Advancing VET Institutions' Capacities for Building Electrical Engineering Skills and Sustainable Future "ADVENTURE" –

COMPARATIVE GENERAL REPORT-SUMMARY

ECUADOR

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adventure
Educational journey to sustainable innovation

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1. Executive Summary

The report of the project "Advancing Vocational Training Institutions' Capacities for Building Electrical Engineering Skills and Sustainable Future (ADVENTURE)" in Ecuador reveals a general disconnection between the technical-professional training and the needs of the labour market, particularly in the electrical sector. Even though there is an educational offer at intermediate and higher levels it is limited in number, geographical distribution, and content. Educational programmes do not adequately respond to the current demands of the country, which has not allowed for the development of the electricity sector, which is currently in an emergency as it is unable to meet the country's demand, nor does it respond to the growing need for sustainable and diversified energy. The results suggest that improvements in the training of this professional field should be oriented towards strengthening the link between educational institutions and industry, modernisation and inclusion of emerging technologies such as renewable energies, programming, data analysis and automation from a comprehensive approach to environmental sustainability and professional ethics. Also, greater emphasis should be placed on the development of soft skills in management, planning, and leadership to facilitate the integration of graduates into the labour market and foster their professional growth. However, it is also necessary to work on the appreciation of technical and professional education, and in particular training in electrical engineering, given that few graduates are interested in this professional field. It is also necessary to generate more inclusive training processes for women and people from vulnerable contexts who opt for technical careers.

2. Introduction

The growing global and local demand for energy brings challenges for the energy sector and the sustainable economic development of society. This requires a skilled workforce to lead the energy transition and to be able to meet the technical and environmental challenges of the countries. The ADVENTURE project, in this context, seeks to strengthen the capacities of vocational education and training institutions, particularly those that offer programmes focused on electrical engineering. To this end, as a first step, it aims to identify the areas for strengthening training in this field, for which purpose this report has been prepared. A mixed approach of qualitative and quantitative research was used to obtain a comprehensive understanding of the educational and labour supply and demand in the electrical engineering sector in Ecuador.

During this process, twenty-two structured surveys, seven interviews and two focus groups were conducted with students, teachers, and employers in the electrical sector, as well as with graduates of the 'Electrical Installations, Equipment and Machines' programme of the San Benildo La Salle Educational Unit. The aim was to gather their perceptions and experiences on the quality of training and employability in the sector, as well as to identify trends, gaps, and projections in the training of electrical engineering professionals.

The fieldwork was mainly conducted in August-September using online digital platforms. The surveys were answered online by teachers and students of the same institution, as well as by practising professionals and representatives of companies in the electrical sector. The focus groups, aimed at students and graduates, were conducted in person at the San Benildo La Salle Institution located in the Guayaquil Canton. The authorities and the teaching team of the institution conducted both the surveys and the focus groups. The interviews, on

the other hand, were conducted by the authors of this report, through online platforms, with academics from higher education institutions, experts from the electricity sector and state regulators.

This report presents a brief diagnosis of the regulatory and labour frameworks concerning technical and vocational training related to electrical engineering. The report also presents the current situation through descriptive analysis and the results of the information gathering, as well as the challenges presented in the process. Due to the character of the representative institution in Ecuador, which, unlike other countries involved in this project, is a middle-level institution that offers a technical bachelor's degree in an area related to electrical engineering, the results presented here are focused more from this perspective, especially the contributions made by students and graduates, However, this is considered a strength and an advantage in terms of identifying the needs and key aspects of the secondary level of education. Thus, it allows us to foster interest in electrical engineering from an early age and to strengthen the educational background from secondary to higher education in technical and vocational training which, as we will show below, is a crucial point to strengthen training in this field.

3. National Framework: Educational and Labour Market Context

Regulatory Frameworks

The technical and vocational education and training system in Ecuador conceives learning as a continuous lifelong process and aims to impart knowledge, skills and abilities for the labour world, productive innovation, and the promotion of entrepreneurship (MINEDUC et al., 2021). For this reason, it integrates various

levels and modalities of training, including formal, non-formal and informal education.

