Seminars in Medical Writing and Education. 2025; 4:744
doi: 10.56294/mw2025744

ORIGINAL

University Chair of Innovative Entrepreneurship and Technology Transfer with Emphasis on Patentable Projects

Cátedra Universitaria de Emprendimiento Innovador y Transferencia Tecnológica con Énfasis en Proyectos Patentables

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Cite as: Bravo Silva JL, Navarro del Toro GJ, Cortés Palacios EM. University Chair of Innovative Entrepreneurship and Technology Transfer with Emphasis on Patentable Projects. Seminars in Medical Writing and Education. 2025; 4:744. https://doi.org/10.56294/mw2025744

Submitted: 16-06-2024 **Revised:** 19-11-2024 **Accepted:** 10-06-2025 **Published:** 11-06-2025

Editor: PhD. Prof. Estela Morales Peralta

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ABSTRACT

The SARS-CoV-2 pandemic was a critical period that caused a significant disruption to almost all human activities. In the area of higher education, uncertainty about the return to face-to-face classes led to the suspension of many essential university activities. Among the most affected were those related to innovative projects to start entrepreneurship, which essentially came to a complete halt. Given this situation, and with the return to face-to-face activities, the Center for Research and Innovation for Organizations at the Centro Universitario de los Altos launched a comprehensive strategy aimed at reactivating and strengthening the entrepreneurial culture on and off campus. This article discusses the implementation of a methodology framed within a dialectical approach based on applied research, with components of participatory action research, strengthened by programs aimed at promoting, encouraging, and advising both internal and external entrepreneurial initiatives. Likewise, the participation of student teams in business innovation competitions was promoted, in addition to various actions aimed at professionalizing the processes of creation and management of productive projects. These actions include obtaining ISO 9001:2015 certification in management of entrepreneurial initiatives, with the aim of raising the quality of the projects developed, especially those with the potential to become patentable innovations. These initiatives seek to actively contribute to the regional development of Los Altos de Jalisco and the strategic positioning of CUAltos as a benchmark in innovation and university education.

Keywords: Consulting; Sustained Growth; Entrepreneurship; Business Innovation IES; Patent.

RESUMEN

La pandemia provocada por el SARS-CoV-2 constituyó un periodo crítico que generó una interrupción significativa de casi todas las actividades humanas. En el ámbito de la educación superior, la incertidumbre respecto al retorno a clases presenciales presenció la suspensión de múltiples actividades universitarias esenciales. Entre las más afectadas estuvieron aquellas vinculadas con los proyectos innovadores para iniciar a emprender, las cuales en esencia se detuvieron por completo. Ante este panorama, y con el regreso a las actividades presenciales, el Centro de Investigación e Innovación para las Organizaciones del Centro Universitario de los Altos puso en marcha una estrategia integral orientada a reactivar y fortalecer la cultura empresarial dentro y fuera del campus. Este artículo habla de la implementación de una metodología enmarcada en un enfoque dialéctico ustentado en la investigación aplicada, con componentes de una vivida investigación-acción participativa,

sfortalecida por programas orientados a fomentar, impulsar y asesorar iniciativas emprendedoras tanto internas como externas. Asimismo, se promovió la participación de equipos estudiantiles en concursos sobre innovación empresarial, además de diversas acciones encaminadas a profesionalizar los procesos de creación y gestión de proyectos productivos. Entre estas acciones se destaca la obtención de la certificación ISO 9001:2015 en gestión sobre las iniciativas de emprendimiento, con el propósito de elevar la calidad de los proyectos desarrollados, sobre todo en aquellos con potencial de convertirse en innovaciones patentables. Con estas iniciativas, se busca contribuir de manera activa al desarrollo regional de Los Altos de Jalisco y al posicionamiento estratégico del CUAltos como un referente en innovación y universitario.

Palabras clave*:* Asesoría; Crecimiento Sostenido; Emprendimiento; Innovación Empresarial IES; Patente.

INTRODUCTION

Entrepreneurship that culminates in the obtaining of patents is a strategic indicator that immediately influences the perception of international companies when considering investing in a particular country. According to Boldrin et al.[1], this capacity is closely related to the level of research carried out in the education system, from higher education to postgraduate studies.

In the case of Mexico, the research system is objectively concentrated in higher education institutions (HEIs), both public and private, Soria[2]. Each federal entity has at least one public HEI, including universities, technological institutes (federal, state, and private), and research centers. Cities such as Mexico City, Guadalajara, Monterrey, León, and Puebla, among others, have a high density of universities and institutes that meet the growing demand for higher education, including postgraduate programs and, in some cases, research with a focus on innovation in the business sphere.

