NEYART
Magazine
ISSN: 2992 - 7161

SWOT ANALYSIS AS A TOOL FOR PROPOSING A UNIVERSITY DEGREE SPECIALTY

SWOT ANALYSIS AS A TOOL FOR PROPOSING A UNIVERSITY DEGREE SPECIALTY

Ruiz-Ibarra Jesús Iván
National Technological Institute of Mexico/ I.T. De Los Mochis https://orcid.org/0000-0001-8800-9314
jesus.ri@mochis.tecnm.mx

Ramírez-Leyva Alberto
National Technological Institute of Mexico/ I.T. De Los Mochis https://orcid.org/0000-0002-6774-6427
alberto.rl@mochis.tecnm.mx

Luna-Soto Karina
National Technological Institute of Mexico/ I.T. De Los Mochis https://orcid.org/0009-0000-1052-2521
karina.ls@mochis.tecnm.mx

Armenta-Acosta Indeliza
National Technological Institute of Mexico/ I.T. De Los Mochis https://orcid.org/0009-0005-9278-2365
indeliza.aa@mochis.tecnm.mx

Parra-Gutiérrez Natanael
National Technological Institute of Mexico/ I.T. De Los Mochis https://orcid.org/0009-0006-1378-7764
natanael.pg@mochis.tecnm.mx

DOI: https://doi.org/10.61273/neyart.v3i1.101 | **Received:** 03/19/2025 | **Accepted:** 05/26/2024 | **Published:** 06/30/2025

Abstract: This article proposes the creation of a specialization in occupational ergonomics at the Technological Institute of Los Mochis (ITLM), in response to the growing demand for trained professionals generated by the new NOM-035, NOM-036, and NOM-037 standards (psychosocial and ergonomic risks and teleworking). Using a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats), the feasibility of implementing this specialization in industrial engineering and business management engineering degrees is evaluated, given the gap between educational offerings and the needs of the labor sector in Mexico. *Results*: Strengths: ITLM has a qualified academic staff (100% with postgraduate degrees), links to ergonomics networks (RIENO, SEMAC), experience in research and projects since 2006, and a registered line of research in occupational ergonomics. Opportunities: educational gap in the region (no local university offers this specialty), recent regulatory requirements (NOM-035/036/037) that demand professionals in the area. Weaknesses: lack of specialized infrastructure and dissemination of the specialty, possible student disinterest due to lack of knowledge. Threats: potential competition from other local institutions. *Conclusions:* The study concludes that ITLM meets the academic and networking conditions to offer the specialty, preferably in industrial engineering (although this already has two specialties) or in business management (which only has one). Recommendations: Address weaknesses through awareness campaigns and infrastructure improvements. Take advantage of regulatory and employment opportunities. Formalize the proposal with TecNM following its guidelines.

Keywords: Strategic planning, Occupational health, Higher education.

Abstract: This article proposes the creation of a specialization in occupational ergonomics at the Instituto Tecnológico de Los Mochis (ITLM) in response to the growing demand for trained professionals driven by the new NOM-035, NOM-036, and NOM-037 regulations (psychosocial risks, ergonomic risks, and telework). A SWOT analysis (Strengths, Opportunities, Weaknesses, and Threats) is conducted to assess the feasibility of implementing this specialization within the Industrial Engineering and Business Management Engineering programs, given the gap between educational offerings and the needs of the labor market in Mexico. Results: Strengths: ITLM has a qualified academic faculty (100% with postgraduate degrees), connections with ergonomics networks (RIENO, SEMAC), research experience and projects since 2006, and a registered research line in occupational ergonomics. Opportunities: educational gap in the region (no local university offers this specialization), recent regulatory requirements (NOM-035/036/037) demanding professionals in the field.

Weaknesses: lack of specialized infrastructure and awareness of the specialization, possible student disinterest due to lack of knowledge. Threats: potential competition from other local institutions. Conclusions: the study concludes that ITLM meets the academic and outreach requirements to offer the specialization, preferably in industrial engineering (although it already has two specializations) or in business management (which only has one). Recommendations: address weaknesses through outreach campaigns and infrastructure improvements. Take advantage of regulatory and employment opportunities**.** Formalize the proposal to TecNM following its guidelines.

Keywords: Strategic planning, occupational health, higher education.