Within the formal scope, the system includes the technical bachelor's degree and productive technical bachelor's degree, which offer intermediate-level training, as a specialisation branch of the unified general bachelor's degree. Complementary training to the common core of the unified general bachelor's degree in technical, artistic or sports areas is offered, as well as the higher education system, which includes third-level technical and technological training in the higher technical and technological institutes, and the offer of engineering degrees in universities and polytechnic schools. At postgraduate level, it includes programmes linked to technical and technological areas (MINEDUC et al, 2021).

At the intermediate level, the professional figures and general statements of the curriculum are issued by the Ministry of Education, based on the curriculum design methodology according to labour competences and is structured in a modular way, in conformity with the Organic Law of Intercultural Education. In the higher education system, the Higher Education Council approve the academic offer. Thus, public and private universities and polytechnic schools, as well as private higher technical and technological institutes, within the framework of their autonomy, can design projects/programmes and submit them to the Council for approval. those projects or programmes must contain an analysis of territorial relevance that justifies the need for approval.

On the other hand, the public higher technical and technological institutes are under the control of the Secretariat of Higher Education, Science, Technology, and Innovation (SENESCYT). This body oversees planning the academic offer of these institutes.

The validity of the degree programmes is subject to evaluation and accreditation by the Council for Quality Assurance in Higher Education (CACES), During their validity they may undergo curricular adjustments if the graduate profile is modified. This allows institutions to update their programmes according to institutional and labour market needs.

Meanwhile, non-formal education includes the National System of Professional Qualifications, which is focused on short-term continuous training programmes to obtain professional certifications. This system has the National Catalogue of Professional Qualifications, which is the technical instrument containing the professional profiles identified for professional qualification. The system is based on the competences necessary for the exercise of a profession, art, or trade, and is a reference for the supply of training and vocational training, is designed based on the methodology of functional analysis and is organised by levels of qualification and standards of competence (COESC, 2016).

Finally, informal education within the TVET system relates to learning acquired through work experience, family life or life in general (MINEDUC et al, 2021).

Characteristics of Vocational Education and Training

The offer at the intermediate level, technical bachelor's degree, is outdated with respect to the current demands of the labour market since the last update of the thirty-five professional profiles in force was conducted in 2016. Moreover, the academic offer implemented is focused on areas such as accounting and computer science, because these do not require advanced technological equipment, which creates a gap between the offer and the country's productive sectors. Only 115 out of 1,671 institutions with a technical bachelor's degree offer the vocational programme installations, equipment, and electrical machines, which

is closely related to electrical engineering, concentrated in the main provinces of the country, such as Guayas and Pichincha, showing poor national coverage of the programme. This professional profile counts with 12,635 students, 5% of the total number of students in the technical bachelor's degree. However, only a low share of bachelor students, 2.1% of 160,000 surveyed in 2023, stated that they would like to work in the electricity supply sector.

Furthermore, it is worth noting that, from the survey of high school graduates, it was found that 21% of 37,045 students responded that they did internships in companies close to the school, which are characterised by being small or medium-sized, while the majority did internships in the school's laboratories, limiting the student's link with the labour market.

Similarly, the academic offer of higher education in general is concentrated in certain areas such as administration, social sciences, journalism and law and engineering, industry, and construction. However, there is still a gap with the labour market. Key areas such as engineering, although it has some representation, is still insufficient with respect to the importance of the manufacturing industry sector, which is among the top three activities that generate the greatest added value to the Ecuadorian economy. Likewise, the academic offer in information technologies is low, which could limit progress in digitalisation and automation in industry.

