THE FUTURE OF EMPLOYMENT IN MANAUS, AMAZONAS: LEGAL CHALLENGES IN THE FACE OF ARTIFICIAL INTELLIGENCE AND LABOR AUTOMATION

O FUTURO DO EMPREGO EM MANAUS, AMAZONAS: DESAFIOS JURÍDICOS DIANTE DA INTELIGÊNCIA ARTIFICIAL E DA AUTOMAÇÃO LABORAL

EL FUTURO DEL EMPLEO EN MANAUS, AMAZONAS: DESAFÍOS JURÍDICOS FRENTE A LA INTELIGENCIA ARTIFICIAL Y LA AUTOMATIZACIÓN LABORAL

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ABSTRACT

The advancement of artificial intelligence and automation has driven significant transformations in the world of work, directly impacting productive organization, employability, and labor legal relations. In this context, the present study aims to analyze the future of employment in Manaus, Amazonas, with emphasis on the legal challenges arising from the incorporation of these technologies into the productive environment, particularly within the Industrial Pole of Manaus. The research is characterized as a qualitative literature review, based on recent scientific studies and relevant institutional documents selected according to criteria of timeliness, thematic relevance, and academic rigor. The findings indicate that automation tends to replace repetitive tasks while increasing the demand for higher levels of professional qualification, which may intensify social inequalities if not accompanied by appropriate public policies. Furthermore, the study reveals that Labor Law faces limitations in regulating new forms of work organization mediated by technology, highlighting the need for normative updates. It is concluded that the future of employment in Manaus will depend on the articulation between technological innovation, legal regulation, and public policies, in order to ensure economic development with social inclusion and protection of workers' rights.

Keywords: Automation. Employment. Labor Law. Artificial Intelligence. Manaus.

RESUMO

O avanço da inteligência artificial e da automação tem promovido transformações significativas no mundo do trabalho, impactando diretamente a organização produtiva, a empregabilidade e

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as relações jurídicas laborais. Nesse contexto, o presente estudo tem como objetivo analisar o futuro do emprego em Manaus, Amazonas, com ênfase nos desafios jurídicos decorrentes da incorporação dessas tecnologias no ambiente produtivo, especialmente no âmbito do Polo Industrial. A pesquisa caracteriza-se como uma revisão de literatura, de abordagem qualitativa, fundamentada em estudos científicos recentes e documentos institucionais relevantes, selecionados a partir de critérios de atualidade, pertinência temática e rigor acadêmico. Os resultados indicam que a automação tende a substituir atividades repetitivas, ao mesmo tempo em que exige maior qualificação profissional, podendo ampliar desigualdades sociais se não houver políticas públicas adequadas. Verificou-se, ainda, que o Direito do Trabalho enfrenta limitações para regular as novas formas de organização laboral mediadas por tecnologia, evidenciando a necessidade de atualização normativa. Conclui-se que o futuro do emprego em Manaus dependerá da articulação entre inovação tecnológica, regulação jurídica e políticas públicas, de modo a garantir desenvolvimento econômico com inclusão social e proteção dos direitos dos trabalhadores.

Palavras-chave: Automação. Direito do Trabalho. Emprego. Inteligência Artificial. Manaus.

RESUMEN

El avance de la inteligencia artificial y de la automatización ha promovido transformaciones significativas en el mundo del trabajo, impactando directamente la organización productiva, la empleabilidad y las relaciones jurídicas laborales. En este contexto, el presente estudio tiene como objetivo analizar el futuro del empleo en Manaus, Amazonas, con énfasis en los desafíos jurídicos derivados de la incorporación de estas tecnologías en el entorno productivo, especialmente en el Polo Industrial. La investigación se caracteriza como una revisión de literatura de enfoque cualitativo, fundamentada en estudios científicos recientes y documentos institucionales relevantes, seleccionados con base en criterios de actualidad, pertinencia temática y rigor académico. Los resultados indican que la automatización tiende a sustituir tareas repetitivas, al mismo tiempo que exige mayor cualificación profesional, pudiendo ampliar las desigualdades sociales si no existen políticas públicas adecuadas. Asimismo, se constató que el Derecho del Trabajo enfrenta limitaciones para regular las nuevas formas de organización laboral mediadas por la tecnología, evidenciando la necesidad de actualización normativa. Se concluye que el futuro del empleo en Manaus dependerá de la articulación entre innovación tecnológica, regulación jurídica y políticas públicas, con el fin de garantizar desarrollo económico con inclusión social y protección de los derechos de los trabajadores.

Palabras clave: Automatización. Derecho del Trabajo. Empleo. Inteligencia Artificial. Manaus.

1 INTRODUCTION

The intensification of the use of artificial intelligence and automated systems has promoted profound transformations in the world of work, directly impacting the way productive activities are organized and executed. This process, associated with the consolidation of industry 4.0, has been changing not only the economic dynamics, but also the legal relationships that structure the bond between workers and employers. In this context, automation ceases to be a merely technological phenomenon and starts to assume a structural character, influencing the generation of jobs, professional qualification and the very configuration of the contemporary labor market. As observed by Perosini (2024), the replacement of repetitive tasks by automated systems shows a significant change in the profile of occupations, requiring new skills and increasing the challenges for labor insertion.