The participation of HEIs in the generation of knowledge, innovation, and technological development is a fundamental basis for the country's growth. These institutions are geared toward promoting new inventions that, once patented and commercialized, benefit both the scientific community and society in general. Each time a patented invention is registered, an advance in science is consolidated and the training acquired by student-researchers is validated. As Bueno and Casani[3] point out, many technology companies are interested in adopting these new inventions, while others integrate their own technologies into new developments. This generates more efficient, economical, and waste-free solutions, leading to emerging needs in the productive sphere.

Research aimed at business innovation is, therefore, a primary source of patentable technological products. These developments not only bring prestige and recognition to HEIs, but also attract external investment interested in collaborating with institutions that are leaders in innovation. In this sense, it is crucial that students play a leading role in both the learning process and entrepreneurship. This will enable them, once they graduate, to be prepared to join a company and optimize its processes through the use of new technologies. According to Loi and Di Guardo[4], training should be based on the intensive use of classrooms and laboratories equipped with state-of-the-art technologies, thus ensuring that future professionals possess relevant and up-to-date skills.

However, one of the great challenges lies in the fact that current workers, if they do not receive continuous training from their companies or do not keep themselves informed, may lag behind recent graduates who arrive with up-to-date knowledge. These new professionals are in a position to propose technological migration and modernization processes, having been exposed to these tools during their academic training.

This situation already highlights an educational paradox: if HEIs do not repeatedly update their academic programs, research centers, and teaching methods, their graduates will not be able to compete in the labor market. Likewise, these institutions run the risk of falling behind if they do not incorporate cutting-edge technologies into their curricula, limiting their ability to train innovative leaders.

One factor that accentuated these gaps was the SARS-CoV-2 (COVID-19) pandemic, which forced a radical transformation of educational models. Researchers, administrators, and teachers adapted to a distance learning model based on approaches such as those proposed by Vélez[5] and Zubieta[6]. This change made it possible to continue with comprehensive student training, adding new entrepreneurship projects as a unifying axis of knowledge in institutions such as the University Center of Los Altos, belonging to the University of Guadalajara (UdeG).[7]

To implement this educational model, CUAltos has the Center for Research and Innovation for Organizations (CIIO), whose purpose is to promote a culture of entrepreneurship with a business vision among students. In addition, it aims to play a key role in the development of the Altos region, through efforts to connect the academic community and the productive sector. Together with researchers, teachers, and graduates, it encourages close collaboration with local entrepreneurs, strengthening educational quality and generating

mutual benefits. In this way, both graduates and companies can grow harmoniously, activating greater value within the CIIO through systematic feedback based on the analysis of the results obtained through its advisory and support programs.

This continuous evaluation, aimed at companies, teachers, students, and researchers, allows for the adjustment and enrichment of strategies, favoring the adoption of new technologies and innovative processes that expand the institutional scope and reinforce its impact on the economic, educational, and technological development of the region. This is essential when considering that many young people never imagined that they could become independent entrepreneurs capable of inventing or perfecting devices, processes, or methodologies, endowing them with originality and practical utility, as pointed out by Vidal and Fernández.[8]

This principle is instantly related to the need to focus institutional efforts on promoting teachers, students, and researchers within higher education institutions (HEIs). It is necessary to recognize that, at present, many HEIs in Mexico lack the infrastructure and budget to significantly increase the volume of research that leads to patent applications. As Navarro del Toro[9] has pointed out, the culture of innovation in Mexico must be strengthened in university classrooms through a cross-cutting strategy that integrates intellectual property, entrepreneurship, and applied research. Otherwise, efforts will be limited to isolated attempts that fail to consolidate into projects with an economy that is neither viable nor sustainable.

In this context, intellectual property (IP) must be understood as a strategic tool for both businesses and educational institutions. Patents, trademarks, and other intangible assets should be seen as real indicators of competitiveness and productivity. As HEIs protect their inventions and knowledge, they establish themselves as pioneers in innovation, technology transfer, and entrepreneurship. To this end, it is essential to foster a culture of IP in the classroom, revisiting traditional paradigms in the generation of science and technology applied to the business sector.[10]

However, there is still a profound lack of knowledge within HEIs regarding the conceptualization of IP, its strategic value, and its potential to generate income and consolidate innovation ecosystems, Navarro del Toro[11]. With the aim of reversing this situation and strengthening national patent production, on July 1, 2020, the new Federal Law on Industrial Property Protection (LFPPI) was enacted in the Official Gazette of the Federation (DOF)[12,13] and entered into force on November 5 of the same year. This legislation repealed the 1991 Law and aligns with the obligations of the United States-Mexico-Canada Agreement (USMCA). Among the most notable aspects are the extension of the term of protection for utility models (from 10 to 15 years), the inclusion of handicraft products in industrial designs, the elimination of the mandatory registration of export licenses, and the new calculation of the term of trademarks, which is now counted from the date of grant (IMPI)[14].

