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Chapter

Perspective Chapter: Prospective of Sectoral Competences for the Design of Dictionaries of Professional Competences and Research

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Abstract

According to the challenges of technological higher education in Mexico, facing the requirements of graduation profiles that respond to educational competitiveness in the face of the challenges of Industry 4.0 and even toward Industry 5.0. This applied research initiative is oriented to the development of actions to strengthen sector competitiveness, considering the learning curve generated in the strategic sectors of Mexico, through the research work of experts in technological higher education of Mexico and specialists in labor, professional, and research skills. The main objective is to present the model to develop Competency Dictionaries Sectoral (DCS) for each study program, through the methodology of the Fifth Systemic Helix (in Spanish: Quinta Helice Sistemica—QHS), as a strategic contribution to reduce the gap of the different knowledge of the competencies in the occupational functions in the regional strategic sectors of the north, center, and south of Mexico; under the frame of reference of the state-of-the-art and frontier research of international knowledge, the foregoing sustained from the scientific work initiative of the academic body project of the Department of Economic and Administrative Sciences entitled "Sectoral Competitiveness, Social Innovation and Sustainable Development" of the National Technological of Mexico, Tijuana Campus.

Keywords: Fifth Systemic Helix (QHS methodology), competency dictionaries sectoral, sustainable education, social economy, circular economy

1. Introduction

The recommendations of the Organization for Economic Cooperation and Development, 2019 [1], report on competencies in Mexico, the current model of the Mexican competency system, has an opportunity to rethink actions aimed at strengthening

the model. For this reason, the proposal of this article is based on the challenges indicated by the OECD to develop the welfare and social progress policies of the federal government of Mexico, sectoral analyzes of the strategic national programs have been generated as an identification of the sectoral gaps at the national level and with it the reorientation of actions and priorities of applied research projects from the higher education sector, as well as the national model and the effective methodology to move to the next stage of the development of the strategic economic sectors, facing the challenges of globalization and the needs of relevant and competitive occupational profiles in the face of the Industry 4.0 revolution and the generational transition to Industry 5.0. Likewise, awareness of empowerment about the Sustainable Development Goals (SDG) of the UN 2030 Goals [2], which makes it imperative to build a model and an appropriate methodology for professional skills and research, making clear the differentiation of the eight levels and their requirements for training, alignment, evaluation, and eventual certification of job skills, professional skills, and applied research skills, with social impact and territorial development, encouraging local capacities with linkages that influence social innovation and with startup and spinoff-type ventures.

This article is based on the development of three scientific research projects registered at the national level at the National Technological of Mexico:

1. Observatory for the integration of engineering to the ecosystem of economic development of the peninsula of Baja California [3],

2. Observatory of sustainable development in graduate programs in Baja California [4], and

3. Prospective of dictionaries of labor, professional and research competences for the sectoral development of the social and solidarity economy in Mexico.

All the above is intended to generate data on the relevance of the programs of study and the effectiveness of the competitions labor, professional, and research, as well as evaluate the results of the graduates in the context of regional development and productive vocations relevant in northwestern Mexico. The purpose of the project is to examine the employability of students and graduates, as well as analyze the causes of the student dropout rate in engineering, which is about 40% during the first semester. The high dropout rate may be related to the socioeconomic factors affecting northern border cities, which have experienced an influx of migrants arriving from Southern Mexico. Until now, the research has focused on sectoral studies related to the postgraduate master's degree in administration at the Technological Institute of Tijuana and the systematic development of projects related to various strategic sectors of industry [5] in which initiatives have been created for applied research programs through postgraduate theses, social service programs, complementary credits in educational programs and professional residences (professional practices).

This research focused on the development of an electronic survey that could systematically collect key information for the creation of an electronic empirical database for the development of a web page that will serve to assess employability and performance, as well as to track results. economic and strategic of students and graduates of engineering and economic-administrative sciences. The aim was to identify variables that could generate feedback on the causes of student dropout rates, as this can have a significant impact on students' families and futures, as well as their communities. In

addition, the development of this survey can provide valuable information on the effectiveness of educational programs and learning tools, especially for students who work and study simultaneously. Also, an empirical database to monitor the employability and career outcomes of graduates could be a strategic tool that could provide useful information for other technological institutes, such as those located in Tijuana, Mexicali, Ensenada, and other higher education institutions in Baja California and a national benchmark, and thereby strengthen strategies of relevance and social entrepreneurship seeking sectoral well-being through the social and solidarity economy [6].