In the Brazilian scenario, such transformations take on even more relevant contours in the face of economic and regional specificities. The adoption of technologies based on artificial intelligence occurs in a heterogeneous way, impacting the various productive sectors and regions of the country in a different way. Lima (2021) highlights that automation tends to affect activities traditionally dependent on labor with greater intensity, which can generate significant effects on employability and income distribution. This context highlights the need to understand the impacts of these changes not only at the national level, but also from regional perspectives that allow the identification of their particularities and specific implications.

In the case of Manaus, Amazonas, the analysis of the future of employment becomes even more relevant due to the centrality of the Industrial Pole in the local economy. Institutional data indicate that the productive structure of the region is strongly linked to the performance of this sector, which makes the incorporation of technologies a determining factor for maintaining competitiveness and job creation. According to SUFRAMA (2026), the Manaus Industrial Pole represents one of the main axes of regional economic development, being directly influenced by technological modernization processes. In this sense, the introduction of automated systems and artificial intelligence in the industrial environment not only redefines production processes, but also directly impacts the local labor market.

From a legal perspective, these transformations highlight the need to review traditional models of labor regulation. Labor Law, historically structured to deal with face-to-face and hierarchically defined relationships, is now facing challenges arising from digitalization and algorithmic management. Barroso (2024) points out that the incorporation of disruptive technologies requires the construction of new regulatory frameworks capable of balancing innovation and protection of fundamental rights, especially with regard to the dignity of the

worker.

Given this scenario, the following research problem emerges: how do artificial intelligence and automation impact the future of employment in Manaus, Amazonas, and what are the main legal challenges arising from these transformations? The investigation is based on the premise that technological advances, although they promote efficiency gains, can also generate social and normative tensions that demand adequate institutional responses. In this sense, the study seeks to understand how changes in the world of work are articulated with the legal system, especially in the context of a strongly industrialized regional economy.

Thus, the general objective of this article is to analyze the impacts of artificial intelligence and automation on the future of employment in Manaus, Amazonas, with emphasis on the legal challenges associated with these transformations. As specific objectives, it is intended to examine the changes in the structure of the labor market, identify the main risks and opportunities arising from automation and discuss the adequacy of existing legal instruments in the face of new labor dynamics. The relevance of the study lies in the need to produce scientific knowledge that contributes to the debate on the future of work, especially in strategic regional contexts, in which technological innovation is articulated with social and economic issues of great complexity.

The relevance of the theme is also justified by the fact that technological transformations are not limited to the economic dimension, reaching social and legal aspects that require in-depth analysis. The incorporation of intelligent systems into the workplace has the potential to alter the way decisions are made, how workers are evaluated, and how subordinate relationships are established. In this sense, Paes (2025) observes that algorithmic management redefines the control mechanisms in the work environment, introducing new forms of supervision that challenge the traditional models of Labor Law.

In addition, the use of algorithms in recruitment, selection, and performance management processes raises concerns related to transparency and fairness. Coimbra Santos (2024) highlights that automated systems can reproduce discriminatory patterns, especially when based on biased historical data. This reality reinforces the need to develop regulatory mechanisms that ensure the protection of workers in the face of automated decisions, avoiding the expansion of inequalities that already exist in the labor market.

Another relevant aspect refers to the reconfiguration of employment power in the face of the adoption of digital technologies. Artur (2025) argues that the use of algorithms in work management shifts the decision-making center of labor relations, creating new dynamics of subordination that do not fully fit into traditional models. This transformation highlights the need

to review classic legal concepts, in order to ensure that labor protection keeps up with technological changes.

In the field of social rights, the literature points out that automation can generate significant impacts on working conditions. Gervasoni (2024) points out that, although technological innovation promotes efficiency, it can also contribute to the precariousness of labor relations, especially in contexts marked by excessive flexibility. This finding reinforces the importance of a legal action that seeks to balance technological development and social protection.

Additionally, the analysis of the local context shows that the adoption of technologies in the Manaus Industrial Pole occurs gradually, being influenced by structural and institutional factors. Rocha (2024) shows that the digital transformation in the region's industrial sector presents important advances, but also challenges related to the qualification of the workforce and the adaptation of companies to new technological requirements. This scenario reinforces the need for public policies aimed at professional training and strengthening the regional productive base.

Thus, it is highlighted that understanding the future of employment in Manaus requires an integrated approach, which considers the interactions between technology, economics and law. Moreira (2025) points out that the absence of specific regulation to deal with the impacts of artificial intelligence on labor relations can generate legal uncertainty, evidencing the need for regulatory updating. In this way, the study is part of a relevant and current field of investigation, contributing to the academic debate and to the construction of solutions that promote the sustainable development of work in the digital age.

2 THEORETICAL FRAMEWORK

The analysis of the future of employment, especially in regional contexts such as Manaus, Amazonas, requires the articulation between technological transformations, productive dynamics and the legal mechanisms that seek to regulate labor relations in constant mutation. In this scenario, artificial intelligence and automation assume a central role, not only as instruments for increasing productivity, but as elements that redefine the very structure of contemporary work. Barroso (2024) argues that the advancement of these technologies imposes relevant regulatory challenges, especially due to the need to balance technological innovation with the protection of fundamental rights, which includes the right to decent work.

Recent literature points out that automation and intelligent systems have been promoting structural changes in the labor market, with direct impacts on employability and productive

organization. According to Perosini (2024), the advance of industry 4.0 intensifies the phenomenon of technological unemployment, as it replaces repetitive and operational activities with automated systems. This transformation is not limited to the elimination of jobs, but also implies the creation of new professional demands, requiring higher levels of qualification and constant adaptation of workers.