INTRODUCTION

In the recent workplace, occupational ergonomics has taken center stage in response to the challenges posed by new ways of working and regulatory developments in occupational health and safety. The entry into force of NOM-035, NOM-036, and NOM-037-STPS in 2023—which regulate psychosocial and ergonomic risks and teleworking—has generated a growing demand for professionals trained to implement these legal frameworks in Mexico. However, El Economista (2023) mentions that according to ILO data, 40% of workers do not have or are unaware of safety protocols in their company, and the OCC reported in El Economista (2023b) that two out of five workers in Mexico say that there are no safety measures or that they are unaware of them, evidencing a critical gap between the needs of the productive sector and the educational supply. As mentioned by Merodio J. (2024), the educational-labor gap is the disconnect between academic training and the practical skills demanded by companies in a constantly evolving work environment.

Despite this demand, higher education institutions in Mexico—especially in regions such as Sinaloa—lack specialization programs in occupational ergonomics. A preliminary analysis reveals that none of the 13 leading universities located in Los Mochis, Sinaloa, offer this training as a specialization within engineering degrees, which limits their ability to respond to regulatory requirements and opportunities for innovation in occupational health. Consequently, this project aims to evaluate the relevance of offering a specialization in occupational ergonomics at the Technological Institute of Los Mochis, which belongs to the National Technological Institute of Mexico, where some of its campuses already offer this specialization, such as the Technological Institutes of Huatabampo, Tijuana, Hermosillo, among others. This would facilitate the opening of the specialty without the need to relocate or migrate to a place other than the students' residence. In contrast, the SWOT (Strengths, Weaknesses, Opportunities, and Threats) strategic planning methodology plays an important role in decision-making regarding the educational offerings of specialties needed by the productive sector. As Merodio J. (2024b) states, closing the gap between education and employment is not only possible but necessary to build a more inclusive and dynamic labor market.

JUSTIFICATION

For higher education institutions, it is imperative to meet the demands of the academic, business, and government sectors. Therefore, with regard to their curricula, it is necessary to update educational programs and evaluate their relevance in order to enable students to be at the forefront, allowing companies and/or society to have professionals capable of facing the challenges and opportunities for development in the region and our country.

The purpose of the research is to conduct a relevance study, based on a SWOT analysis, to support the launch of the Occupational Ergonomics specialization, which will enable graduates to comply with the new NOM 035-STPS-2018, 036-STPS-2018, and 037-STPS-2023 on psychosocial risks, ergonomic risks, and teleworking-occupational safety and health conditions, respectively, which came into full effect in 2023. In addition, the development of this methodology seeks to answer the basic questions of the research.

This research project seeks to align the professional skills profile of the ITLM school community with the provisions of the General Law on Humanities, Sciences, Technologies, and Innovation (2023), which promotes the right to science as the foundation of public policy, establishing that "every person shall enjoy the benefits of scientific development and technological innovation, as well as human rights in general," as well as with the provisions of Article 3, section V "... to formulate and conduct national policy in the field of humanities, sciences, technologies, and innovation." Therefore, it is of interest to carry out a thorough methodological process that is feasible for the needs of the context through SWOT analysis, which stimulates the design of a curriculum that complements the educational offering of the Occupational Ergonomics specialty of the TecNM system and, in particular, the ITLM.

DEVELOPMENT

The methodology used to develop the project is based on the quantitative paradigm, using the inductive method, with descriptive research. The guiding questions for the development of the project were:

Is there interest in the productive sector in hiring professionals focused on the area of occupational ergonomics? Is there interest among students of industrial engineering and/or business management in the creation of a specialization in occupational ergonomics? Is there human capital available in industrial engineering and/or business management programs to meet the

specialization in occupational ergonomics? What is the legal framework for occupational ergonomics in Mexico?

These questions were posed to inform the development of a curriculum proposal for the specialization in "Occupational Ergonomics," based on the results of the SWOT analysis (see Table 2), to aid in the decision-making process for its inclusion in the educational programs of the Industrial Engineering and/or Business Management Engineering degrees at the Technological Institute of Los Mochis.

Importance of the major at a university. According to the ITLM's 2024 accountability report, total enrollment at the institution in 2024 was 3,760 students (3,737 in undergraduate programs and 23 in graduate programs), with those enrolled in accredited programs representing 73% of the total, or 2,734 students. The percentage of accredited students representing the degree programs of interest in this research (Business Management Engineering and Industrial Engineering) was 44%.