2. Theoretical framework (state-of-the-art)

The scientific research project focused on the creation of a methodological proposal called dictionaries of sectoral competences, part of the learning curve generated by more than a decade of applied research in different sectors through the QHS methodology for sectoral integration; which considers a multidisciplinary work with specialists representing the government sector, universities, companies, associations, clusters, and consultants. In order to analyze the gaps in the human capital agendas for their full labor, professional, research, and innovation development. Under the leadership of the technological higher education institutions, encouraging competitiveness through educational relevance for the development of innovation and sustainability ecosystems.

This research employed a systematic approach with the QHS methodology developed [7, 8] to cover all aspects of society; therefore, sectoral experts were contacted, such as government, educational, business, professional associations, chambers, as well as specialized consultants.

Figure 1 presents a chronological review of the state-of-the-art on competencies for professional development. In 1973, the article was published "Measuring competencies and not intelligence." [9] Under initiatives of applied research projects from the academy, case studies have been developed, aimed at systematizing and generating a database that generates the variables that become labor, professional, and research skills, based on the professional careers of the Department of Sciences. Administrative economics of the National Technological of Mexico Tijuana Campus, and thereby facilitate the development of the focus group processes to convene review processes, update study plans, graduation competencies, and specialties required by the interest groups that eventually become the main employers of higher education graduates. Under a natural process, they become candidates for supervisory, coordination, managerial, or even managerial-level positions. In specific cases, they are children of businessmen, who require skills to join the board of directors of family businesses or corporate groups.

The prospective goals for the implementation of circular economy models in SMEs in Baja California, as well as the enterprises and practices of the social economy and social innovation, require the human capital agenda that integrates variables of technical skills, soft skills, and transversal competences under the skills approach, on knowledge, intervention methodologies, as well as tools and instruments to strengthen efficiency, effectiveness, and productivity, and with it the robust concept of competitiveness, including future skills in managing the Sustainable Development Goals of the UN 2030 goals through the nodes of social and solidarity economies (NODESS) programs.

In this line of development of human talent management, in 1985, the National Council for the Evaluation and Certification of Labor Competence [10] was created as a Federal Government entity under the Ministry of Public Education, with the aim of
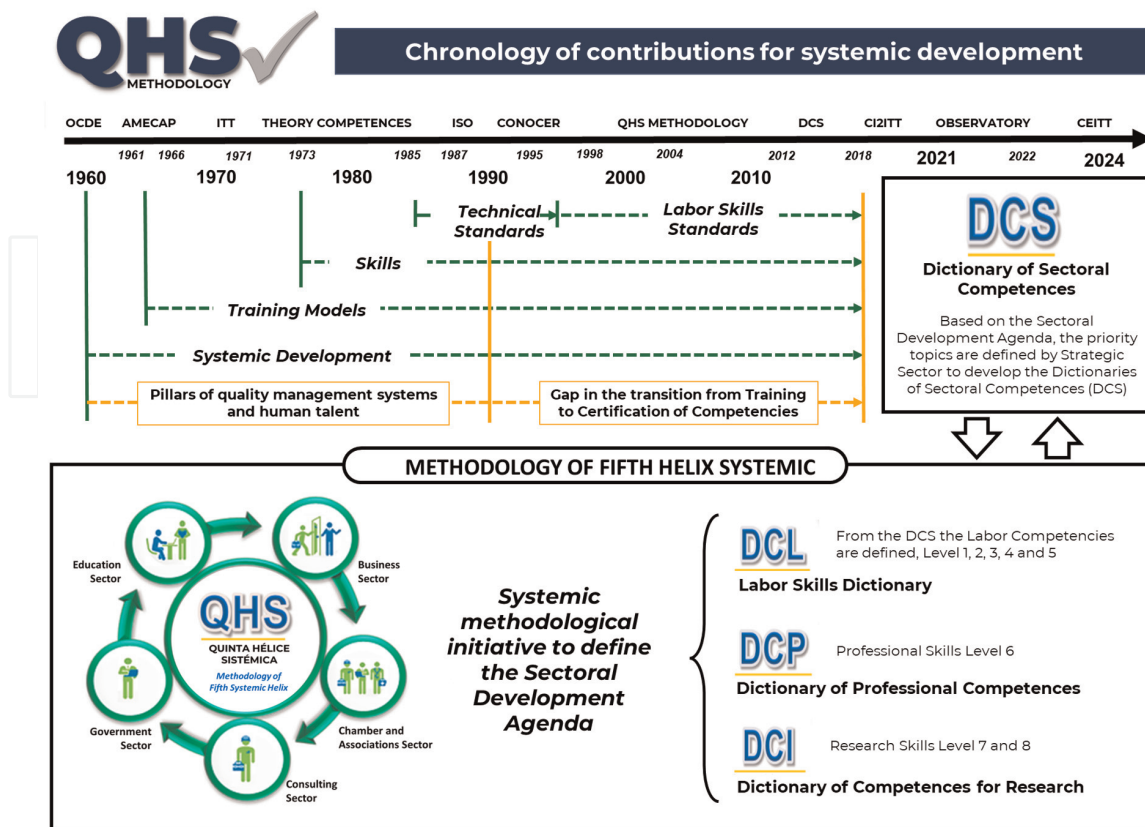
Figure 1.
Timeline of the transition from training to competencies. Reference: Own elaboration (2022).