In the Brazilian context, such transformations take on specific contours, especially in industrialized regions. Lima (2021) highlights that automation tends to have a more intense impact on traditional productive sectors, significantly changing the occupational structure and expanding the need for public policies aimed at professional requalification. This perspective is particularly relevant for understanding the Amazonian reality, where the economic base is strongly linked to the industrial sector.

In the case of Manaus, the Industrial Pole represents one of the main economic engines in the region, being directly affected by the digitalization and automation processes. Rocha (2024) shows that the introduction of technologies associated with industry 4.0 has promoted gains in efficiency and competitiveness, but also reveals challenges related to the qualification of the local workforce and the adaptation of production structures. This scenario demonstrates that technological advancement, while bringing economic benefits, can also deepen inequalities if there are no adequate inclusion and training policies.

From a legal perspective, these changes impose the need to reinterpret the traditional institutes of Labor Law. Paes (2025) points out that the incorporation of systems based on artificial intelligence changes the forms of control and subordination in the work environment, requiring the construction of new regulatory paradigms. In this sense, the author highlights that the emergence of a Labor Law focused on the digital reality is indispensable to deal with the specificities of relationships mediated by algorithms.

Additionally, the increasing use of technologies in labor management raises concerns related to transparency and fairness. Coimbra Santos (2024) argues that algorithmic systems can reproduce discriminatory patterns, especially when operating on the basis of biased historical data. This problem reinforces the need for legal mechanisms that ensure control, auditability, and accountability in the use of these technologies, avoiding the perpetuation of inequalities in the labor market.

The reconfiguration of employment power is also a relevant aspect in this debate. Artur (2025) observes that the use of algorithms in labor management shifts the decision-making center of labor relations, creating new forms of subordination that do not fully fit into traditional models. This displacement requires an in-depth reflection on the limits of the employer's power

and on the need to ensure effective protection for workers in highly technologized environments.

On the other hand, the incorporation of technologies in the world of work does not occur without social costs. Gervasoni (2024) points out that, although technological innovation can generate efficiency gains, it can also contribute to the precariousness of working conditions and the weakening of social rights. This aspect shows that the discussion about the future of employment cannot be restricted to the economic dimension, but must also consider the social and legal impacts of these transformations.

In this context, understanding the future of employment in Manaus requires an integrated analysis between technological advances, the local productive structure and the legal instruments available to regulate these changes. The official indicators of SUFRAMA (2026) demonstrate the relevance of the Industrial Pole for the regional economy, which reinforces the importance of understanding how automation and artificial intelligence can impact job creation and work dynamics in the region.

The intensification of the use of digital technologies in the productive environment has caused not only quantitative changes in the labor market, but also qualitative transformations in the forms of organization, control and execution of work activities. In this sense, Moreira (2025) highlights that the replacement of human labor by automated systems directly challenges the normative structure of the Consolidation of Labor Laws, requiring the updating of its provisions to deal with new forms of labor provision. Such a scenario shows that Labor Law, historically built on the centrality of the traditional employment relationship, finds it difficult to encompass emerging realities mediated by artificial intelligence.

From this perspective, it is observed that automation does not only eliminate jobs, but redefines fundamental legal categories, such as subordination, working hours, and employer responsibility. Paes (2025) points out that algorithmic management introduces a diffuse form of control, in which decisions are made by automated systems, often without transparency or the possibility of contestation by the worker. This new configuration challenges the very notion of directive power, requiring the construction of legal instruments capable of ensuring balance in labor relations.

In this context, the problem of algorithmic opacity stands out. Artur (2025) argues that the use of automated systems in work management makes it difficult to identify the criteria used in decisions, which can compromise workers' fundamental rights. The absence of transparency not only limits the exercise of adversarial proceedings, but also makes it difficult to hold accountable in cases of unfair or discriminatory decisions, which reinforces the need for specific regulatory mechanisms.

The discussion about algorithmic discrimination is also part of this scenario. Coimbra Santos (2024) shows that algorithms can reproduce discriminatory patterns that already exist in society, increasing gender, race, and class inequalities in access to employment. This finding reveals that technological neutrality is a myth, and it is essential that the legal system establishes clear parameters for the ethical and responsible use of these tools in the workplace.

At the same time, the literature points out that the impacts of automation are not uniform among the different economic sectors. Perosini (2024) observes that sectors that are more intensive in repetitive activities tend to be more quickly replaced by automated systems, while functions that require creativity, complex decision-making, and human interaction have greater resilience. In the context of Manaus, this differentiation is particularly relevant, considering the diversity of activities developed in the Industrial Pole.

The local reality reinforces the need for contextualized analysis. Rocha (2024) demonstrates that the adoption of industry 4.0 technologies in the Manaus Industrial Pole occurs gradually, marked by challenges related to technological infrastructure and the qualification of the workforce. This transition shows that the impact of automation depends not only on technological advancement, but also on the structural and institutional conditions of the region.

In addition, the economic dimension of these transformations cannot be dissociated from the legal analysis. Lima (2021) points out that automation can generate productivity gains and economic growth, but it also tends to widen inequalities, especially when not accompanied by adequate public policies. This duality reinforces the need for state action to promote inclusion and reduce the negative effects of technological unemployment.