While these reforms represent significant progress, their effective implementation requires structural changes in the educational model. A system that focuses exclusively on the teacher, without considering the individual potential of the student, limits the student's ability to think, propose, undertake, and innovate. This restricts the emergence of ideas that transcend the curriculum and leads to lost opportunities for more visionary business training. This lag is a consequence of the historical transition through various educational models. The behaviorist model, one of the most influential, based teaching on the observation of behavior and the control of stimuli, as proposed by Pavlov in 1890 with his theory of classical conditioning and Skinner in 1976 with his approach to behavioral reinforcement and conditioning. Subsequently, the cognitive model focused on understanding learning, that is, on teaching how to learn.[15]

The competency-based model, currently in use in Mexico, promised to empower students in science and technology. However, over time, many students have drifted toward a conformist attitude, focused on passing courses rather than building meaningful knowledge and empowering students by promoting meaningful learning and practical skills. Nevertheless, many students display a conformist attitude, focusing only on passing subjects without actively engaging in the construction of their knowledge. This phenomenon can be attributed to educational legislation, which limits creativity by creating strict regulations on intellectual property, as well as the characteristics of the current generation's excessive use of social media. Access to digital technologies, including artificial intelligence, may lead to quick problem solving, discouraging deep learning.

Added to this sequence are approaches such as the environmentalist model, which promotes a conscious relationship with the environment (Martínez and Mendizábal)[16], and the constructivist model, described by Uriarte[17] as one of the most suitable for modern education as it focuses on the active construction of knowledge through the confrontation of ideas.

Navarro del Toro[18] warns that as long as the educational model remains student-centered, homogeneous teaching that does not recognize individual differences will continue to prevail, thereby limiting the development of skills for innovation and critical thinking. In addition, the current model tends to minimize student participation, reducing their capacity for agency in the educational process.

The key is to recognize that each student is unique and therefore requires differentiated educational experiences. If the model were largely student-centered, it would equip students with the tools to contribute to the economic and social development of their region. However, by standardizing learning, the competency-

based model limits student initiative. Teacher planning predetermines content, which removes the possibility for students to explore their own interests. This leads to demotivation and can result in school dropout.

Given this scenario, HEIs must ensure that their graduates have practical tools, up-to-date knowledge, and entrepreneurial skills. As Degl'Innocenti etal.[19] state, these institutions must train professionals who are able to successfully enter any company or develop their own emerging business initiatives based on the strategic use of information and communication technologies (ICT).

Within the University Center of Los Altos (CUAltos), these concerns are addressed comprehensively in the work of the Center for Research and Innovation for Organizations (CIIO), which is positioned as a key agent for regional development, welcoming the emergence of new competitive companies with the acquisition of robust and sustainable technologies. This synergy between education, innovation, and entrepreneurship allows the knowledge generated in the classroom to be translated into concrete benefits for the economic and social environment of Los Altos de Jalisco.[20]

METHOD

This research highlights that establishing relationships with emerging companies is an essential component of the current educational model, as proposed by Díaz[21], considering that this integration must be continuous and strengthened through specific strategies. To this end, activities are developed in which students, teachers, and researchers participate, while advice and support are provided to companies in the Los Altos de Jalisco region. This approach responds to the commitment of the Center for Innovation and Research for Organizations (CIIO), whose outreach actions seek to generate tangible impacts on the environment.

From this perspective, this theoretical-methodological foundation is adopted, which coincides with the mission and vision, aligned with what was proposed by Diaz[22]. In this logic, the participation of students and researchers is key to implementing applied research programs that contribute to understanding regional social and economic phenomena and, based on this, generating concrete solutions through technological, organizational, and social activities. As Navarro del Toro[11,12] has stated, entrepreneurship must be seen as a transformative factor in regional development. In this sense, the programs promoted by the CIIO should not be limited to a descriptive approach to the business environment, but rather should be oriented toward identifying, imagining, designing, and executing innovative actions that allow university actors and local entrepreneurs to move from a passive role to a proactive one in the transformation of their productive environment.

To this end, research was carried out using a descriptive-mixed implementation, based initially on a dialectical approach to analyze the interaction between university actors and emerging companies in the Altos de Jalisco region. Probability sampling was used, comprising 50 emerging companies, 150 students, and 50 teachers and researchers. The variables were analyzed for each month of activities, based on performance as recorded in the agendas for the semesters established by the university. Data collection included the use of questionnaires and documentary review of thematic content for descriptive statistical data for quantitative variables, based primarily on the length of the calendar.

Under this approach, the CIIO seeks to continuously renew its strategic vision and theory with practice through entrepreneurial projects that promote the incorporation of emerging technologies, process innovation, the redesign of working methods, and the improvement and application of devices that drive the sustainable development of human capital and regional industry.