contributing to raising the level of economic competitiveness, educational development, and social progress of people, in the country, through the national system of people competences and defines the labor competence standards in light of the challenges identified and indicated by the OECD.

In the 90s and as a result of the international standards of the International Organization for Standardization, the competencies of human resources in organizations are defined based on four components: education, experience, training, and skills, and with it generate technical standards for its definition. In 2011, the United Nations Educational, Scientific and Cultural Organization (UNESCO) approved the application of the International Standard Classification of Education (ISCED) [11], The nine educational levels begin with the first instance of learning (0), elementary (1), secondary (2), baccalaureate (3), technologist (4), higher technician (5), bachelor's degree (6), master's degree (7), and PhD (8).

The chronological phases of the conceptual transformation of the term competencies are derived from two philosophical approaches.

1. The first conceptual approach is associated with aspects of competencies supported by constructs of abilities, skills, and aptitudes of knowing how to know, knowing how to do, and knowing how to be.

2. A second conceptual approach is associated with the transversal application of the application of competencies, where the performance of individuals reflects the level of efficiency, productivity, and competitiveness of public and private organizations.

The competencies reflect the product of experience, performance, and good practices developed throughout the productive life of the economically active population; therefore, the level of international competitiveness of a country.

As part of their studies, defined that the characteristics of the competencies are made up of a set of attributes (enumerated) of the individual, not limited to knowledge, but include skills, attitudes, communication, and personality, in other words, it takes into consideration all work elements, not limited to just knowledge [12]. According to specialized studies on competencies, it is concluded that competencies can be measured with assessment instruments. In the case of theoretical knowledge, questionnaires are developed; in the case of know-how skills, rubrics are developed with checklists with specific criteria for a product or service to be developed. And in the case of the evaluation of attitudes, performance guides are developed with specific criteria of behaviors and universal ethical values.

In the year 1994, four classifications of professional competencies were described [13]:

1. Technique: Development of the management of the different knowledge necessary in a specific function of specialized performance.

2. Professional: Role of specialization in the performance of functions under the criteria of an expert, backed by previous experience in the specific function to be performed.

3. Social: Performance with attitudes of the leadership role, group management, and interpersonal relationships, with conflict resolution skills.

4. Participatory: Skills of the decision-making role, delegation, and administration of responsibilities of the work team.

The state-of-the-art on study approaches based on the evolution of performance competencies in individuals chronologically since the eighties were associated with abilities and hallmarks of extraordinary talent in isolation. In such a way that success in professional performance was correlated to the individual cognitive qualities, for which the competencies evolve toward a more complex definition that protects competencies as functional personality configurations made up of knowledge, skills, motives, and values. **Table 1** describes the typology of competencies necessary for work, professional, and research development, as well as soft skills and transversal competencies for managerial development. The professional competence approach and models consolidate the elements necessary to cover the needs of people, companies, and society.

In the field of professional competencies, the research-based approach defines three main conceptions [14]:

1. Behaviorist: Includes the comprehensive approach to growth, from the point of view of the full improvement of the individual to their maximum performance capacity and challenges of personal improvement.

2. Functional: Under the principle of the functional map structure, it is established that every individual has a key performance function in an organization and a specific contribution from their profile of the position held in the organization.

