, speed, and size. Humans are witnessing profound changes in business models, industries, consumption patterns, transportation, and most importantly, communications, where people have altered their ways of gathering information and expressing themselves. "My concern is that decision-makers are too often absorbed by immediate concerns to think strategically about the forces of disruption and innovation shaping our future" Schwab (2016, p. 8).

Diamandis and Kotler (2012) point out that these technological changes compel countries, companies, and individuals themselves to analyze the skills and abilities necessary to face the challenges of the future. Countries must establish public policies that constantly identify the changing skill needs for work and incorporate them into the curricula of educational systems. Furthermore, companies should implement skills retraining programs to have a globally competitive workforce. Lastly, individuals need to be attentive to these skills for their personal study and training projects.

Technological advances have allowed the automation of many human activities. Davenport and Kirby (2015) note that automation has had three eras: the first in the 19th century when machines helped reduce manual labor, especially dirty and dangerous work; the second in the 20th century, where machines helped reduce tedious work, and the third in the 21st century, where machines make decisions.

On the other hand, the Organization for Economic Cooperation and Development (OECD, 2017) has recognized the need for countries to establish strategies for skills development, acknowledging the impact of globalization over the last two decades and detecting that both countries and workers face new challenges and opportunities in the future. It also points out that workers, to integrate into global markets, must have not only cognitive, communication, and learning skills but also social and emotional skills to specialize in the most advanced technological industries.

Skills and Competencies for Work in the Third Decade of the 21st Century

The accelerated and disruptive technological changes signal a new role for humans in the global economy, with tasks and skills that are no longer as

crucial, leading to the necessity of acquiring new skills and competencies. According to Cognizant (2015), technology also has its limits, at least in the short term, still reserving some activities exclusively for humans, such as medical administration, speaking or understanding colloquial language, case review, among others. The preference for human interaction in certain activities may prevent their automation, as seen in the care of the elderly and children (Finkel, 2017). Additionally, alongside technological advancement, the global environment, demographic conditions, and migration have accelerated the world of work, making it more diverse and increasingly unpredictable for the workforce Lent, (2018).

In their book, Neubauer and Ghazai (2015) discuss the case of the Institute for the Future in San Francisco, California, where they defined six "drivers of change" that have altered the skills of workers:

1. Extreme Longevity: the increase in workers' lifespan has changed the nature of careers and learning.
2. The Rise of Machines and Intelligent Systems: humans are being excluded from repetitive tasks.
3. Computational World: the increase in sensors and processing power.
4. The New Media Ecology: new tools for social communication.
5. Superstructured Organizations: the emergence of technologies that provoke new forms of production and creation.
6. Globally Connected World: the need to place diversity and adaptability at the center of all organizational operations.

The institute determined that for these six "drivers of change," it is necessary to possess ten skills for future work:

1. Sense-making: the ability to understand the deeper meaning of what is expressed.
2. Novel and Adaptive Thinking.
3. Social Intelligence: the ability to connect with others.
4. Transdisciplinarity: literacy and the ability to understand across different disciplines.
5. New Digital Literacy: the ability to critically evaluate and develop content in new technological media.
6. Design Mindset: the ability to represent and develop tasks and work processes for desired outcomes.
7. Cognitive Load Management: the ability to discriminate information and maximize cognitive functioning.
8. Intercultural Competence: the ability to operate in different cultural environments.
9. Virtual Collaboration: the ability to work as a member of a virtual team.

- Computational Thinking: the ability to translate large amounts of data into abstract concepts and understand data-driven reasoning.

MATERIAL AND METHODS

This is a quantitative research, as it involves the measurement of variables and the interpretation of results with the aim of addressing and solving the posed problem.

The research design is non-experimental, cross-sectional, and descriptive. It observes the reality of companies and HEIs in Chihuahua without intervening in them.

The logical process used is inductive, meaning it moves from the particular to the general. The results come from the study conducted on a sample of HEIs in the city of Chihuahua.

The procedure involved obtaining data through samples to generalize the results to a broader context. It employed a hypothetical-deductive method, using a questionnaire as the main technique. Additionally, a descriptive statistical analysis was carried out to interpret the collected data.

RESULTS AND DISCUSSION

The most significant challenge for companies in the city of Chihuahua, according to HEIs, is 'The political stability of the country,' followed by 'Challenges in the national economy.' In contrast, 'Insecurity' and 'Challenges in the state economy' are considered less important challenges for the future of Chihuahua's companies in the next four years. It is important to note that the difference between the mean values of all possible responses is no greater than 1.4 between the lowest and the highest.