For universities, it is important that teachers develop multiple skills, which may include: extensive knowledge of specific profiles and updates in their field, mastery of ICTs, understanding the importance of teamwork, and promoting problem-solving techniques, among others, in order to face the new challenges posed by a constantly changing society. An important part of the institution's work is the quality of its teachers, so it is vital that they have the tools that allow them to promote and encourage cognitive activation in students and motivation to learn, in order to acquire knowledge and thereby find new uses and applications for it. This would not be possible without establishing guidelines to guide its implementation. Currently, the institution has lines of research registered and authorized (see Table 1) by TecNM, of which those relevant to this research are those pertaining to the Industrial Engineering (II) and Business Management Engineering (IGE) programs.

Table 1. Registered lines of research for the Industrial Engineering and Business Management programs.

Code	Line of research	Program
LGAC-2025-MOCH-IGEM-215	Development of Production Chains, Clusters, and Business Networks	Business Management Engineer
LGAC-2025-MOCH-IGEM-366	Business Management and Development	Business Management Engineering
LGAC-2025-MOCH-IIND-308	Occupational Ergonomics	Industrial Engineering

LGAC-2025-MOCH-IIND-369	Implementation and Development of Management Systems	Industrial Engineering
LGAC-2025-MOCH-IIND-523	Optimization of Products and Processes	Industrial Engineering

SWOT analysis "is a straightforward framework that indicates the importance of external and internal forces in order to understand the sources of competitive advantage. It is a logical approach in which each organization must evaluate its external and internal environments in order to adopt its strategy" (Ghazinoory, Abdi, and Azadegan-Mehr, 2011). Ponce H. (2007) states that "SWOT analysis consists of evaluating the strengths and weaknesses that, taken together, diagnose the internal situation of an organization, as well as its external evaluation, i.e., opportunities and threats. It is also a tool that can be considered simple and that provides an overview of the strategic situation of a given organization."

Table 2. SWOT matrix related to the opening of a new specialty.

Strengths	**Weaknesses**
What do we do well in the area of ergonomics? What makes the occupational ergonomics specialty suitable to offer? Is there personnel trained in occupational ergonomics to teach the courses?	Are there occupational ergonomics projects linked to economic and social sectors? What specialized equipment could improve our resources? Lack of human capital trained in ergonomics?
Opportunities	**Threats**
Will we be the first in the region to offer a specialization in occupational ergonomics? Is compliance with occupational ergonomics regulations mandatory? Will human capital with a specialty in occupational ergonomics as a response to current regulations, with a humanistic approach?	In what areas do other universities that offer degrees in industrial engineering, business management, or related fields, with a specialization in occupational ergonomics, industrial hygiene and safety, or related fields, surpass us? Is there a possibility that the productive sector demand ergonomists and the institution not meet this demand?

Improve specialized equipment	

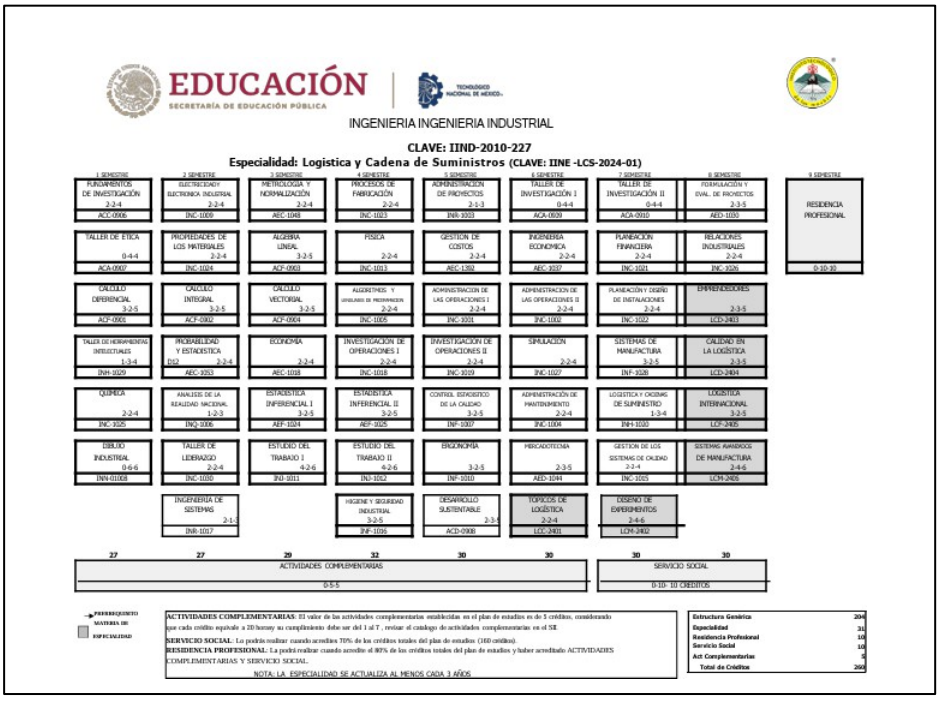
Analysis of the current situation by degree program

The proposal for a new specialization is aimed at Industrial Engineering and Business Management Engineering degree programs.

