

Research Article

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Integrating Emerging Technologies in University Entrepreneurship Education Under the Andean Worldview

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Abstract

Background/purpose. The incorporation of new technologies, such as AI, Blockchain, VR, and other emerging technologies in Andean entrepreneurial education, which maintains the traditional values of Ayllu (Community), Ayni (Reciprocity), and Pachamama (Nature), is studied in this descriptive work. The primary objective of this study is to examine how the culture of Andean students influences their entrepreneurial attitudes, highlighting the most common challenges and the impact of cultural heritage on their projects. The objective is to compare the traditional values and modern technological systems taught to students at university with those used by successful entrepreneurs, with a focus on the use of modern technologies. It is also to analyze digital transformation with a focus on collaboration and sustainability.

Materials/methods. The study employed a convergent parallel mixed design to integrate statistical and thematic analysis on entrepreneurship and Andean cosmovision in seven public universities. Validated instruments were applied to 355 students through stratified sampling, triangulating quantitative and qualitative data on technology and cultural values (Ayllu, Ayni, Pachamama).

Results. Based on the results of a survey and online interviews with students, the entrepreneurial inertia of the family environment is generally favorable; however, the lack of practical training and the limited use of modern technologies is notable.

Conclusion. It is suggested that a combination linking traditional business practice and digitalization to execute such ventures would undoubtedly foster culturally sensitive and sustainable blocks of dedication.

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1. Introduction

The integration of emerging technologies in entrepreneurial education has become a crucial necessity in the current global context. However, despite the advances made in incorporating technological tools, a significant gap remains in the educational literature regarding how these technologies can be integrated with cultural worldviews, specifically the Andean worldview, in the educational field. Instead of being considered a "problem," this gap should be understood as a significant opportunity to innovate in the field of entrepreneurial education. This study aims to precisely fill this gap by exploring how emerging technologies, such as artificial intelligence (AI), blockchain, and virtual reality (VR), can be integrated into entrepreneurial education, based on the fundamental principles of the Andean worldview. This worldview, which focuses on deeply rooted values such as *Ayllu* (community), *Ayni* (reciprocity), and *Pachamama* (Mother Earth), provides an ethical and cultural framework that can guide the use of new technologies in the training of entrepreneurs. In this sense, the aim is not only economic profitability but also social and environmental sustainability that is truly meaningful for Andean communities, while preserving cultural identity.

The gap identified in the academic literature highlights the importance and relevance of this study, which not only addresses the need to integrate emerging technologies into entrepreneurship education models but also delves into how the ancestral principles of the Andean worldview, such as *Ayllu*, *Ayni*, and *Pachamama*, can become fundamental pillars in the training of entrepreneurs. These principles are not only essential for cultural well-being but can also be used to create responsible enterprises committed to the environment and society, especially in the Andean regions, where the relationship with nature and the community remains fundamental (Achig Balarezo, 2019; Caballero García et al., 2019; Cruz Pérez, 2018; Estermann, 1997; Sáenz, 2024; Sotomayor et al., 2024). In this context, emerging technologies can offer innovative opportunities for economic development, but always within a framework of respect for cultural values and balance with nature.

The primary objective of this research is to explore how the Andean worldview, understood as a cultural and epistemological system, can be integrated with emerging technologies to develop an entrepreneurial education model that is both culturally relevant and socially sustainable. Instead of simply teaching the use of modern technologies, the study seeks to analyze how the fundamental values of the Andean worldview can influence the entrepreneurial attitudes of university students, both in their capacity to undertake ventures and in their willingness to generate positive social and environmental changes. Additionally, it explores how digital tools can be implemented in a manner respectful of these principles, without losing the sense of cultural identity and socio-environmental responsibility. The questions that will guide this study are: 1) How do the values of the Andean worldview, such as *Ayllu* and *Ayni*, influence the entrepreneurial attitudes of university students in the Andean region? 2) In what ways can emerging technologies, such as AI, VR, and blockchain, be integrated into entrepreneurial education while respecting and promoting Andean cultural principles? 3) How can an educational model that integrates these technologies and cultural principles foster sustainable, ethical, and community- and environmentally-responsible entrepreneurship?