Objective of agenda 2030	Action/contribution
SDGs 1—End of poverty	In progress
SDGs 2—Zero Hunger	Product analysis project not in force in tortilla shops
SDGs 3—Health and well-being	Analysis of the nutritional impact of corn
SDGs 4—Quality education	Through academic and research bodies, offer training
SDGs 5—Gender equality with equity and equality actions in the processes of orientation	With equity and equality actions in the processes of orientation
SDGs 6—Clean water and sanitation	In progress
SDGs 7—Affordable and clean energy	In progress
SDGs 8—Decent work and growth economic	Analysis of typologies of trades and tasks in ESS of Tijuana
SDGs 9—Industry, innovation, and infrastructure	Development of productive projects with social innovation
SDGs 10—Reduction of inequalities	Social inclusion and integration projects
SDGs 11—Sustainable cities communities	Identification and definition of variables of an observatory of SSE in Tijuana
SDGs 12—Responsible production and consumption	In progress
SDGs 13—Climate action	In progress
SDGs 14—Underwater life	In progress
SDGs 15—Life of terrestrial ecosystems	In progress
SDGs 16—Peace, justice and strong institutions	In progress
SDGs 17—Alliances to achieve the goals	Inter-institutional collaborative work

Reference: Own elaboration (2022).

Table 1.
Contribution to the SDGs by the NODESS Tijuana project.

3. Constructivist: Competences are processes of constant evolution in individuals, learning as a factor of empowerment of the relationship of the performance of activities, responsibilities, and experiences acquired in the different roles of the learning curve of professional experience.

3. Methodological strategy

Through sectoral comparison and the use of the Fifth Systemic Helix (QHS in Spanish) methodology [15, 16], an evolution of the Triple Helix component of the economic growth model of the sixties of the twentieth century, but contextualized to the reality of the new century and the global trends of economic development, a series of methodological alternatives and systemic variables are proposed, according to the QHS methodology for the cooperative sector and the social solidarity economy (ESS) for the exploration of research that approaches the determinants of the state of development and its competitiveness.

Methodology QHS	Bachelor's degree	Postgraduate and research	Continuing education and professional update
H1. Government	Municipal	UN Goals 2030	Social economy, solidarity, cooperatives
H2. Education	Educational relevance	Entrepreneurship and spinoff projects	Telecommuting, remote, or work from home
H3. Business	Legal compliance and learning curve	Tools for continuous improvement	Technological capabilities and innovation
H4. Associations	Legal compliance and post-covid actions	Local and global competitiveness	Development and training
H5. Consultants	Audit and legal regulations	Sustainable development	Professional certifications

Reference: Own elaboration (2022).

Table 2.
Typology of skills necessary for professional development.

Table 2 presents a relationship of actions developed with the QHS methodology, thereby generating indicators for the sectors: cooperatives, cooperative education, government (public management for cooperatives), cooperative associations (including the perspectives and expectations of society on cooperatives and the social solidarity economy) and cooperative consultants, representing a frame of reference for the systemic evaluation of the development of cooperatives local, regional, and international (models of good practices).

The vein proposals for future research in the cooperative sector and social solidarity economy (ESS) are raised through a methodology called Fifth Systemic Helix (QHS). **Table 3** conceptually describes the different types of skills. One of the great

Competences	Conceptual description
Labor	Manual assembly of products, low level of technology in processes
Professionals	Teamwork, responsibility, initiative, interpersonal relationship, willingness to learn, punctuality, interpersonal communication, leadership, organization, analytical skills, knowledge of some software, skills for math or any other basic subject, good spelling and writing, creativity and inventiveness, acceptance of changes, active listening, communication effective from different means, tendency to solve problems and not create them, motivation, and accept criticism and offer it appropriately
Research	Pose a problem, develop a contextual framework, review the state-of-the-art, create and validate a data collection instrument, build and validate models, master data techniques, master scientific writing style, present research papers in conferences, languages, and knowledge of art and culture universal.
Soft	Communication, time management, emotional intelligence, adaptability, creative thinking, empathy, organization, teamwork, resolution of problems, and leadership
Global and managers	Global and intercultural knowledge, understanding of local issues, appreciation of worldviews, understanding of differences in communication, and methods of interaction with different cultures and languages.

Reference: Own elaboration (2022).

Table 3.
Typology of systemic competences for professional development.

values of solidarity companies is their cooperative nature and ability to manage organizational work in education, training, and awareness of associativity.

The proposal of the QHS-ESS variables leads to the beginning of a multisectoral relationship with unity and synergies orientation toward the improvement of the conditions of the principles of cooperatives and the social solidarity economy in the face of the challenges of an increasingly globalized economy and with requirements of quality management systems and international competitiveness.

It is worth mentioning the context of the historical development of cooperative companies; it was born at the height of the Industrial Revolution, under two large branches and with a great diversity of activities, the first focused on consumer activities and the second on production or industrial activities. In the same way as a capitalist company, the cooperative company has the function of producing; however, its objective or purpose is not to obtain maximum benefit or profit, but rather the development and well-being of its members, thereby covering the essence of the social solidarity economy companies.