Industrial Engineering Educational Program

The Industrial Engineering program at the Technological Institute of Los Mochis consists of nine semesters with a total of 54 courses, giving a total of 204 credits, of which 31 credits correspond to the program's specialization, equivalent to six courses located in the sixth, seventh, and eighth semesters, as shown in the previous grid (see Fig. 1). The ninth semester is devoted to professional practice. Furthermore, according to TecNM guidelines, the specialization must be updated at least every three years. Currently, the Industrial Engineering program has two specializations: i) Logistics and Supply Chain, and ii) Quality Systems. There are approximately 408 students enrolled in the program.

Figure 1. Industrial Engineering Curriculum Map

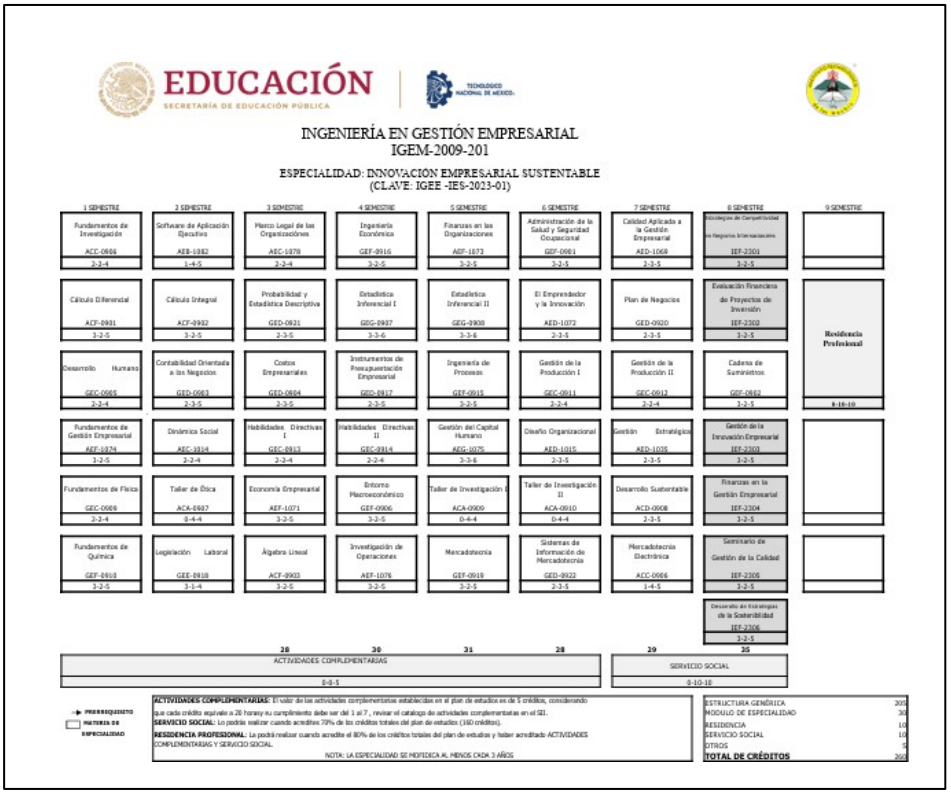


Business Management Engineering Educational Program

The Business Management Engineering degree program at the Technological Institute of Los Mochis consists of nine semesters with a total of 50 courses, giving a total of 205 credits, of which 30 credits correspond to the degree specialization, equivalent to six courses located in the eighth semester, as shown in the grid in Figure 2. The 9th semester is devoted to professional practice. On the other hand

, according to TecNM guidelines, the specialization must be updated at least every three years. Currently, the Business Management Engineering degree has one specialization: Sustainable Business Innovation.

Figure 2. Business Management Engineering curriculum.



Educational offerings

In the city of Los Mochis, Sinaloa, there are 14 universities, of which 9 are private and 5 are public; of these, 5 have study programs related or similar to Industrial Engineering and Business Management Engineering. It should be noted that none of them offer a specialization in Occupational Ergonomics or any other related field.