From the perspective of social rights, Gervasoni (2024) points out that the incorporation of technologies in the world of work can result in precariousness, especially when there are no adequate protection mechanisms. The flexibilization of labor relations, associated with the intensive use of technology, can weaken historically conquered guarantees, requiring a more active role of the Law in the defense of the dignity of the worker.

The analysis of economic indicators reinforces the centrality of the Manaus Industrial Pole in the generation of jobs and income in the region. SUFRAMA data (2026) show that the performance of the industrial sector directly impacts the local labor market, which makes it even more relevant to understand the effects of automation on this structure. In this sense, the future of employment in Manaus depends not only on technological evolution, but also on the ability of legal institutions and public policies to adapt to the new demands of the contemporary world of work.

The consolidation of artificial intelligence and automation in the production environment also raises reflections on the need to redefine the very foundations of Labor Law. In this sense, Barroso (2024) points out that digital transformation does not only represent a technological change, but a structural change in the forms of social and economic organization, requiring institutional responses that preserve the centrality of the dignity of the human person. Such a perspective reinforces that the regulation of labor, in the face of this new scenario, must be guided by constitutional principles capable of ensuring a balance between innovation and social protection.

From this approach, it is evident that the future of employment cannot be understood in isolation, but as part of a broader system of economic and social relations. Lima (2021) highlights that the effects of automation on the labor market tend to intensify over time, especially in developing economies, where the technological transition can occur more abruptly. This process requires the formulation of public policies aimed not only at generating jobs, but also at adapting the workforce to new technological requirements.

In the legal field, this transformation imposes challenges related to the effectiveness of existing rules. Moreira (2025) observes that labor legislation, by being based on traditional employment models, presents limitations to regulate new forms of work mediated by technology. The absence of specific devices to deal with automation and artificial intelligence can generate regulatory gaps, making it difficult to protect workers in highly digitized contexts.

In addition, the reconfiguration of labor relations also impacts the very notion of employment relationship. Paes (2025) points out that technological mediation can fragment the relationship between worker and employer, creating situations in which the identification of the person responsible for decisions becomes more complex. This fragmentation challenges classic concepts of Labor Law and requires the construction of new parameters for defining responsibilities and guarantees.

Another relevant aspect refers to the need for transparency and governance in the use of technologies in the workplace. Artur (2025) emphasizes that algorithmic management must be accompanied by mechanisms that allow the understanding of the criteria used in decisions, guaranteeing the worker the right to contest any injustices. This requirement is directly related to the protection of fundamental rights, especially with regard to equality and non-discrimination.

In this context, the problem of algorithmic discrimination takes center stage. Coimbra Santos (2024) shows that the use of automated systems can reproduce existing discriminatory patterns, increasing inequalities in access to employment and working conditions. This finding reinforces the need for specific regulation that establishes limits and responsibilities in the use

of these technologies, ensuring that innovation does not translate into social exclusion.

From a socioeconomic perspective, the impacts of automation are also reflected in working conditions and income distribution. Gervasoni (2024) argues that the incorporation of technologies can generate precariousness, especially when accompanied by excessive flexibility in labor relations. This reality shows that technological advances, although they promote efficiency, can deepen inequalities if there are no adequate mechanisms for social protection.

In the regional context, these transformations take on their own characteristics. Rocha (2024) demonstrates that the Manaus Industrial Pole faces specific challenges related to the implementation of advanced technologies, including structural limitations and the need for labor qualification. This reality reinforces the importance of public policies aimed at regional development, capable of integrating technological innovation with social inclusion.

In turn, Perosini (2024) highlights that the transition to industry 4.0 requires not only investments in technology, but also in education and professional training, in order to avoid the expansion of structural unemployment. This perspective dialogues directly with the reality of Manaus, where dependence on the industrial sector makes the impact of technological transformations on employment even more sensitive.

The data presented by SUFRAMA (2026) show the economic relevance of the Manaus Industrial Pole, reinforcing that any change in its production structure has a direct impact on the local labor market. In this sense, the future of employment in the region depends on the ability to articulate technological innovation, legal regulation, and public policies, in order to ensure that the advances provided by artificial intelligence and automation are accompanied by social protection and the promotion of worker dignity.

3 METHODOLOGY

The present study is characterized as a theoretical research, with a qualitative approach, developed through a literature review. Such a methodological choice is justified by the need to understand, systematize and critically analyze the recent scientific production on the impacts of artificial intelligence and automation on the labor market, with emphasis on the legal challenges and specificities of the context of Manaus, Amazonas. The literature review enables the construction of an analytical panorama based on already consolidated studies, allowing the identification of convergences, gaps and trends in the field investigated.

The research design was structured based on the previous definition of the theme, the research problem and the objectives of the study, guiding the careful selection of sources. The

search for materials took place in databases recognized in the academic environment, prioritizing scientific articles published in relevant journals, as well as institutional documents of recognized credibility. Only recent studies, published in recent years, were considered in order to ensure the timeliness and relevance of the discussions presented.

As inclusion criteria, works were selected that directly addressed the relationship between artificial intelligence, automation, the labor market and Law, with an emphasis on contemporary analyses of labor transformations and their legal developments. Studies that presented relevant contributions to the understanding of the Brazilian context and, especially, the reality of the Manaus Industrial Pole were also included. Materials that did not present scientific rigor, lack of defined authorship, methodological inconsistencies, or disconnection with the object of the research were excluded.