Within the systemic approach to cooperatives, it is convenient to mention the seven cooperative principles, which are:

a. Voluntary and open membership,

b. Democratic management by partners,

c. Economic participation of the partners,

d. Autonomy and independence,

e. Education, training, and information,

f. Cooperation between cooperatives, and

g. Interest in the community. Cooperatives represent the most widespread form of social economy entity in the world.

The cooperative sector represents a fertile scenario for the development of the welfare of the social economy, through the combination of different forms and articulation of efforts of sectors and activities of inter-cooperatives, generating and consolidating the sustainability of the organizations, the approach of the variables of cooperatives, the perspective of the principles of research in cooperatives and social solidarity economy is addressed and that, through systemic research, opportunities are identified to strengthen through education and cooperative values a collective wealth, generating with it, development of successful cooperative models. Prospective of sectoral competences for the design of dictionaries of professional competences and research, cooperative sector in Mexico, research topics are:

1. National Competence System: competency training gap.

2. Analysis of the results of the municipal development agendas—INAFED/SG (articulation of local governments)

3. Requirements for the development of a world-class local supplier.

4. Gap between higher education and cooperatives.

5. Competencies of the logistics actor in the strategic sector of logistics services in Baja California.

6. Model and methodology for DCS for cooperatives.

Within the framework of the project to form a NODESS program in the city of Tijuana, through the call of the National Institute of Social Economy (INAES) for the articulation sector through the leadership of higher education institutions, the Technological Nacional of México, Tijuana Campus has taken the initiative derived from the development and direction of educational programs for different sectors of society with impact in the social economy, the Research and Information Center for the Social Economy and Solidarity (CIRIEC Mexico North Region), with the objective of systematizing experiences and dissemination of social economy and solidarity models. Active participation in the Honorary Presidency of the Social Economy Commission of the Development Ecosystem Economic Department of the Tijuana City Council, in addition to international links.

Preliminary studies by observatory researchers [17] promoted the design of dictionaries that have been used to define the competencies of the sector as a strategy to improve and promote continuing education and professional updating. **Figure 2** NODESS TIJUANA program operation model, necessary for professional development and issues concerning the master's in administration program [18] that have been addressed by the academic body project called "Sectoral Competitiveness and Innovation," which included a multidisciplinary group of professors and researchers of the Department of Economic and Administrative Sciences, Division of Graduate Studies and Research, of the National Technological of Mexico, Tijuana Campus (TecNM).

Figure 2.
NODESS TIJUANA program operation model. Reference: Own elaboration (2022).

TecNM Tijuana currently leads the project of the Federal Government Secretariat of the Interior in Mexico to promote Nodes for the Promotion of the Social and Solidarity Economy (NODESS), it is a program that articulates the efforts of municipal institutions, cooperatives, and higher education institutions. Through the master's in administration program, applied research is developed to strengthen the capacities of sectors, such as the medical tourism cluster, determining the training and educational skills of all sectors involved in the provision of labor, professional, and research services [19].

According to the UN [8] "The SDGs are appropriate mechanisms that will allow the population and its leaders to jointly participate in the search for social consensus and reduce the gaps." The 17 Sustainable Development Goals, and their 169 goals, affect the structural causes of poverty, combat inequalities, and generate opportunities to improve the quality of life of the population within a framework of sustainable development. **Table 4** presents the sustainable development objectives that integrate the NODESS TIJUANA program. This important agenda serves as a launching pad for action by the international community, governments, as well as law enforcement agencies civil society, academia, and the private sector, in order to address the three interconnected elements of sustainable development: economic growth, social inclusion, and environmental sustainability.

Focus FHS	Bank of questions by systemic sector
H1. Cooperative companies	• What are the problems or challenges of the cooperative sector to strengthen its internal operations? • What do cooperatives need to integrate at the regional level? • What are the barriers that cooperatives face at the local and regional level? • What do cooperatives need to internationalize? • Have cooperative consultants contributed to the success of the cooperative sector? • What do cooperatives need to open up to cooperative educational links? • How can cooperatives be linked to all sectors? • What is the cooperative perception of the other sectors? • Do the cooperatives consider that the profiles of the professionals have labor, professional, and research competences on cooperatives? • What do local suppliers need to do to be chosen by cooperative companies? • What kind of help do cooperatives need to develop local technology with support from the government and schools? • What is the profile of a successful cooperative?
H2. Cooperative education	• What are the knowledge and skills (competencies) that are provided in the schools for the cooperatives sector? • How do the schools update their plans and study programs according to the advances and development of the cooperatives/ESS? • How are the professors updated to teach the current issues of cooperatives and social and solidarity economy? • How do you measure the effectiveness of your study programs, according to the development indicators of cooperatives? • How is the link between the education sector and the cooperatives promoted? • How is cooperative education promoted for the development of models and self-management? • What are the main needs of the cooperative education sector? • What are the main lines of research in the cooperative sector?
H3. Government–public management for cooperatives	• What are the commitments to the health and education of the workers of the cooperatives? • How can the government be facilitated with actions that contribute to the development of local supply through local professionals and entrepreneurs for the cooperatives and social economy sector?