ANALYSIS OF RESULTS AND DISCUSSION

SWOT analysis of opening a specialization

The study was conducted using the inductive method, with a quantitative research design that included an analysis of the environment. Among the findings were the following, which answer the questions identified in Table 2.

Strengths

F1. Academic staff: The Department of Industrial Engineering (II), which also provides support services for the Business Management Engineering (IGE) program, has 12 full-time professors and 12 part-time professors, all of whom have postgraduate degrees.

F2. Membership in professional associations: Five of the full-time faculty members belong to the Interinstitutional Network of Ergonomists of the Northwest (RIENO) and the Society of Ergonomists of Mexico, Civil Association (SEMAC), as do four part-time faculty members.

F3. Research and outreach: Records of research related to ergonomics have been kept since 2006. Since its founding in 2009, the department has participated in the creation and participation in RIENO, collaborating on research and publications, as well as participating in consecutive years in international conferences, with the participation of students in areas related to ergonomics to this day.

F4. Student participation: There is a University Chapter (CAPUNI), endorsed by SEMAC, which grants junior certification to those who belong to it and participate actively (see Fig. 3).

Figure 3. Official website of the Mexican Society of Ergonomists (SEMAC).

F5. Promotion and dissemination: Since 2013, a series of academic weeks, conferences, and symposiums related to ergonomics have been held each year, with a little over 3,000 students participating over the years.

F6. There is an LGAC registry for the Occupational Ergonomics specialty in the Industrial Engineering program.

Weaknesses

D1. Little publicity and visibility of the ergonomics specialty. D2.

Lack of specialized infrastructure.

Threats

A1. Universities in the area: In the municipality of Ahome, particularly in the city of Los Mochis, there are 13 higher education institutions, of which 9 are private and 4 are public.

A2. Educational offerings: Of the total number of universities, four were found to offer degrees in industrial engineering and/or business management engineering or related fields, which could offer specializations in ergonomics, occupational health, or related fields.

A3. Low enrollment due to lack of interest or awareness among potential students.

Opportunities

O1. Regulations: Recent publications in the Official Gazette of the Federation (DOF) of NOM-035-STPS, NOM-036-STPS, and NOM-037-STPS. These relate to psychosocial and ergonomic risks and teleworking, respectively, and are topics closely related to occupational health and ergonomics.

O2. Of the 13 institutions in the Los Mochis region, none offer a degree, specialization, or related field in ergonomics or occupational health.

O3. Potential collaborations with companies for professional internships, in compliance with the NOMs

Through a comprehensive analysis, the internal and external environments of the Technological Institute of Los Mochis were examined with the aim of identifying strengths, opportunities, weaknesses, and threats in order to propose steps to be taken to comply with a specialization in occupational ergonomics. After this study, consideration should be given to involving academia in order to establish the requirements for opening agreements in accordance with TecNM guidelines.

Based on the above, it is proposed that the study continue with the aim of opening a specialization in occupational ergonomics. This is specified and argued based on the study of the previous context, which coincides with Villagómez et al. (2014), where they also used the SWOT methodology, although it was applied to define lines of research and academic bodies. This converges with the results obtained by Salgado N., Pantosín A., and Ramírez M. (2024b), where SWOT helped them identify the quality of teachers, the minimum infrastructure required, as well as the

weaknesses and threats that require further observation. They applied it to improve educational programs and educational management, which was also the case in this research for the specialty proposal.

CONCLUSIONS

The SWOT analysis shows that ITLM has sufficient academic and networking strengths to offer the specialty in occupational ergonomics, in a context where labor regulations generate demand for trained professionals. However, weaknesses such as dissemination and competition with local institutions need to be overcome. According to the analysis, the most suitable degree program for adopting this specialization is Industrial Engineering. However, it already has two specializations, one of which was recently created. On the other hand, the Business Management Engineering degree program, which only has one specialization, would have the option of offering this specialization, which would lead the administration to decide which one is more convenient to offer.

FUTURE WORK

Thanks to the findings of this research, the proposal will be formalized before the directors and the industrial engineering academy to structure, in an orderly manner and in accordance with TecNM guidelines, the opening of the "occupational ergonomics" specialty at the Los Mochis Institute of Technology. In this sense, future work would be aimed at reversing weaknesses and reducing threats by taking full advantage of the institution's strengths.