In relation to training in electrical engineering, 114 out of 7,919 programmes and careers specifically related to electricity and energy were found, mostly located in universities and polytechnic schools. In 2022, 6,219 out of 792 thousand students enrolled in third level and 337 students in fourth level programmes were studying a career in electrical engineering or electricity. Although it was showed that enrolment in the universities and polytechnic schools is higher than in higher

technical and technological institutes, 792 thousand versus 129 thousand. There is a marked preference for university education, as only 7.6% of 95 thousand unified general bachelor's degree students said they would like to study in higher technical and technological institutes and only 8.1% of students in the technical bachelor's degree would choose to continue their studies in a higher technical and technological institute. It was also observed that in electrical engineering more professionals may hold higher technical and technological institutes degrees than universities and polytechnic school degrees. During the period 2013-2023, there were 7,791 electrical engineering degrees in universities and polytechnic schools and 9,795 electrical technology/technical degrees[1] in higher technical and technological institutes. However, a low level of specialisation in this professional field, which is further supported by the number of fourth-level degrees registered in the period, which only amounts to 2,110 is also proved.

Furthermore, the weak academic pathway between secondary technical education and higher technical education should not be overlooked. This might lead to a decrease in the supply of specialised technicians in the field of electrical engineering.

Characteristics of the Sector, Supply, and Demand for Employment

The Ecuadorian labour market is characterised by a high rate of informality, with 50% of the employed population working in the informal sector, without social protection coverage and employment-related benefits. National unemployment reached 3.8%. However, the youth unemployment rate is over 8%, reflecting a low

[1] We talk about degrees and not people because a person could have more than one degree. Generally, when they first study a technology/subject and then obtain engineering, but it is a reference to know an approximate value of professionals in the field.

transition from education to the labour market. Furthermore, at least 26% of women and 11% of men aged 15-24 are neither studying nor working (ENEMDU, 2023).

When analysing the activities that generate the highest gross value added (GVA) and the activities that create most employment, there is a total disconnection between the education and employment sectors. Agriculture, for example, despite being the fifth largest contributor to GVA, is the activity that creates most employment, most of which is unskilled, while professional activities, despite being the second largest contributor to GVA, are the activity that generates the least employment.

In the energy sector, the main employer of electrical engineering professionals contributes to the national GVA of approximately two billion and forty-eight thousand out of eight million people employed in this sector, both formally and informally. In other words, despite being a strategic sector for the country, its contribution to the national economy is limited both in terms of income and employment. This may be due to the sector's high dependence on fossil fuels.

Of the formal employment records, it is shown that 0.6% belongs to 'generation, transmission, and distribution of electricity, i.e. 19,000 out of 3.2 million formal employees work in this sector, reflecting that almost 30,000 people work in this sector informally. The largest employer, in the formal economy, is the public sector, since 2013, coincidentally when investment in the mega hydroelectric projects began. The average salary in the sector is $1500, one of the highest, second only to those employed in international organisations. However, it is a highly male-dominated sector, as 79% of the employees are men, ranging from 35 to 64 years of age.

In terms of unemployment in the electricity sector, over the last ten years it has relied on renewable sources. As of 2023, 69.1% came from hydroelectricity and 25.6% from thermal sources and 1.7% from other sources such as biomass, biogas, wind, solar and imports (Ministry of Energy and Mines, 2023). The energy imports have increased particularly since 2023 by 183.9% compared to 2022, to meet the country's electricity demand, which has increased by 6.8% compared to 2022.

In addition, since 2023, Ecuador has been experiencing a series of electricity rationing due in part to the lack of rainfall which is crucial for the operation of hydroelectric plants. This is closely related to the negative effects of climate change. Similar events occur in other Latin American countries, highlighting the need to diversify the country's electricity sources and contribute to the decarbonisation of sectors such as transport and industry.