The process of selecting sources involved initial exploratory reading, followed by a more in-depth analysis of the texts considered relevant. Subsequently, the analytical and interpretative reading was carried out, with the objective of extracting concepts, theoretical categories and empirical evidence that would contribute to the construction of the theoretical framework. This procedure allowed the content to be organized in a logical and articulated way, ensuring internal coherence to the study.

Data analysis was conducted qualitatively, using the content analysis technique, with emphasis on the identification of patterns, thematic recurrences, and divergences among the authors. It sought to understand how different theoretical perspectives address the impacts of artificial intelligence and automation on work, as well as the legal challenges arising from these transformations. From this analysis, it was possible to structure interpretative categories that guided the discussion of the results.

With regard to methodological limitations, it is noteworthy that the literature review depends on the availability and quality of the selected sources, and there may be restrictions related to access to certain studies or the scarcity of specific research on the regional approach adopted. In addition, as it is a qualitative approach, the results are subject to the interpretation of the researcher, even if they are based on scientific evidence.

Despite these limitations, the methodology adopted is adequate to the objectives of the study, as it allows an in-depth and critical analysis of the theme, contributing to the understanding of the legal challenges associated with the transformations of work in the context of artificial intelligence and automation, especially in the scenario of Manaus, Amazonas.

The systematization of the sources used throughout the research is essential to ensure methodological transparency, traceability of information and coherence in the construction of

the theoretical framework. Table I below presents, in an organized way, the main works that supported the study, allowing us to visualize the profile of the selected scientific and institutional productions, as well as their adequacy to the investigated theme.

Table 1

Synthesis of the sources used in the research

Lead author / Institution	Document Title	Font type	Year
Artur	Algorithms, work and normative spaces: rebalancing employment power?	Scientific article	2025
Barroso	Artificial intelligence: promises, risks and regulation. Something new under the sun	Scientific article	2024
Coimbra Santos	Algorithmic discrimination in labor relations and human rights	Scientific article	2024
Gervasoni	The hidden costs of technology and the protection of the social right to work	Scientific article	2024
Lima	Exploring the future impact of automation in Brazil	Scientific article	2021
Moreira	The impacts of automation and artificial intelligence on employment relations in the light of the CLT	Scientific article	2025
Paes	Artificial intelligence, human labor and labor law: the challenges and meanings of regulation	Scientific article	2025
Perosini	The impact of industry 4.0 on the labor market and technological unemployment	Scientific article	2024
Rock	Industry 4.0 in the Manaus Industrial Pole: a study on digital transformation in the electronics sector	Academic annals	2024
SUFRAMA	Indicators of the Manaus Industrial Complex, December 2025	Official document	2026

Source: Authors'.

The analysis of the table shows the predominance of recent scientific articles, which reinforces the current and qualified nature of the research. The presence of a relevant institutional source is also observed, which contributes to the empirical contextualization of the Manaus scenario.

The selected productions present a strong thematic convergence around artificial intelligence, automation and their impacts on work, while offering different perspectives, legal, economic and technological, allowing a consistent interdisciplinary approach aligned with the objective of the study.

4 RESULTS AND DISCUSSIONS

The analysis of the selected studies shows that the incorporation of artificial intelligence

and automation in the world of work is not limited to a technological phenomenon, but configures a structural transformation with direct implications on the productive organization and on Labor Law. The results point to convergence among the authors regarding the idea that automation promotes efficiency and productivity gains, while profoundly changing the dynamics of employment. In this sense, Perosini (2024) highlights that the replacement of repetitive tasks by automated systems redefines the role of the worker, requiring new skills and expanding the need for professional qualification.

At the same time, it is observed that this transformation does not occur in a homogeneous way, being conditioned by economic, structural and regional factors. In the context of Manaus, the data analyzed indicate that the Industrial Pole plays a central role in the absorption of labor, which makes its modernization processes particularly relevant for the future of employment in the region. Rocha (2024) shows that the adoption of technologies associated with industry 4.0 has occurred gradually, revealing advances in production efficiency, but also challenges related to the training of the local workforce and the adaptation of industrial structures.

The discussion of the results also reveals that automation directly impacts the occupational structure, promoting both the elimination of certain jobs and the creation of new functions. Lima (2021) observes that this process tends to intensify inequalities, especially in contexts in which there are no effective public policies for professional retraining. This finding reinforces the need for articulation between technological development and inclusion policies, in order to prevent the benefits of innovation from being concentrated in specific groups.

From a legal perspective, the findings indicate that the traditional model of labor regulation faces significant limitations in the face of new forms of labor organization. Moreira (2025) points out that the Consolidation of Labor Laws, although still relevant, presents difficulties in encompassing relationships mediated by digital technologies, especially with regard to the definition of employment relationship and accountability in automated contexts. This normative gap highlights the need to update legal instruments to ensure effective protection for workers.

Another relevant point identified in the studies refers to the transformation of forms of control in the work environment. Paes (2025) argues that algorithmic management introduces continuous and automated supervision mechanisms, which can intensify control over the worker without the same transparency as traditional models. This change alters the very nature of subordination, requiring new theoretical and normative approaches to understand contemporary labor relations.