2. Literature Review

This study is framed within fundamental educational theories, such as constructivism (Vygotsky, 1978) and critical pedagogy (Freire, 1970), which promote the idea that learning is a social and contextual process. These theories emphasize the importance of social interaction in the learning process, which is essential for creating an inclusive educational environment where students not only acquire technical knowledge but also develop competencies to solve problems within their own cultural context. Moreover, critical pedagogy promotes an education that is transformative, critical,

and capable of generating change in society. Through the integration of these theories with the Andean worldview, a solid foundation is provided to explore how cultural values can enrich the educational process and how emerging technologies can be used to strengthen these principles.

Likewise, it is recognized that the Andean worldview is not only an ethical system but also an epistemology that offers a comprehensive framework of knowledge, in which the human being is intrinsically connected to their community and to nature. This worldview establishes a holistic vision of life, where each action is seen as part of an interconnected whole, which can be especially useful in the creation of pedagogical models that respect this interdependence and promote a more inclusive and equitable educational approach. According to Estermann (1997), this Andean worldview is crucial for understanding education in contexts where the relationship with the community and nature is central. Thus, the goal is not only to incorporate technologies into the educational curriculum but also to ensure that these tools help preserve and strengthen cultural traditions and ancestral knowledge.

Emerging technologies, such as artificial intelligence (AI), virtual reality (VR), and blockchain, offer new possibilities for transforming entrepreneurial education. These tools allow for personalized learning, the creation of interactive simulation environments, and the establishment of networks of trust and transparency (Flores et al., 2021; García et al., 2024; Guillen et al., 2024; Pla-Campas et al., 2022). However, their implementation in Andean contexts requires a culturally sensitive approach that not only focuses on efficiency but also considers the social and environmental impact of these technologies. Technology must be aligned with Andean values of reciprocity (Ayni) and respect for nature (Pachamama) to ensure that its implementation in entrepreneurial education does not have negative effects on communities or the environment (Guédez & Pérez, 2020; Lizana & Burgos, 2022). This study proposes an innovative pedagogical model in which the Andean worldview is combined with these emerging technologies to promote entrepreneurship that respects both innovation and cultural and ecological sustainability. Emerging technologies, for example, can contribute to the revitalization of indigenous languages, improve the quality of life in rural areas, and protect sensitive ecosystems without sacrificing business innovation (Sáenz, 2024).

The relevance of this research lies in its ability to provide an integrative approach that combines the Andean worldview with emerging technologies, thereby developing an educational model for entrepreneurship that supports not only technical learning but also respects and promotes Andean cultural identity. This model has the potential to transform entrepreneurial education in the Andean region, creating entrepreneurs who are more aware of their social and cultural context and capable of generating projects that benefit both local communities and the environment. As Andean society faces global challenges such as accelerated digitalization, climate change, and social disparities, it is essential that entrepreneurial education adapts to these realities without losing sight of respect for local culture and ecological balance.

3. Methodology

This study is based on a convergent parallel design, characteristic of research that employs mixed methods. The main objective was to simultaneously collect and analyze qualitative and quantitative data on the adoption of innovative technologies and the impact of the Andean worldview on university entrepreneurial education. The quantitative component allowed for the collection of measurable indicators, such as the number of entrepreneurial family members, the regular use of technological tools, and involvement in entrepreneurship competencies. For its part, the qualitative component focused on exploring the perception and experience of Andean values, such as Ayllu, Ayni, and respect for nature, also known as Pachamama. Subsequently, the data from both approaches were combined to obtain a comprehensive perspective on the strengths and weaknesses of entrepreneurial education in Andean contexts.