In this regard, the Electricity Master Plan 2023-2032, in response to the emergency context of the electricity sector, established as objectives to increase the use of clean energy, consider new technologies for supply and self-production based on distributed energy resources such as distributed generation, electromobility, the use of green hydrogen, the inventory of energy resources, geothermal energy, considering energy efficiency, demand-side management, strengthening the infrastructure of the distribution and marketing systems (Ministry of Energy and Mines, 2024, p. 8). For this purpose, the document establishes as strategies the strengthening of engineering teams and field technicians of the distribution companies and reinforcing the training of specialised technical groups (energised, sub-transmission, underground networks, others), which are capable of facing the risks associated with the sector, and it also proposes increasing female participation in the contracting processes of works by 5% and in service processes by at least 10%.

4. Results of the Information Gathering: Demands and Needs of the Electricity Sector

The overall results of the survey show that according to respondents, high quality technical education is perceived as the main priority for educational institutions. This underlines that there is a strong expectation towards the ability of the institutions to prepare students with a strong technical focus in electrical engineering.

However, most respondents, especially employed teachers and professionals, consider that the connection between the academic and the business sector is partial or non-existent. This is of concern as it indicates a possible need to strengthen the link to improve the effectiveness and relevance of academic training in the labour market. This is also confirmed in the interviews and focus groups, where both graduates and employers mentioned the importance of strengthening these ties, through internships, pre-professional placements, or technical visits. Even though, according to the regulations, both secondary and higher education programmes must have internship hours, these seem to be insufficient, especially at the secondary level, where internship opportunities are limited.

In the focus groups, there was a positive evaluation of the training received in basic areas such as electrical theory, but there was criticism of the focus of teaching in the residential area, leaving aside the industrial and commercial sphere, as well as the lack of access to modern equipment. Students from the San Benildo La Salle educational unit mentioned that they often must share equipment among several students, which does not facilitate learning. Also, practice in real environments is limited, which affects the students' ability to

adapt quickly to the work environment. This was also corroborated in the interviews, where professionals highlighted the lack of access to current technology and the disconnection between theory and practice as a barrier to graduate success.

Additionally, most of the survey participants pointed out that training should include more content related to renewable energy, industrial automation, and home automation, as these are growing fields that demand skilled professionals.

- Perspectives of the Different Stakeholders: Students, Graduates, Academics, and Employers

Students

Students expressed that, although they value the technical knowledge acquired, they feel the training is too much oriented towards residential electricity, with little exposure to the industrial and commercial field. They also pointed to the lack of specialised modern equipment such as network analysers, advanced energy meters and electrical protection devices, which are standard in industry, limiting their practical training. The lack of advanced equipment is compounded by the difficulty of working in groups during practical classes, as they must share the same equipment with several students at the same time, which does not allow them all to have a direct learning experience.

This not only affects their ability to work in more advanced environments, but also reduces their opportunities for integration in companies that require experience in the use of modern technologies.

They also highlight that additional training before entering the labour market should essentially include internships, since lack of previous work experience is

perceived as the main difficulty in entering the labour market, as well as career guidance workshops and preparation for job interviews. Considering the high rates of youth unemployment as well as the predisposition to work in areas of electricity supply, this becomes a crucial point for electrical engineering education.

Graduates

The graduates value the knowledge in motors and automation, as it has been useful both in the workplace and in their higher education, reflecting a strength of the educational unit San Benildo La Salle, but also of secondary education to promote this occupational field and improve performance in higher education. However, they also express concern about the residential focus of the training and point to areas for improvement. For example, many indicated that they did not receive training in emerging areas such as programming or the use of tools such as Python or Power BI. These graduates stated that they had to learn these skills on their own, indicating a disconnect between the academic curriculum and the demands of the labour market.

Along with the students, they highlighted as an important limitation in their training the lack of some equipment and the need for more practice in conditions closer to those of the real world. This is seen as an area in which other institutions could be better prepared, and which San Benildo should consider remaining competitive.

In addition, they pointed out that training should include more content related to renewable energy, industrial automation, home automation and PLC (Programmable Logic Controller) control, electrical engineering, and maintenance of electric motors, robotics, mechatronics, as these are expanding fields that

demand trained professionals. They also emphasise the development of skills for the interpretation of electrical plans, maintenance of electrical systems and safety regulations.