In addition, the analysis shows that the use of algorithms in work management raises

concerns related to transparency and fairness. Coimbra Santos (2024) highlights that automated systems can reproduce discriminatory patterns, which reinforces the need for control and regulation mechanisms that ensure justice and equality in access to employment. This problem becomes even more relevant in contexts of automated selection, in which decisions can be made without direct human intervention.

On the other hand, the results also point out that technology should not be understood only as a risk factor, but also as an opportunity for positive transformation. Barroso (2024) argues that artificial intelligence can contribute to economic development and innovation, as long as it is accompanied by appropriate regulatory frameworks. This view reinforces the need for a balance between stimulating innovation and protecting fundamental rights, especially in the field of labor.

In this scenario, the reconfiguration of employment power emerges as one of the main consequences of the adoption of digital technologies. Artur (2025) observes that the use of algorithms displaces the decision-making center of labor relations, creating new forms of subordination that challenge traditional models. This change requires the construction of legal mechanisms capable of ensuring transparency and balance in labor relations, avoiding the expansion of asymmetries between employers and workers.

The social impacts of these transformations are also evident. Gervasoni (2024) points out that the incorporation of technologies can result in precarious working conditions, especially when associated with the flexibility of labor relations. This finding shows that technological advances, although they bring economic benefits, can generate negative externalities that need to be considered in the regulation process.

The analysis of institutional data reinforces the relevance of the regional context for understanding the results. The SUFRAMA indicators (2026) demonstrate the importance of the Manaus Industrial Pole in the generation of jobs, showing that any transformation in its productive structure has direct impacts on the local labor market. In this sense, the results point out that the future of employment in Manaus is directly conditioned by the way automation and artificial intelligence will be incorporated into the productive dynamics of the region, requiring integrated responses between technology, law and public policies.

The continuity of the analysis shows that the effects of automation and artificial intelligence are not restricted to the productive plane, reaching structural dimensions of the labor legal system itself. In this sense, Moreira (2025) argues that the progressive replacement of the human workforce by automated systems tends to strain the protective logic of labor legislation, especially with regard to the maintenance of jobs and the guarantee of minimum

rights. Such a scenario reveals that legal regulation, if maintained in traditional ways, may become insufficient to respond to the new forms of work organization.

The discussion of the results also allows us to identify that algorithmic management represents one of the main ruptures in the classic model of subordination. Paes (2025) highlights that the control exercised by automated systems redefines the relationship between employer and employee, to the extent that decisions are made by technological structures that operate continuously and often invisibly. This configuration expands the reach of the directive power, while making it difficult to oversee, requiring more sophisticated legal instruments to ensure balance in labor relations.

In this context, the opacity of artificial intelligence systems emerges as one of the main challenges identified in the literature. Artur (2025) argues that the absence of transparency in the criteria used by algorithms compromises the worker's ability to understand and contest decisions that directly affect their professional life. This limitation impacts not only the right to be heard, but also the effectiveness of labor guarantees, making it necessary to build algorithmic governance mechanisms.

The analysis also highlights the centrality of the issue of algorithmic discrimination in the contemporary debate. Coimbra Santos (2024) points out that automated systems can reproduce historical inequalities present in the data used for their training, which results in discriminatory practices in recruitment, performance evaluation, and career progression. This phenomenon reinforces the need for specific regulation, aimed at preventing biases and promoting equity in the workplace.

From an economic perspective, the results indicate that automation can generate ambivalent effects on the labor market. Lima (2021) observes that, although there is potential for increased productivity and economic growth, there is also a risk of increasing structural unemployment, especially in sectors that are more vulnerable to technological substitution. This duality reinforces the importance of public policies that promote the adaptation of the workforce, reducing the negative impacts of the technological transition.

In the specific case of Manaus, the data analyzed reveal that the impact of automation is directly related to the local production structure. Rocha (2024) shows that the modernization process of the Industrial Pole occurs gradually, being influenced by factors such as technological infrastructure and availability of qualified labor. This reality shows that the adoption of advanced technologies depends on structural conditions that are not always fully consolidated in the region.

In addition, the analysis of institutional indicators reinforces the economic relevance of

the Industrial Pole for the local labor market. SUFRAMA data (2026) indicate that job creation in the region is strongly linked to the performance of the industrial sector, which makes any automation process particularly sensitive. In this sense, the introduction of technologies must be accompanied by strategies that ensure the maintenance of adequate levels of employment and income.

On the other hand, the results also indicate that technological innovation can represent an opportunity for positive transformation, as long as it is properly regulated. Barroso (2024) points out that artificial intelligence has the potential to boost economic development and promote social advances, as long as it is accompanied by regulatory frameworks that ensure the protection of fundamental rights. This perspective reinforces the need for a balance between encouraging innovation and preserving labor guarantees.

The social dimension of these transformations is also manifested in the possible precariousness of working conditions. Gervasoni (2024) highlights that the flexibilization of labor relations, associated with the intensive use of technology, can weaken the social protection of workers. This process shows that technological modernization, if not accompanied by adequate policies, can result in social setbacks, expanding existing inequalities.

The analysis of the results allows us to identify that the reconfiguration of labor relations requires an interdisciplinary approach, which integrates legal, economic and technological aspects. Perosini (2024) reinforces that the transition to industry 4.0 requires not only investments in technology, but also in education and professional training, in order to ensure that workers can adapt to new market demands. Thus, the findings indicate that the future of employment in Manaus will depend on the ability to articulate innovation, legal regulation and public policies aimed at social inclusion.