Table 1: Importance of Challenges for Companies in the Next Four Years According to Higher Education Institutions (HEIs)

Challenge	Mean Value*	Standard Deviation
Political stability of the country	3.20	1.619
Challenges in the national economy	3.50	2.273
Need for new workforce skills	3.80	1.989
Technological changes	4.00	2.667
Challenges in the state economy	4.30	1.889
Challenges in the global economy	4.60	1.955
Insecurity	4.60	1.713

*Note: The lower Mean Value indicates higher importance, as the scale for the question ranged from 1 for the most significant challenge to 7 for the least significant.

Source: Own elaboration.

Regarding the inquiry about the technologies that each company expects to adopt in the next 4 years, Figure 1 shows that the technologies most needed by companies according to HEIs are "Digital Commerce,"

mentioned by 80% of IES, and the "Internet of Things," also at 80%. In third place is "Big Data Analysis," with 70% of companies considering adopting this technology.

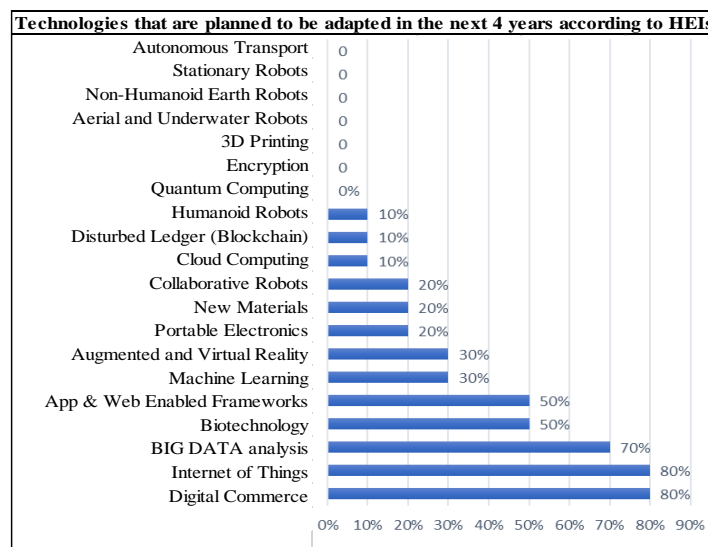


Figure 1

Source: Own Elaboration.

Table 2 reveals that HIEs consider "Analytical Thinking" as the primary skill companies will seek in

their workforce for the year 2024, with "Active Learning" moving to the second most mentioned skill.

Table 2: Top Skills Sought by Companies in the Workforce for 2024 According to Higher Education Institutions (HEIs)

Future Skill	% of Mentions	Future Skill	% of Me-ntions
Analytical Thinking	60	System Analysis	10
Active Learning	50	Autonomy	10
Innovation at Work	40	Creativity	10
Leadership	40	Flexibility, Balance, and Coordination	10
Learning Strategies	30	Initiative	10
Critical Thinking	30	Mathematics	10
Integrity	20	Originality	10
Complex Problem Solving	20	Cooperation	10
Adaptability/Flexibility	20	Idea Generation and Reasoning Ability	10
Social Influence	20	Time Management	10
Problem Solving	20	Spatial Skills	10
Stress Tolerance	20	Verbal Skills	10
Quality Control Analysis	10		

Source: Own Elaboration.

When grouping the 69 skills into the 26 skill groups used by the World Economic Forum (WEF) for presenting its results, Figure 19 shows that the "Analytical Thinking and Innovation" group obtained the highest percentage of mentions with 20.0%, followed by "Active Learning and Learning Strategies" with 16.0%, and in third place, "Leadership and Social Influence" with 12.0%. This is in relation to the skills that HEIs believe companies will seek in the year 2024.

CONCLUSION

The essential skills for future work in the private economic activity were identified according to the perceptions of Higher Education Institutions (HEIs) in the city of Chihuahua. The top five activities that were considered will seek by 2024 are "analytical thinking," "active learning," "innovation for work," "leadership," and "learning strategies." Grouping these skills revealed that the first five skill groups companies will seek include "analytical thinking and innovation," "active learning and learning strategies," "leadership and social influence," "creativity, originality, and initiative," and "resilience, stress tolerance, and flexibility."

Achieving the objective of relating the expectations of future skills from the educational sector in Chihuahua to the results of the World Economic Forum (WEF), it was found that out of the top 10 skill groups that companies worldwide will seek by 2024, there is agreement with the opinions of IES on the first two skill groups: "Analytical thinking and innovation" and "Active learning and learning strategies." Among the top 10 skill groups sought globally for 2024, there are four skill groups that do not appear within the top 10 for IES in Chihuahua: "Technology Design and Programming," "Emotional Intelligence," "Reasoning, Problem Solving, and Ideation," and "Systems Analysis

and Evaluation." Therefore, it can be concluded that there is a majority but not complete agreement.

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