On the other hand, they ask for reinforcement of knowledge in integral calculation, which would make it easier for students to enter a higher education institution.

There is increasing concern about the transition to sustainable renewable energies. Graduates recognise that solar and other clean energy sources are not only areas of growing demand at present but are expected to increase significantly in relevance in the coming years due to pressure for greater sustainability and reduced environmental impact. Thermodynamics and thermal systems management are also mentioned as potentially key areas, suggesting an expansion of the curriculum to include more on renewable energy and emerging technologies. The ability to work with renewables, interpret safety regulations and apply sustainability concepts are seen as key skills for the future of the electricity sector. Furthermore, they point out that automation will be fundamental both for the transition to a more sustainable electricity system and for the expansion of smart systems in homes and industries.

In addition, international exchange and collaboration programmes are mentioned as a priority for students and graduates, who value this experience positively for professional development as it offers a global perspective and can enrich the students' educational experience.

Academics

From the perspective of academics, the main challenge lies in the lack of a smooth connection with the employer sector. Although there are attempts to establish

partnerships, these are not consistent nor systematic. Academics suggest that strengthening links with the employer sector should focus on creating more internships and technical visits to enhance students' practical experience.

Interviewees confirmed this, highlighting the urgent need to improve communication between educational institutions and companies to facilitate the employability of graduates. They also pointed out that current salaries do not reflect the investment of time, effort, and resources that electrical engineers make during their training, which generates dissatisfaction among graduates and could discourage new talent from entering the sector.

It is important to note that only the female participants highlighted the importance of the inclusion of women in the sector to make use of the available talent and contribute to innovation in this field. No other interviewee emphasised this, as it seems that the low inclusion of women in the sector is very normalised.

Employers

Employers, on the other hand, identified in the surveys a clear gap between the technical skills acquired and the needs of the labour market. They pointed out that, although graduates have a good theoretical background, they lack essential practical skills, such as the use of workshop tools and the ability to self-learn. Furthermore, they stressed that graduates often have difficulties in integrating effectively into the work environment due to a lack of soft skills, such as communication and teamwork.

The interviews confirmed this point, raising the need to train engineers who, in addition to possessing solid technical skills, also have management and administrative skills to better adapt to the demands of the labour market, especially when they take on administrative or leadership positions. A

representative of a hydroelectric project in the country pointed out that, although he does not observe differences between the technical knowledge of the country's professionals and international professionals, the differences are in attitude issues, as he stressed that international professionals from Europe tend to be more proactive and oriented towards decision-making and rapid problem-solving. This has an influence when it comes to occupying leadership positions and managing large-scale projects, which in Ecuador are usually managed by international companies.

5. Gaps between Skills Taught and Labour Market Needs

The overall analysis shows that the gaps between the skills taught, and the requirements of the labour market are wide and diverse.

a) Outdated technical skills: students, graduates and employers all agree that academic programmes are not aligned with emerging technologies. Graduates lack training in critical areas such as industrial automation and renewable energy. In addition, they are not sufficiently competent in programming, e.g. Python or Power BI, or in the use of digital tools, which puts them at a disadvantage when faced with the new technological demands of the sector.

b) Lack of practical skills: one of the biggest problems identified is the lack of practice in actual circumstances. Students and graduates pointed out that many of the internships are conducted in the institution's laboratories, with obsolete equipment that does not reflect the conditions of the real working environment, which is in line with the data described in the

diagnosis. This situation generates an important disconnection between what they learn and what they face when entering the labour market.

c) Underdeveloped soft skills: employers also mentioned that graduates are not prepared in terms of soft skills such as teamwork, project management, interpersonal communication and problem solving. These skills are essential for adaptation and success in any work environment, and their absence can significantly limit graduates' opportunities for both accessing jobs and rising to senior leadership positions.

d) Disconnection between educational institutions and the employer sector: although there have been occasional efforts identified to link institutions with business, most surveys and interviewees perceive that these initiatives are not sufficient. There is a partial connection that needs to be strengthened through stronger partnerships, internship programmes and strategic agreements between universities and companies.