Objective

To promote entrepreneurship to generate devices and methods associated with patents through the advisory services offered by the CIIO to students, institutions, and companies in the Los Altos region.

Development

The competency model was implemented in the country to promote the improvement of educational quality, as was done in other countries. Unfortunately, as might be expected, the results are different. This implies that each country has its own problems, but one of them is extremely notorious in Mexico, as can be seen in INEE[23], since it is related to the equipment of classrooms for teaching and laboratories for practical work. Another factor that has a significant impact on results is the number of hours that students attend school, which varies greatly from one level to another. One could continue to mention the factors that have been decisive in preventing the results of the implementation of *the competency-based* education model from reaching their full potential and, therefore, the results obtained are not similar to those of other countries where it has been implemented.

This problem is not unique to Mexico. Several Latin American countries, such as Colombia, Ecuador, Argentina, and Chile, face similar limitations in terms of infrastructure and effective time devoted to practical training, which has an impact on the quality of higher education and the ability of students to develop entrepreneurial and technological innovation projects. Studies highlight that economic limitations, unequal access to resources,

lack of infrastructure, cultural norms, discrimination, and exclusion are factors that can prevent young people from accessing upper secondary and higher education, according to Hilda Patiño Domínguez of IBERO.[24]

In contrast, in the United States, higher education tends to have a greater focus on entrepreneurship and innovation from the early stages of university education. Many universities integrate specific programs and courses dedicated to entrepreneurship, intellectual property, and technology transfer, supported by adequate infrastructure and access to resources such as business incubators and specialized laboratories (Kuratko). Likewise, the effective time devoted to practice and extracurricular training is generally longer, favoring the application of knowledge and the development of practical skills.

In an effort to address this problem, the CIIO analyzed what students must face during their academic preparation at the bachelor's degree level and found that no bachelor's degree program at public or private HEIs includes courses related to promoting research for the development of patentable inventions.

For this reason, one of the main tasks of CUAltos, as part of the CIIO's operations, has been to strengthen, in the first instance, the detection of ways in which the knowledge acquired by its students, teachers, and researchers can be reinforced and directed towards the implementation of programs that enable entrepreneurship and, ultimately, the obtaining of patents.

For this reason, one of the programs that has been emphasized most at the CIIO is the one that has been implemented and focused on promoting and increasing innovation projects among students, teachers, and researchers, since they are the ones responsible for strengthening the industry in the Los Altos region. based on the development or improvement of novel and innovative methods, techniques, and devices that can be applied in companies without losing sight of the objective of obtaining IMPI (Mexican Institute of Industrial Property) approval so that they can be patented and used only by those who earn the right to do so.

Another program implemented by the CIIO, in addition to focusing on project incubation and the creation of business plans among its students, is the implementation of the method *for the new era*, which has been explained by Vélez[5] as a creation of Steve Jobs. It proposes autonomous learning, a model that needed to be used during the SARS-CoV-2 pandemic, since during that time, CUAltos students were forced to set their own goals, guided by their teachers and supported by the CIIO staff and programs.-CoV-2 pandemic, as during that time, CUAltos students were forced to set their own goals, guided by their teachers and supported by CIIO staff and programs.

This made it clear that technology should be integrated into the academic curriculum, providing access to multimedia, interactive, and entertaining content that would enrich the individual learning process and enable communication between peers and teachers. influencing the program of activities designed for 2022A, which consisted of activities aimed at interesting and capturing the attention of the region's general public, starting with students, researchers, and teachers from CUAltos itself, and extending to direct contact with businesspeople in the region. The activities included as part of this program consisted of:

- Organizing and participating in conferences (workshops), lectures, entrepreneurship competitions, diploma courses, and working meetings with educational and government institutions to expand the services provided by the CIIO.
- Organizing and participating in meetings between executives and students, researchers, corporate entities, and municipal and state authorities.
- Advising on internal and external business projects.
- Providing legal advice for business incorporation, trademark registration, and patent registration with the IMPI.
- Promote the activities carried out by the CIIO to new students, students from other educational levels, entrepreneurs, and institutions that may be interested in them at some point.

RESULTS

February

A visit was made by industrialists to inform them about the activities carried out by the CIIO, and a workshop (conference) was held to guide and provide tools to participants so that they could propose and implement innovative solutions that transform reality and generate social, environmental, and economic value through innovation projects within companies that may become feasible and viable. Legal advice was provided to fill out employment contracts for a marketing consulting plan for one of the marketing projects that was undertaken. Ninety high school students and a group of 35 first-year business administration students were visited to inform them about the activities carried out at CIIO. Fifteen students were advised on how to generate entrepreneurial projects.

March

The month began with an analysis of the activities involved in verifying the functioning of a project that was carried out during 2022. Advice was provided on two incubation projects.