The final stage of the analysis allows us to advance in the integrated interpretation of the findings, showing that the impacts of artificial intelligence and automation on work cannot be understood in isolation, but rather as part of a broader process of reconfiguration of economic and social relations. In this sense, Barroso (2024) highlights that digital transformation imposes the need to review institutional frameworks, especially with regard to the protection of fundamental rights in contexts of high technological complexity. This perspective reinforces that legal regulation must follow technological evolution, avoiding gaps that may compromise the dignity of the worker.

The joint analysis of the sources also shows that the replacement of human labor by automated systems tends to generate differentiated impacts between sectors and regions. Lima (2021) points out that economies with a strong industrial base, such as Manaus, may face more

intense challenges in the technological transition process, especially due to the concentration of activities susceptible to automation. This finding reinforces the need for specific strategies for regional contexts, considering their productive and social particularities.

From the normative point of view, the results indicate that labor legislation faces a scenario of increasing complexity. Moreira (2025) observes that the absence of specific regulation for the use of artificial intelligence in the workplace can generate legal uncertainty, both for workers and employers. This gap highlights the need to update the legal system, with the creation of rules capable of disciplining the use of emerging technologies in labor relations.

The discussion also reveals that algorithmic management significantly modifies the power structure in the workplace. Paes (2025) argues that the control exercised by automated systems expands the reach of employment power, while reducing the visibility of decisions, making it difficult to contest them. This scenario requires the construction of mechanisms that ensure transparency and accountability, in order to preserve balance in labor relations.

In addition, the analysis shows that the use of algorithms can intensify existing inequalities. Coimbra Santos (2024) points out that the reproduction of biases in automated systems can compromise equitable access to employment, making it essential to implement regulatory measures that ensure justice and equality. This problem demonstrates that technology, far from being neutral, reflects and can amplify preexisting social structures.

In the field of labor relations, the reconfiguration of directive power is also presented as a central element. Artur (2025) points out that the adoption of algorithmic systems redefines the way work is organized and supervised, creating new dynamics of subordination. This transformation requires a review of the traditional concepts of Labor Law, in order to ensure that legal protection keeps up with technological changes.

The social dimension of the results also deserves to be highlighted. Gervasoni (2024) argues that the incorporation of technologies can lead to the precariousness of working conditions, especially when associated with the flexibilization of labor relations. This reality shows that technological advances, although they promote efficiency, can generate adverse effects if there are no adequate public policies to mitigate their impacts.

In the regional context, the analysis confirms the centrality of the Manaus Industrial Pole in the dynamics of employment. Rocha (2024) demonstrates that the technological modernization of the industrial sector is an ongoing process, marked by advances and challenges, especially with regard to the qualification of the workforce. This scenario reinforces the importance of investments in education and training, as a way to ensure the adaptation of workers to the new demands of the market.

Additionally, SUFRAMA data (2026) show that the performance of the Industrial Pole is directly related to the generation of jobs in the region, which makes automation a critical factor for the future of work in Manaus. In this sense, the introduction of technologies must be accompanied by strategies that ensure the economic and social sustainability of the local production model.

The results indicate that the transition to a productive model based on artificial intelligence and automation requires an integrated approach, which articulates technological innovation, legal regulation and public policies. Perosini (2024) highlights that adapting to industry 4.0 depends not only on investments in technology, but also on the ability to prepare the workforce for new challenges. Thus, the discussion shows that the future of employment in Manaus will not be determined exclusively by technological advancement, but by the way society, the State and legal institutions will respond to this transformation process.

The systematic organization of the authors used in the research allows us to visualize in a synthetic way the main theoretical and methodological approaches and results found in the literature analyzed. Table 2 below presents a structured synthesis of the contributions of the selected studies, facilitating the understanding of the convergences and specificities of each approach in the context of artificial intelligence, automation, and their impacts on work.

Table 2

Synthesis of the studies used in the research

Authors	Objective	Method	Main results
Artur	Analyze the impact of algorithms on employment power and labor relations	Theoretical and normative analysis	Identifies reconfiguration of employment power and need for algorithmic transparency
Barroso	Discuss the risks and potentialities of artificial intelligence from a legal perspective	Theoretical-legal essay	It points to the need for regulation that balances innovation and fundamental rights
Coimbra Santos	Investigate algorithmic discrimination in labor relations	Qualitative analysis of theoretical basis	Evidence of reproduction of inequalities by automated systems
Gervasoni	Assessing the social impacts of technology on the right to work	Literature review	Highlights Precariousness and Hidden Social Costs of Automation
Lima	Examine the future impacts of automation on the Brazilian labor market	Empirical analysis and economic projections	It indicates increased inequality and the need for professional retraining
Moreira	Analyze the effects of automation on employment relations in the light of the CLT	Legal and doctrinal study	It points out normative gaps and the need for legislative updating
Paes	Discuss the challenges of artificial intelligence for Labor Law	Theoretical-legal analysis	Highlights changes in subordination and work management
Perosini	Investigating the impacts of industry 4.0 on employment and technological unemployment	Literature review	Identifies task substitution and requirement for new skills

Authors	Objective	Method	Main results
Rock	Analyze the digital transformation in the Manaus Industrial Pole	Case Study	Demonstrates technological advances and local qualification challenges

Source: Authors'.