Challenges in Data Collection

The data collection process presented significant challenges regarding the distribution and representation of participants in the different data collection tools. The interviews involved only twenty-two participants, a small number that limits robust comparisons between different actors and the identification of clear trends. However, the interviews provided a rich variety of opinions thanks to the diversity of practitioners and sector representatives involved. Despite this, decision-makers in the public policy domain of the electricity sector, employers from sectors other than water projects, and graduates of higher education institutions were not involved. The lack of access to these key actors limited the representativeness of the sample.

Another important challenge that has been identified is the possibility of bias in the focus groups, as they were led by institution authorities, which could influence the participants' responses, limiting the frankness of their opinions on everything related to the quality of education received. In addition, there was less participation of women in the study, which affected the diversity of perspectives. Finally, the interviews did not include companies in the industrial and residential sectors, which may have limited the analysis of labour demands in these areas.

6. Overall Conclusions

The findings of this report reflect that vocational training related to electrical engineering, both at the secondary and higher education levels, is limited in terms of number of programmes offered, geographical distribution and content. In secondary education, mainly, technical bachelor's degrees operate with outdated curricula, which means that they are obsolete with respect to the current demands of the sector, and the same happens in higher education, since the comparative analysis between the activities that generate the greatest added value to the economy and the activities that generate the most employment does not show a direct relationship. A major part of employment, which is generally unskilled, is created in activities such as agriculture, although its relevance in terms of contribution to GVA is not as significant as that of commerce, professional and scientific activities, manufacturing and mining and quarrying.

Likewise, a low level of specialisation is evident in electrical engineering, as most of the degrees registered are at the technical-technological level. That shows a positive preference for this type of training, but also the low levels of specialisation of this professional sector compared to the level of an engineering degree. In addition, the registration of fourth level degrees is extremely low in this field or in the field of renewable energies. This is translated or reflected in the low contribution of the electricity and energy sector to the national GVA and the low share of employment it generates, compared to other sectors, evidencing the low productivity of the sector.

The electricity sector in Ecuador finds itself in an emergency, as it is no longer able to meet the country's demand. It depends on water sources, which in a context of climate crisis is negatively affected by the lack of rainfall. In this regard, the sector needs to innovate and diversify its energy sources, not only to

boost the sector, but also to contribute to the transformation of other industries such as transport, which is highly dependent on fossil fuels, and industry. To this end, in addition to increasing investment in the sector in terms of infrastructure, technical and professional education in these areas should be strengthened in terms of technological updating, links with the productive sector and the labour market so that the contents are in line with the skills required by the sector and aligned with national objectives.

However, as shown in the diagnosis, the perception of the quality of technical training is low, including training in electrical engineering, because despite having the highest salaries, very few graduates want to work directly in the sector, which suggests that there is little knowledge about the work environment of this profession and that the professional vocation in this career should be strengthened.

All of the above suggests that the lack of alignment between academic training and the needs of the productive sector, in this case the energy industry, together with factors such as social stigmas, limits the availability of trained professionals and limits the development of the industry, affecting the adoption of sustainable energy technologies and reducing its competitiveness.

The information collection confirms this and highlights the urgent need to adjust curricula and strengthen training in electrical engineering towards more sustainable energy models adapted to current realities, and the following findings stand out:

- lack of experience, internship opportunities and professional networks are identified as the main barriers to entering the labour market, evidencing a gap between the labour market and the education sector. Therefore, it is essential to strengthen partnerships with companies, especially large ones,

to offer more internships in real environments, instead of being limited to in-house laboratories;