Municipal staff in the CUAltos area of influence were given information about the activities carried out at CIIO and identified projects that could be carried out jointly with them or for them.

Sixteen businesspeople were assisted in establishing the conditions under which cooperation between them and CU Altos will take place. Seven advisory sessions were provided during the month of March to students from the teams that will participate in the ANFECA competition at the regional level, and subsequently to those who reach the national level.

Fourteen advisory sessions were provided to four internal projects and one external project. Advice was given to start a new project. Two advisory sessions were given to two project incubator teams to start their activities. A conference on entrepreneurship was held to motivate students in general to start their own businesses. Two groups (64) of high school students were attended to explain the activities carried out by the CIIO. A meeting was held with the other members of the University Center Network of the University of Guadalajara to establish a comparison of results in terms of entrepreneur development.

April–May

These months are grouped together because April only had two weeks of activities due to the spring break, and the following activities were carried out in May:

Structuring the organization to host the ANFECA regional competition, which required planning the activities to be carried out to ensure a positive experience for the local community (staff, participating students, and in general, administrative, teaching, and research personnel, including businesspeople from the Los Altos region) and visitors who would take part in the contest as competitors, advisors, and people interested in learning about the projects. Three events were held to publicize the ANFECA competition, which were attended by all CUAltos staff and students, as well as people (businesspeople and the general public) who might be interested in getting involved in the business world, which is the focus of the competition. A total of 10 advisory sessions related to the ANFECA competition were also held, with CUAltos and the technical committee advising the participating teams and organizing the competition itself. Two advisory sessions were also provided to students participating in the competition organized by CUCEA, as well as in the municipal entrepreneurship competition. Similarly, three advisory sessions were given on trademark and patent registration, as well as advisory sessions to two different companies in the region to improve their processes, which included training.

Events involving CUAltos students were also used to publicize the activities carried out by the CIIO and encourage more people to request its services. Three meetings were organized for innovative CUAltos students, one with the center's management and two networking meetings, one with INADEJ and the other with business leaders from the region. A meeting between CUAltos, CIIO, COPARMEX, and municipal authorities was also organized and attended.

June–July

The activities carried out by the CIIO in June and July of this year are presented together, as the school semester ends at the end of June and begins in July, which is why most of them took place in June.

An advisory session was held with students who will participate in the ANFECA competition at the national level. Four advisory and evaluation sessions were held for four different entrepreneurship projects. Five evaluation and follow-up sessions were held on the ISO 9001:2015 standard. Two sessions were held for the second generation of participants in the DIDENCE (Business Development and Entrepreneurship Culture) diploma course, as the second session marked the formal start of the program. An informational and working session was held on new social service providers and professional internships for CUAltos students. The procedures were carried out for training to become certified as Agents for the delivery of on-the-job courses aligned with the Ministry of Labor and Social Welfare. Finally, the call for proposals and mechanisms for general participation by the University Center to obtain support for projects were organized and presented, concluding the semester with the presentation of the 2022-B calendar of activities for the CIIO.

August–September.

The last period included is August and part of September, mainly because the data analysis began in the first week of September, leaving the rest of the month and subsequent months out of the analysis.

Three sessions were held throughout August to evaluate and deliver the documentation required for the ISO 9001:2015 accreditation process. Four advisory and follow-up sessions will also be provided for three of the projects that have been advised. Similarly, a colloquium was held with students, teachers, and researchers from the Law program to provide them with advice on the activities, laws, and regulations corresponding to trademark registration processes.

A summer course for children was planned and implemented to encourage the participation of children in the region so that they can join the activities carried out at CUAltos. A calendar of activities related to all phases of entrepreneurship was prepared and presented, to be carried out during the current university school

year. The DIDENCE diploma course continued.

A session was held with the advisors of the projects that will participate in the ANFECA national competition. Similarly, a meeting was held with COPARMEX Guadalajara to offer the services provided by the CIIO. A meeting was organized and attended with the College of Accountants of the Los Altos Region for export and international accounting processes. An advisory session was held to promote entrepreneurship in the region. A meeting was organized and attended to facilitate the establishment of a manufacturing process by the CIIO for companies in the Los Altos region.

Distribution of Results

During February, the activities carried out with the direct participation of CIIO researchers, as well as teachers, entrepreneurs, and students in general, are presented in figure 1.

Figure 1. CIIO activities to promote entrepreneurship in February 2022

Of the activities carried out, *50 %* (125 people) agreed that they were aimed at providing advice, *37 % (93* people) thought they were aimed at promoting and publicizing the activities carried out at the CIIO, and *13 %* (33 people) thought they were aimed at organizing a conference focused on promoting innovative plans. During *March,* several activities were held to showcase the competitiveness of the CIIO, as well as the results of the activities carried out during the month, which can be seen in figure 2.