The research was conducted with 355 participants from seven state universities located in the Quechua region, whose altitudes range between 2,300 and 3,500 meters above sea level. Since mentioning the names of the universities is not ethically appropriate, only the geographical region where the study was conducted is indicated. The study universe included 4,600 students from the Professional School of Administration, of which 355 participants were selected through stratified probabilistic sampling. This sampling ensured the representativeness of the students by educational institution and academic role, guaranteeing that each university and each stratum was adequately represented. It is worth noting that these 355 participants were both surveyed and interviewed, with the same individuals participating in both phases of the study.

The analysis of the 355 university students of Administration from the Quechua region in Peru showed that 29% were 20 years old, 22% were under 19 years old, and 63% were women. 81% had completed high school, and 60% were full-time students. 52% lived in homes with cement floors.

Two key instruments for data collection were designed and validated. First, a structured survey with Likert scales and multiple-choice questions was developed, focusing on the use and perception of emerging technologies and the importance of Andean values in entrepreneurship projects. This instrument was evaluated by experts in pedagogy and educational digital technologies and subjected to a preliminary implementation phase, obtaining a Cronbach's alpha coefficient of 0.75, which indicated good reliability. Second, a semi-structured interview guide was conceived to gather more detailed accounts of students' experiences regarding the challenges and opportunities presented by cultural aspects such as Ayllu, Ayni, and Pachamama, in contrast to university education and the use of technologies. The interviews were conducted individually or in groups, and in some cases, the Quechua dialect was used, according to the interviewees' preference.

The interviews and surveys were conducted at the seven selected universities. To ensure adequate participation and that the respondents completed the survey correctly, it was necessary to coordinate with the "Entrepreneurship" offices and some academic authorities. The survey was sent digitally to the selected students, using Google Forms for its application. The interviews were recorded with the participants' consent, who agreed to conduct the interviews in a suitable environment for this purpose.

Once the data was collected, the analysis of the results was carried out. The qualitative data obtained from the interviews were analyzed thematically, using predefined categories such as "technological appropriation," "integration of the Andean worldview," and "financial and bureaucratic limitations." On the other hand, the quantitative data were processed using statistical techniques through SPSS version 27 and Excel, which included obtaining frequencies, averages, and correlations. Data triangulation allowed for the integration of both sets, comparing the obtained figures (for example, the average number of technological tools used, the time dedicated weekly to the venture) with qualitative findings on cultural and training barriers.

With the aim of ensuring methodological transparency and the reliability of the results, the process of selecting participants and the sampling techniques used in the qualitative phase were clearly and precisely detailed. Although the research employed a convergent parallel design, the objectives of both phases —qualitative and quantitative —were explicitly defined, describing the methods used in each. Detailed information was included about the demographic characteristics of the participants, the exact number of individuals in each phase, and the methodology applied for the selection of qualitative participants, which reinforces the transparency of the study and facilitates its replicability.

Likewise, detailed information was provided about the procedures used to ensure the validity and reliability of the instruments, as well as the analysis methods applied. Although the study mentions the use of thematic analysis and statistical techniques, it specifies that for quantitative

analysis, tools such as SPSS version 27 and Excel were used. For the qualitative analysis, ATLAS.ti version 24 was used for data coding and theme creation, clearly detailing the stages of the analysis process. These aspects significantly contribute to reinforcing methodological transparency, improving the validity and reliability of the results, and enabling the replication of the study in future research.

4. Results

4.1. University Entrepreneurial Culture

Family and University Environment Towards Business. Several students come from families with small businesses, which is a positive thing. However, not many students advance with their projects at the university level. The average number of entrepreneurial family members is between 2 and 3, and 65% dedicate between three and six hours a week to their business initiatives. The Andean vision provided by an ayllu offers a community potential that, if well utilized, will enhance training and education (Vigo et al., 2016).