- the most demanded skills include internships in companies, the use of modern tools, and the acquisition of soft skills (teamwork, communication, leadership). The need for more training in automation, renewable energy, emerging technologies, programming, and data analysis is highlighted;
- students and graduates value the knowledge acquired but criticise the lack of modern equipment and exposure to key technologies, such as automation and renewable energy. Although well prepared in basic areas, graduates feel that their training is not fully aligned with the needs of the industrial and commercial sector;
- graduates request to include programming (Python, Power BI) and advanced motor theory, as well as a focus on robotics, mechatronics, and home automation, which are areas of increasing relevance;
- there are deficiencies in the infrastructure of educational institutions and a lack of investment in laboratories. In addition, there is a need to strengthen ethics and regulatory training, as well as a focus on long-term energy planning, in line with the future demands of the sector;
- the need to promote the inclusion of women in the field of electrical engineering and to train proactive leaders to face the challenges of the electricity sector, both nationally and globally, was highlighted.

7. Recommendations

The following recommendations are drawn from the findings presented in this report.

- Updating curricula. The suggestion is to promote the curricula updating, especially those of the technical bachelor's degree, regarding the deepening of knowledge in emerging technologies such as renewable energies and a comprehensive approach to environmental sustainability. This will not only allow professionals to conduct installations of these technologies, but also to develop and adapt them to the Ecuadorian context. It also includes aspects such as electrical engineering, industrial automation, maintenance of electric motors, home automation, programmable control systems (PLC), management of digital tools and programming language in Python or Power BI, as requested by the participants of the information survey. In addition, in the technical bachelor's degree it is suggested to reinforce the theory of integral calculus, which would facilitate the process of entering and remaining in an institution of higher education.

  In addition, to contribute to the objectives of the country and the region, it is recommended to incorporate topics related to electromobility to contribute to transforming the transport sector.

- Promotion of soft skills. The development of soft skills such as leadership, communication, teamwork, project management, as well as administrative and financial aspects, management and strategic planning, and national and international regulations should be included in educational

programmes. As well as strengthening courses on professional ethics to foster a culture of integrity and responsibility in this professional field.

- Academy-industry connection. Strengthen the practical component of academic training at the middle and higher levels, through dual training or the integration of internships from the first semesters, which would allow students to be exposed to real problems and develop practical skills from an early stage. This strategy would improve their preparation to face industrial challenges without relying solely on the controlled environments offered by laboratories.

  Establishing strong links with industry and leading companies in each region of the country through job fairs, internship agreements and technical visits will allow students to apply their knowledge in real contexts and increase their employability. In addition, creating a database that connects graduates with job opportunities would facilitate the insertion of graduates into the labour market and provide a smoother transition from academia to the professional world.

- Investment in infrastructure. Educational institutions should invest in upgrading laboratories and resources, ensuring that students have access to current equipment and technologies in a more personalised way, allowing them to be better prepared for the challenges of the sector.

- Implement continuous training programmes. To ensure that professionals keep up with technological advances and market demands, educational institutions could articulate with training operators qualified by the National System of Professional Qualifications to update skills profiles related to electrical engineering, as well as implement joint training processes.

- Create inclusive training spaces. Implement specific strategies to attract and retain more women in the field of electrical engineering. Existing barriers for women in the field must be addressed to harness the full potential of the available talent and create inclusive training spaces that also contribute to innovation and development in the sector.

  Likewise, the characteristics of the population that is part of technical and vocational training must be considered to adapt curricula and teaching-learning methodologies to their needs and to promote quality and inclusive education. Any training programme must consider the needs of its target audience, not only from the academic, but from the socio-economic aspect to achieve its purpose.

- Strengthen the pathway between secondary and higher technical education. Strengthen communication about the advantages of moving from secondary technical specialisation to higher technical studies, both in higher technical and technological institutes and universities and polytechnic schools, in terms of knowledge advantages over peers, job opportunities and time to graduation. It is also necessary to improve communication about the benefits of opting for a career in electrical engineering, as well as its field of occupation, to encourage high school graduates to opt for this career.

  In addition, it is necessary to strengthen the specialisation of professionals in the sector and promote fourth-level training in this field.

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