Focus FHS	Bank of questions by systemic sector
	• What does the government need to develop public policies that encourage and protect cooperative companies? • What initiatives is the government developing in preventive terms of public safety that do not affect the development and investment of the cooperatives? • What strategic actions is the government developing in the short, medium, and long term for cooperative development? • What failures does the government recognize that it has had and therefore the local supply for the cooperative and social economy sector? • Would the government be open to creating an agenda for cooperative development, regardless of what changes exist at the political level?
H4. Cooperative associations	• What are the strategies to help local and national suppliers to insert themselves and contribute to the cooperative sector? • What programs have generated and encouraged the development and consolidation of the cooperative sector? • What are the strategies to support cooperative businesses and the benefits of being a member of a cooperative association? • How is cooperative research promoted? • How is communication promoted between cooperatives? • How is the development of human resources promoted in cooperatives? • How do you promote protection and support gender equality initiatives in cooperatives? • How is the certification of labor, professional, and research skills promoted in cooperatives?
H5. Cooperative consultants	• What is missing in educational institutions so that their graduates are more entrepreneurial and consolidate the cooperative sector? • What actions do you recommend to the government sector to strengthen the cooperative sector and the supply chain through local and national suppliers to promote the development of regional vocations? • What initiatives are considered to be carried out by business organizations and chambers in order for them to be a key actor or agent of change in cooperative development and the social economy? • What are the professional services that cooperative consultants must provide to help increase competitiveness?

Reference: Own elaboration (2022).

Table 4.
Bank of questions to determine dictionary of sectoral competences.

4. Results

The present investigation generated various strategies for the construction of the variables that would generate the elements, constructs, and scaffolding necessary for the design of a model based on an observatory for monitoring the results socioeconomic and employability of students, graduates, and even students who failed to complete their professional or postgraduate studies.

For TecNM Tijuana, it is a matter of concern, since it is national policy to promote professional training since it affects the future development and social progress of the country. In addition, having an educated population reflects the country's competitiveness and innovation in the face of global challenges [20].

The first methodological approach of this research was based on a prospective study on the certification of competencies in Mexico. This study generated the current standards for study programs in technological higher education, specifically those that

lead to engineering careers in various economic regions of the nation. In Mexico, there are three regions, known as north, center, and south, and each of these regions has specific needs for commercial vocations and ecosystems based on their natural environments and very different socioeconomic developments, supported by their business vocations associated with their strategic sectors that make up their economic development ecosystems.

This study generated the principles for the design of sectorial competence dictionaries (DSC) that propose competence standards in order to certify the knowledge, skills, and understanding acquired according to the occupational profiles of engineering graduates in an effort to produce personnel highly qualified and prepared to respond to the needs of business sectors [21]. That is why the National Technological of Mexico, Tijuana Campus at the national level is the technological higher education institution that generates 50% of the enrollment of engineering graduates in Mexico since 1948, with currently more than 600,000 students with 254 campuses throughout the national territory.

As a product of a systematically developed method, the structure of the empirical database was defined for the observatory's approach to monitor the employability results of engineers trained by the National Technological Institute of Mexico Tijuana.

The results will be of a public nature and may be used to collect information and targeted feedback that will influence strategic decisions and actions in different sectors, not only for this study, but also for research and development programs in different sectors of the industry. Periodic reports from the observatory will provide feedback on relevant needs and gaps in management education and development programs, including job and business acumen, research, and soft skills, according to local, national, and global challenges. Described below are the data mining elements that defined the electronic survey inquiries that will be circulated as a plan among students and graduates representing more than 35,000 graduates from the Tijuana campus alone.

The first preliminary results of the in-depth interviews carried out with engineering professionals who have successfully graduated from the National Technological of Mexico Tijuana Campus, raised central issues, which will be considered pillars of the necessary skills for the employability of graduates of engineering study programs, as well as the knowledge and specializations required. **Figure 3** describes the road map of the model to develop dictionaries of sectoral competences.