Figure 2. Activities carried out by the CIIO to promote entrepreneurship and the registration of patents for inventions and trademarks in March 2022

Of all the activities that were planned and carried out, *54 %* involved 135 actors who provided advice to various projects currently under development, as these require a large number of hours in each of the sessions specifically set aside for this purpose. *Twenty-seven percent* of the activities carried out during this period involved 67 people in advisory sessions for students participating in various competitions organized for teams to develop projects derived from the application of various disciplines. However, only *19 %* of these, 48 people, confirm that it was aimed at publicizing the activities carried out at the CIIO and how it works, as this increases the number of potential candidates to become part of the CUAltos student body in the future.

In April, there was only the opportunity to work for two weeks, while May allowed for activities throughout the month. The results obtained are shown in figure 3.

Figure 3. Activities carried out by the CIIO to promote entrepreneurship and the registration of patents for inventions and trademarks in April–May 2022

Of the total activities, *59 %* were aimed at providing advice on the various subjects covered by the ANFECA competition so that the CUAltos student teams participating in them would have a better chance of reaching the national phase. *Seventeen percent* was related to 43 members in the dissemination of CIIO activities among students at the level and any entity that could be a future client. Meanwhile, 12 % of the outreach activities carried out during the period were aimed at providing advice to companies or entrepreneurs in the region, as confirmed by 30 individuals.

The results for the *June–July* period are shown in figure 4.

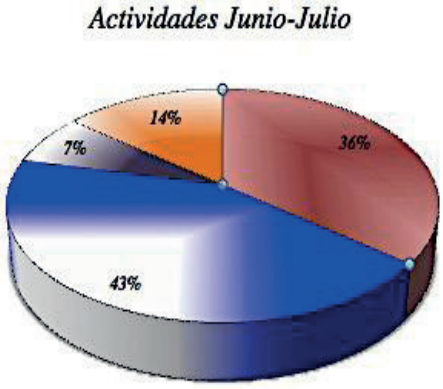

Figure 4. Activities carried out by the CIIO to promote entrepreneurship and the registration of patents for inventions and trademarks in April–May 2022

Forty-three percent of the activities carried out during this period correspond to advisory sessions provided to various projects that are under development this year. Thirty-six percent of the activities carried out correspond to work sessions dedicated to achieving ISO 9001:2015 accreditation, which sometimes took up to three days and involved CIIO staff as leaders, as well as researchers, teachers, administrators, and students who are doing their social service and professional internships at the CIIO. Fourteen percent of the activities during this period were used to provide assistance to professionals and entrepreneurs interested in DIDENCE and, which is one of the ways to continue to attract more people interested in business development and organizational culture, which can help them become entrepreneurs and businesspeople who contribute to regional development. However, for the period reported, it should be taken into consideration that it is the end of the semester, in addition to the fact that the vast majority of students return home during this season and, as a result, there was only one advisory session for the teams participating in the ANFECA competition at the national level.

The last period covered by this research corresponds to the entire month of *August* and the first part of *September* (figure 5), This is because the U de G's 2022A calendar of activities was planned in this way, and since CUAltos is part of the University Center Network, it must carry out its activities in accordance with that calendar.

As this period falls between the end of the first semester of the year and the beginning of the second, the organization of the children's summer program was included. in which the children of the institution's staff and the general population participate, as a policy has been developed that the younger the children are, the more

they should be made aware of what researchers and teachers do in relation to entrepreneurship, in order to awaken their interest in activities that will help them in the future to benefit the Los Altos region.

Figure 5. Activities carried out by the CIIO to promote entrepreneurship and the registration of patents for inventions and trademarks in August-September 2022

Thirty-eight percent of the activities carried out were aimed at sessions on various entrepreneurship initiatives, as on this occasion two were added corresponding to companies in the region, in addition to continuing to provide advice on processes originating internally. Twenty-five percent of the activities carried out during this period correspond to the sessions required to promote the development and growth of regional companies, while 19 % of the sessions were dedicated to achieving ISO 9001:2015 accreditation, with each session taking the time necessary to achieve the objective. Finally, there were three different activities that received 6 % of the attention each (i.e., 18 % between the three), which were continuing with the DIDENCE diploma course, advising the teams that will participate in the ANFECA competition at the national level, and finally, continuing and completing the children's summer course.

DISCUSSION

The reactivation after SARS-CoV-2 proposed that the previous face-to-face activities at CUAltos have always been and will continue to be a driving force for students in socioeconomic careers and currently for the center, together with the networks that provide both opportunities and challenges to strengthen new forms of innovation and emerging ventures that meet the needs and new connection with the region.

In summary, this allowed the CIIO's programs to be carried out more satisfactorily, integrating students, researchers, and entrepreneurs from different fields in face-to-face dynamics that favor knowledge transfer, the creation of high-impact projects for the Altos de Jalisco region, and, above all, keeping this ecosystem more united for future generations. This result is in line with what Saad and Zawdie[25] mention, who emphasize that direct interaction between the academic sphere and the productive sector drives innovation and local development.