The analysis of the table shows a strong convergence among the authors regarding the structural impacts of artificial intelligence and automation on the labor market, especially with regard to the reconfiguration of labor relations and the resulting legal challenges.

The predominance of qualitative and theoretical-normative approaches is observed, which reinforces the interpretative character of the theme, combined with the presence of empirical and institutional studies that contribute to the contextualization of the Brazilian and Amazonian reality.

In general, the results indicate that, although technology promotes efficiency and innovation gains, it also imposes significant risks, such as technological unemployment, job insecurity, and widening inequalities, which highlights the need for integrated responses between law, public policies, and technological development.

5 CONCLUSION

The present study allowed us to understand that the future of employment in Manaus, Amazonas, is directly conditioned by the way artificial intelligence and automation have been incorporated into production processes, especially in the scope of the Industrial Pole. The analysis showed that such technologies promote structural transformations in the labor market, redefining functions, professional requirements and forms of labor organization, which imposes significant challenges to contemporary Labor Law.

The results obtained showed that automation, while enhancing efficiency and competitiveness gains, also tends to reduce jobs in repetitive activities, increasing the need for professional qualification and adaptation of the workforce. In this sense, it was found that the transition to a technology-based production model requires not only investments in innovation, but also public policies aimed at the training and requalification of workers, in order to avoid the deepening of social inequalities.

In the legal field, it was found that labor legislation faces limitations to keep up with the new dynamics imposed by digitalization and algorithmic management. The emergence of forms of automated control and the difficulty of fitting these relationships into traditional models highlight the need for regulatory updating, with the construction of instruments capable of guaranteeing effective protection to workers without compromising technological development.

In addition, the research showed that the use of systems based on artificial intelligence can generate risks related to transparency, accountability, and equity in labor relations. The possibility of automated decisions directly influencing the professional lives of workers reinforces the importance of mechanisms that ensure control, auditability, and respect for fundamental rights, especially in contexts marked by power asymmetries.

In the specific context of Manaus, it was observed that the economic dependence of the Industrial Pole makes the region particularly sensitive to technological transformations. Productive modernization, although necessary to maintain competitiveness, must be accompanied by strategies that ensure social inclusion and the sustainability of employment, avoiding negative impacts on the local working population.

In view of this scenario, it is concluded that the future of employment in the region will not be determined exclusively by technological advances, but by the ability to articulate innovation, legal regulation and public policies. It is essential that the State, institutions and the productive sector act in an integrated manner, promoting an environment that favors technological development without compromising the dignity of the worker.

It is noteworthy that the study contributes to the academic debate by highlighting the need for an interdisciplinary approach in the analysis of work transformations, integrating legal, economic and social perspectives. As a limitation, the dependence on secondary sources is recognized, which indicates the importance of future empirical research that deepens the understanding of the impacts of artificial intelligence in the Amazonian context, expanding knowledge about the challenges and opportunities that present themselves for the contemporary world of work.

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REFERENCES

Artur, K. (2025). Algoritmos, trabalho e espaços normativos: Reequilíbrio do poder empregatício? Mediações. https://www.scielo.br/j/mediacoes/a/gqzdgf98Pwc8ks3qQb8scyq/

Barroso, L. R. (2024). Inteligência artificial: Promessas, riscos e regulação: Algo de novo debaixo do sol. Revista de Direito Público. https://www.scielo.br/j/rdp/a/n89PjvWXTdthJJKwb6TtYXy/

Coimbra Santos, R. (2024). Discriminação algorítmica nas relações de trabalho e direitos humanos. Sequência. https://www.scielo.br/j/seq/a/9FGhvr75HYSdGMRfKnJ9FZd/

Gervasoni, T. A. (2024). Os custos ocultos da tecnologia e a proteção do direito social ao trabalho. Revista de Direito Público. https://www.scielo.br/j/rdp/a/DDXBQ4gwrbvgkg8C3HsKK3w/

Lima, Y. (2021). Exploring the future impact of automation in Brazil. https://cbae.ufrj.br/wp-content/uploads/2025/06/Yuri_Lima_Exploring_Automation_Impact_Brazil.pdf

Moreira, R. B. da R. (2025). Os impactos da automação e da inteligência artificial nas relações de emprego à luz da Consolidação das Leis do Trabalho (CLT): Desafios jurídicos diante da substituição da mão de obra humana. Revista Direitos Humanos e Sociedade. https://periodicos.unesc.net/ojs/index.php/dirhumanos/article/view/10259

Paes, A. B. (2025). Inteligência artificial, trabalho humano e direito do trabalho: Os desafios e os sentidos da regulação. Revista do Tribunal Superior do Trabalho. https://revista.tst.jus.br/rtst/article/view/166

Perosini, G. L. (2024). O impacto da indústria 4.0 no mercado de trabalho e no desemprego tecnológico. Desenvolvimento em Questão. https://periodicos.utfpr.edu.br/de/article/download/16038/10277

Rocha, P. M. (2024). Indústria 4.0 no Polo Industrial de Manaus: Um estudo sobre a transformação digital no setor eletroeletrônicos. In Anais de evento científico. https://static.even3.com/anais/980515.pdf

Superintendência da Zona Franca de Manaus. (2026). Indicadores do Polo Industrial de Manaus, dezembro de 2025. Governo Federal. https://www.gov.br/suframa/pt-br/centrais-de-conteudo/indicadores/2025/IndicaDEZ25/view