The methodological proposal to develop dictionaries of sectoral competences was born as a strategy of the experience generated in the collaboration of the development of municipal development plans and the analysis of the national strategic programs of the nation plan, which is aligned with the Sustainable Development Goals of the 2030 Goals of the United Nations Organization. Developing sector development agendas makes it possible to identify gaps to limit challenges and areas of opportunity to encourage sector development and growth. Strengthens the relevance of study plans in the academic sector, as well as the training and development processes.

In the State of Baja California, a sectoral articulation and linkage model has been developed, which is characteristic of the unit and focused on strengthening specialized human capital. Historically, Baja California has distinguished itself by development and innovation, with a very independent style, considering its geographic situation similar to an island, where its territorial limits are the State of California, United States, and the State of Sonora and Baja California Sur.

The following points detail the data collected by the electronic survey. These will be disseminated through the electronic survey and social networks to the
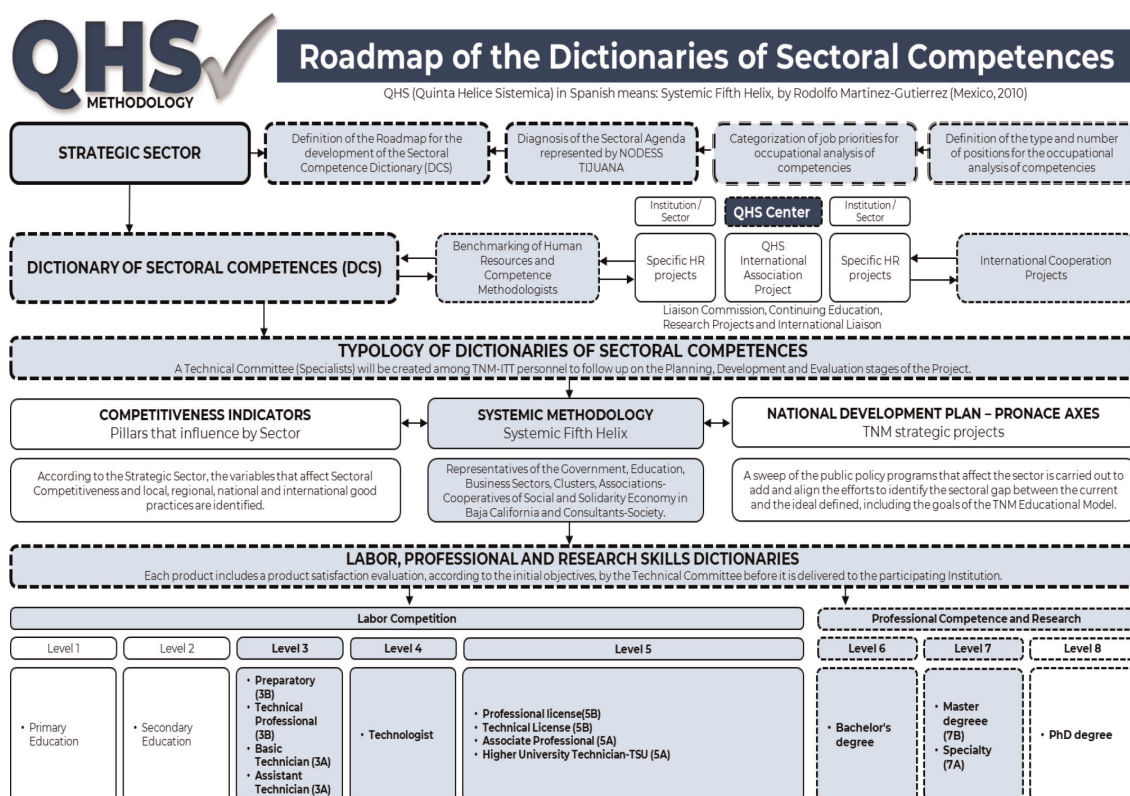
Figure 3.
Model for the development of a dictionary of sectorial competences. Reference: Own elaboration (2022).

more than 35,000 TecNM Tijuana graduates, as well as to the 12,000 students on average.

4.1 Respondent data

4.1.1 Characteristics of the respondent

Academic training: Participants will have 254 current technological institutions to choose from and select for their survey.

- Enrollment status, student: Individual currently in a program of study (participants may select a professional or graduate option).

- Status of registration, graduate: Person who completed a study program, either at the professional or postgraduate level (master's or doctorate) or exchange.

- Alumni enrollment status: Natural person who suspended their studies temporarily or indefinitely.

4.1.2 Statistical data of the respondent

- Year of the beginning of professional and/or postgraduate studies.