The interaction that took place during this period created a university-business link, where innovation activities, regional impact, and perceived usefulness were quite noticeable in the months analyzed. This revealed that the main challenge identified was readapting to face-to-face processes, especially in consulting and coordinating competitions, which required organizing teams, establishing collaboration networks, and adjusting support strategies. However, previous experience in virtual activities made it possible to optimize resources and combine modalities, thus strengthening institutional resilience. The implementation of the second generation of the DIDENCE diploma course was a clear example of this process.[26]

Future work

After completing a full semester of face-to-face classes, even with the measures and precautions in place to continue protecting everyone, a review was conducted of the activities that still need to be carried out for the benefit of permanent companies, dependent companies, and CUAltos. These include increasing participation and exchange meetings with other University Centers of the U de G, since each center has highly valuable personnel who are willing to participate in various ways that lead to entrepreneurial projects that can be patented. It is therefore highly recommended that the CIIO extend more invitations to these meetings so that their fruits can achieve the sustained growth of CUAltos itself, including all its members and the region.

In addition, greater publicity should be given to entrepreneurs and businesspeople in the region so that the necessary agreements can be established and they can be provided with the advice they need to develop their projects, as well as assistance with the procedures for registering inventions, utility models, trademarks, and

anything else related to the IMPI.

It should not be forgotten that the competitions in which CUAltos students participate are a source that allows them to broaden both their knowledge and their attitudes towards proposing and developing their own ventures. This will promote and encourage the growth of students who want to start developing projects and companies that require the various services offered by CUAltos, as well as gradually opening up contributions aimed at increasing the number of patents registered in the name of the U de G, its students, researchers, and teachers, without leaving out those that can be advised to companies in the region. Finally, the necessary studies and procedures will be carried out to integrate at least one subject directly related to entrepreneurship into the CUAltos curriculum.[27]

CONCLUSIONS

For CIIO staff, the pandemic was a time to focus on the fact that it would largely depend on them to help develop the ideas of the innovative students that the University of Guayana produces each year, since entrepreneurship is an appropriate way to help students, companies, and the university grow. Therefore, it can be considered that the objectives achieved are only the beginning of the next stages, where it will be possible to continue growing in activities and achievements. All the work carried out during the period described in this research has been very personally rewarding, as we have managed to incubate two projects that are in the process of obtaining patents, as well as registering a trademark and continuing to support new generations so that they can become great entrepreneurs who will benefit the region, enhancing the prestige of CUAltos. but above all, that they never lose sight of the fact that all their contributions will not only be personal or to the companies, but also to those who use these ventures. Therefore, the first objective that must be met as CUAltos is to provide the conditions required for the sustained growth of everything that is part of the institution and the region where it is located, diversifying training activities and continuing programs such as the DIDENCE diploma course, which contribute to sustained growth. Emphasizing the need to establish medium- and long-term monitoring mechanisms to ensure the permanence and effectiveness of the actions undertaken, especially in a post-pandemic context characterized by constant changes in the productive and educational environments.

REFERENCES

1. Boldrin M, Levine DK. The Case against Patents. The Journal of Economic Perspectives. 2013;27(1):3-22.

2. Soria M. Misión social y patentes universitarias en México, 1991-2015. En: Calderón G, Díaz C, Jaso M, Sampedro J, editores. Aproximaciones a la universidad emprendedora en México. UAM-Cuajimalpa; 2019.

3. Bueno E, Casani F. La tercera misión de la universidad. Enfoques e indicadores básicos para su evaluación. Economía Industrial. 2007;366:43-59.

4. Loi M, Di Guardo MC. The Third Mission of Universities: An Investigation of the Espoused Values. Science and Public Policy. 2015;42(6):855-70.

5. Vélez A. Holanda: un sistema educativo que da voz y apoyo al alumno; 2016 noviembre 25. Disponible en: https://es.euronews.com/my-europe/2016/11/25/holanda-un-sistema-educativo-que-da-voz-y-apoyo-al-alumno

6. Zubieta J. La universidad a la vanguardia tecnológica: los Cursos Masivos Abiertos en Línea (MOOC). En: Zubieta J, Rama C, coordinadores. La educación a distancia en México: Una nueva realidad universitaria. UNAM y Virtual Educa; 2015. p. 137-54. Disponible en: https://virtualeduca.org/documentos/observatorio/2015/la-educacion-a-distancia-en-mexico.pdf

7. World Economic Forum. 3 ways the coronavirus pandemic could reshape education; 2020. Disponible en: https://www.weforum.org/agenda/2020/03/3-ways-coronavirus-is-reshaping-education-and-what-changes-might-be-here-to-stay/