The formation of academic bodies by professors who have the desired profile and who already have jobs in the field of ergonomics, as revealed by the SWOT analysis of this research, is considered part of future plans.

REFERENCES

Burton, J., et al. (2010). *Healthy work environments: World Health Organization framework and model: contextualization, practices, and supporting literature*. World Health Organization.

Political Constitution of the United Mexican States. (2023, June 6; rev. 2024, November 19). *Title Six*. Official Gazette of the Federation. https://mexico.justia.com/federales/constitucion-politica-de-los-estados-unidos-mexicanos/titulo-sexto/

Official Gazette of the Federation. (2018, October 23). *Detailed note*. Official Gazette of the Federation https://www.dof.gob.mx/nota_detalle.php?codigo=5541828&fecha=23/10/2018#gsc.tab=0

El Economista. (2023, April 27). *Forty percent of workers do not have or are unaware of safety protocols in their company*. El Economista. https://www.eleconomista.com.mx/capitalhumano/El-40-de-los- workers-do-not-have-or-are-unaware-of-safety-protocols-in-their-company-20230427-0094.html

García Flores, J. (2017). Legal framework applicable to occupational ergonomics in Mexico. *Journal of Research in Law, Criminology, and Legal Consulting, 11*(21), 193–216.

Ghazinoory, S., Abdi, M., & Azadegan-Mehr, M. (2011). SWOT methodology: A review of the state of the art for the past, a framework for the future. *Journal of Economics and Business Management, 12*(1), 24–48. https://doi.org/10.3846/16111699.2011.555358

Los Mochis Institute of Technology. (2024). *Accountability report, 2019–2024 of the Los Mochis Institute of Technology*. Los Mochis Institute of Technology. https://www.mochis.tecnm.mx/274-2/planeacion-programacion-y-budgeting/irc2019-2024/

Lagoria, S. L. (2009). *SWOT analysis of education systems in the central region: Challenges for integration*. In XXVII Congress of the Latin American Sociology Association and VIII Sociology Conference of the University of Buenos Aires. Latin American Sociology Association.

General Law on Humanities, Sciences, Technologies, and Innovation. (2023). *General Law on Humanities, Sciences, Technologies, and Innovation*. Chamber of Deputies. https://www.diputados.gob.mx/LeyesBiblio/pdf/LGMHCTI.pdf

Merodio, J. (2024). *Bridging the education-employment gap: the key to the future of work*. LinkedIn. https://es.linkedin.com/pulse/reduciendo-la-brecha- educativa-laboral-clave-para-el-futuro-merodio-uooff#:~:text=The%20Education-Employment%20Gap:%20A,new%20skills%20to%20remain%20relevant.

World Health Organization. (2017). *Protecting workers' health*. World Health Organization. https://www.who.int/es/news-room/fact-sheets/detail/protecting-workers'-health

Ponce, H. (2007). The SWOT matrix: An alternative for diagnosis and determination of intervention strategies in various organizations. *Teaching and Research in Psychology, 12*(1), 113–130.

Salgado Reyes, N., Pantosín Cóndor, A. G., & Ramírez Cevallos, M. de los Ángeles. (2024). Effectiveness of SWOT strategic analysis at the Instituto Superior Japón. *Revista Internacional Bastcorp, 3*(2), 69–84. https://doi.org/10.62943/bij.v3n2.2024.94

Ministry of Labor and Social Welfare. (2008). *Guide to designing ergonomic workspaces for workers with disabilities* (2nd ed.). Undersecretary of Human Development for Productive Work.

Ministry of Labor and Social Welfare. (2014, November 13). *Federal Occupational Safety and Health Regulations.* Ministry of Labor and Social Welfare. https://www.diputados.gob.mx/LeyesBiblio/regla/n152.pdf

Ministry of Labor and Social Welfare. (2018). *NOM-036-1-STPS-2018. Ergonomic risk factors at work: Identification, analysis, prevention, and control. Part 1: Manual handling of loads*. Ministry of Labor and Social Welfare.

COLLABORATIVE WORK TABLE

Role	Author(s)
Research	Jesús Iván Ruiz Ibarra
Data curation	Alberto Ramírez Leyva
Writing - Preparation of the original draft	Jesús Iván Ruiz Ibarra
Writing - Review and editing	Alberto Ramírez Leyva, Natanael Parra Gutiérrez
Visualization	Indeliza Armenta Acosta
Supervision	Karina Luna Soto, Natanael Parra Gutiérrez