- Year of completion of the study program.

- Student, employee, entrepreneur, unemployed, or researcher.

- Thesis, title, and professional license, or in the process of completion.

- Personal information, marital status, age, and place of birth.

- Place of residence and employment (local, national, or abroad).

4.2 Data of the labor sector of the student or graduate

4.2.1 Characteristics of employment sectors

- Primary sector: Livestock, fishing (river and sea), agriculture, mining (mines and rock complements), and forestry.

- Secondary sector: Industrial, energy, mining (also considered part of the secondary sector due to various products derived from mining), and construction.

- Third sector: Transportation, communications, business, tourism, health, education, art, finance, and administration.

- Fourth sector: Information and knowledge services, research and development, and innovation.

- Fifth sector: Health services, security, emergency services, education, culture, science, social, and domestic activities.

4.2.2 Employment characteristics

- Sector: Private, public, cooperative, or social economy.

- Type and level of position held in the organization or institution.

4.3 Typology of skills necessary for professional development

4.3.1 Research skills

The skills in the research process highlight the ability to theorize and build models and scientific writing skills, as well as the relational capacity of the researcher with the research subjects, data management, and certain personality characteristics of the investigator.

4.3.2 Soft, managerial, and global skills

Global competence is a multidimensional and lifelong learning goal. Globally competent individuals can examine local, global, and intercultural issues, understand and appreciate different perspectives and worldviews, interact successfully and

respectfully with others, and act responsibly toward sustainability and collective well-being.

According to the applied research developed on "Labor, professional and research skills for logistics engineers" at TecNM Tijuana, defined by the principle of the correlation between competitiveness and education, it is essential to point out that a prepared society will have better and greater opportunities for growth, development, and progress. Which makes it necessary to reflect from the academy, specifically from the technological higher education sector on the determinants that impact the innovation of human talent. By developing self-management capacities, the maximum participation of cooperative members is achieved so that the best decisions are strategically made for the benefit of the entire cooperative organization and the relationship with other entities that can contribute to the growth and sustained prosperity of the cooperative under the interaction with society. The development of cooperative companies is linked to the principles of alliances and strategies of sectoral interoperation and solidarity growth. This contribution is a benchmark for exploring the challenges of cooperatives from a systemic approach and that provides a benchmark for sectoral public policy initiatives of the social solidarity economy.

As a result of documentary research and the strategic application of the Fifth Systemic Helix methodology for the social and solidarity economy sector, a consensus has been reached on the development of a bank of key questions for the approximation of the identification and consideration of all comprehensive approaches to develop a dictionary of sectoral competences, which integrates the dictionary of labor, professional, and research competences, to strengthen the sectoral development of the social and solidarity economy, thereby encourage development and social impact, implicitly considering the 17 objectives for the sustainable development of the 2030 goals of the United Nations Organization.

The scientific research project "Prospective Dictionaries of Labor, Professional and Research Competences for the Sectoral Development of the Social and Solidarity Economy in Mexico" represents the applied research efforts developed during the period 2019–2023. Within the framework of the creation and registration of the first NODESS (social and solidarity economy node) on the northern border of Mexico [22], the City of Tijuana has become a benchmark for innovation and vanguard models in sectoral articulation processes, from the academy with the government sectors, clusters, business chambers, and specialized consultants.

The National of Mexico, Tijuana Campus has promoted the development of an observatory of the evolution of the Sustainable Development Goals of 2030, under the registry of scientific research projects registered at the national level with the purpose of generating knowledge through scientific articles and linkage practices between national and international research centers, generating comparative studies of good practices between universities and researchers and representatives of different sectors of society. The collaboration of the Tijuana City Council through the Municipal Institute for Citizen Participation has generated a statistical analysis of the existence of more than 57 thousand SMEs with challenges of implementing sustainability projects, and the determination of critical factors in the social and solidarity economy. The city of Tijuana, due to its geographical location in the Baja California Peninsula, represents the opportunity for comprehensive systemic development for all sectors of society.

The preliminary results in Phase 1 and Phase 2 show key variables to include in an electronic survey, which will be circulated among TecNM Tijuana students and graduates, businessmen, and graduates in their professional practice, with the data

collected will support the development of a database through a web page, and the development of dictionaries of sectoral competences, to strengthen the employability and follow-up at the local, national, and international level of graduates and students. The conclusions of this research suggested that the information in the database should include factors that affect student dropout rates, such as business affiliation and sense of belonging, as well as those that affect comprehensive competencies for employability, professional development, continuing education, and professional updating through postgraduate studies and research.

Acknowledgements

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