8. Vidal LMJ, Fernández OB. Aprender, desaprender, reaprender. Educ Med Super. 2015;29(2). Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-21412015000200019

9. Navarro del Toro GJ, Romo González LE. Escuela de refuerzo de las matemáticas y del idioma español, emprendimiento para sacar provecho de la COVID-19. RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo. 2022. doi: https://doi.org/10.23913/ride.v13i25.1259

10. Navarro del Toro GJ, Romo González LE, Rodríguez Sedano E. La importancia de desarrollar habilidades blandas en el trabajo. The Conversation; 2024. Disponible en: https://theconversation.com/la-importancia-de-desarrollar-habilidades-blandas-en-el-trabajo-218616

11. Navarro del Toro GJ, Espinosa León LE, De la Torre Barba S. Transformación educativa en las universidades públicas: Innovación, emprendimiento y competencias del siglo XXI. Estudio de caso Centro Universitario de Los Altos. RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo. 2025;15(30). doi: https://doi.org/10.23913/ride.v15i30.2299

12. DOF. Diario Oficial de la Federación. Secretaría de Economía; 2020 julio 1. Disponible en: https://www.dof.gob.mx/index_113.php?year=2020&month=07&day=01#gsc.tab=0

13. DOF. Diario Oficial de la Federación. Secretaría de Cultura; 2020 julio 1. Disponible en: https://www.dof.gob.mx/index_113.php?year=2020&month=07&day=01#gsc.tab=0

14. IMPI. impi en Cifras 2020: 1993 a septiembre 2020; 2021. Disponible en: https://www.gob.mx/impi/documentos/instituto-mexicano-de-la-propiedad-industrial-en-cifras-impi-en-cifras

15. Rodrigues da Silva A. Caracterización del paradigma cognitivo y sus implicaciones educativas. Revista Vinculando; 2017. Disponible en: https://vinculando.org/psicologia_psicoterapia/caracterizacion-del-paradigma-cognitivo-sus-implicaciones.html

16. Martínez J, Mendizabal AB. El paradigma ambiental en la formación universitaria y el comportamiento de estudiantes; 2019 diciembre. Disponible en: https://www.researchgate.net/publication/347380062_El_paradigma_ambiental_en_la_formacion_universitaria_y_el_comportamiento_de_estudiantes

17. Uriarte JM. Constructivismo; 2021 septiembre 7. Disponible en: https://www.caracteristicas.co/constructivismo/#ixzz7TDPwsVhF

18. Navarro del Toro GJ. El paradigma del marketing digital en la academia, el emprendimiento universitario y las empresas establecidas. RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo. 2022. doi: https://doi.org/10.23913/ride.v13i25.1321

19. Degl'Innocenti M, Matousek R, Tzeremes NG. The interconnections of academic research and universities "third mission": Evidence from the uk. Research Policy. 2019;48(9):103793.

20. Navarro del Toro GJ, Valenzuela Chavira I, Bravo Silva JL, Valle G. Optimization of the entrepreneurship ecosystem: 5-axis model for higher education systems; and the higher education systems. Case study for Center University of Los Altos. Seminars in Medical Writing and Education. 2025. doi: https://doi.org/10.56294/mw2025677

21. Díaz C. Flexibilidad y autonomía en la generación de conocimiento: la experiencia de la UAM-Iztapalapa. En: Aboites J, Díaz C, editores. Inventores y patentes académicas: la experiencia de la Universidad Autónoma Metropolitana. Siglo XXI Editores/Universidad Autónoma Metropolitana; 2015. p. 154-271.

22. Díaz C. Ciencia, tecnología e innovación: retos estratégicos de Jalisco. En: Acosta A, editor. Jalisco a futuro 2018-2030. Construyendo el porvenir. Vol. I. Ediciones Universidad de Guadalajara; 2019. p. 282-336.

23. INEE. Panorama educativo de México: Indicadores del Sistema Educativo Nacional. INEE; 2019.

24. IBERO. Limitaciones económicas y normas culturales frenan acceso a educación media y superior; 2024. Disponible en: https://ibero.mx/prensa/limitaciones-economicas-y-normas-culturales-frenan-acceso-educacion-media-y-superior

25. Saad M, Zawdie G. Introduction to Special Issue: The Emerging Role of Universities in Socio-Economic Development through Knowledge Networking. Science and Public Policy. 2011;38(1):3-6.

26. Morales MA, Segoviano LE. Una perspectiva económico-institucional sobre la toma de decisiones: resolución de problemas bajo incertidumbre. Investigación Económica. 2016;75(298):57-75. doi: https://doi.org/10.1016/j.inveco.2016.11.002

27. UNESCO. Repensar la educación. ¿Hacia un bien común mundial? UNESCO; 2015.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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