Change in Attitude Towards Entrepreneurial Activity Upon Entering University. The courses broaden the scope of the definition of an entrepreneur, but there is no practical guidance. 40% are willing to engage in some form of business activity at least twice a year, and 20% do not plan to participate in business at all. Incorporating formal strategies that depict Ayni (reciprocity) in mentoring and networking events will undoubtedly enhance collaboration among students.

Main Barriers and Challenges of Young University Entrepreneurs. The most relevant barriers are the lack of funds, few mentors, and the bureaucracy of the procedures. Between 60% and 70% took one to three entrepreneurship courses during this semester; the average investment made is between S/1,000 and S/5,000. With an Andean perspective, an Ayllu and the Ayni could provide a cooperative fund and a support network (Lizana & Burgos, 2022).

Attitude Towards Entrepreneurship with an Andean Worldview Perspective. Current training is not linked to Andean or rural markets, which is why 70% do not participate in contests or incubators. Introducing principles like Pachamama and ayllu would foster culturally relevant and sustainable projects (Ripoll Rivaldo, 2023).

4.2. Emerging Technologies Applied to Entrepreneurship

Use of technological tools in Business Development. Social media, Canva, and Trello stand out, largely due to personal initiatives prior to university. The average number of tools used is 2 to 3 (out of 7). The digital Ayni has the potential to mobilize collaborations that do not exist.

Comparison between tools taught and used by successful entrepreneurs. In institutions, the fundamentals are taught, while autonomous entrepreneurs add AI or Big Data. The vast majority identify 2-3 cases of successful entrepreneurs, and 10-15% mention 5 or more. Training in the ayllu would encourage cultural recolonization through the use of new technologies.

Impact of emerging technologies on entrepreneurship education. AI and VR stimulate creativity, but there are protocols for equipment and teacher training. Under the concept of ayllu, it is possible to think about uniting to create work that promotes transparency and cooperation through technology.

Technological essentials for achieving business success. For many, the importance of social media, e-commerce, CRMs, and accounting in business is undeniable. A collaborative solution (ayllu) is to allow selling and promoting through the community and creating communities.

Digitalization and its impact on traditional business management. Technology becomes an ally of traditional management. 20 percent of these believe that the returns will come after 5 years or more. The union of reciprocity (Ayni) with Pachamama will strengthen sustainable practices.

4.3. Methodologies and Educational Approach in Entrepreneurship

Adjustment of Content Regarding Entrepreneurship to the Market and Local Reality. The requested examples are from rural or developing markets; 70% have never participated in competitions. Incorporating the perspective of the ayllu would strengthen the connection with the Andean Region (Caballero et al., 2019).

Practical Experience of Professors in Economics Instruction. Many educators lack an entrepreneurial background. Ayni would involve inviting local entrepreneurs, creating an example of mutual learning (de Besa Gutiérrez et al., 2024).

Skill in Case Investigations and Methodologies in the Real Environment. The theory is not suitable for smaller or indigenous enterprises. From the perspective of Pachamama and ayllu, there is a demand for participatory methodologies deeply rooted in the local culture (Leal & Salazar, 2017).

Tactics to Optimize Instruction in Entrepreneurial Education in the University Context. Students propose real situations, guidance, training in emerging technologies, and local projects. Ayni could be interpreted as a regional cooperation that contributes to strengthening cultural identity (González et al., 2024).

Development of innovative programs in Education for Business. The creation of workshops, incubators for small businesses, and partnerships with companies in the Andean region is recommended. The worldview (ayllu, Pachamama, Ayni) would enhance initiatives with sociocultural impact (Saco et al., 2022).

4.4. Perception and Trust in Entrepreneurship with the Arrival of New Technologies

Evolution of Trust. Digitalization facilitates market entry and cost reduction, but 60% do not attend entrepreneurship events, highlighting the need for support. The ayllu and Pachamama could articulate sustainable production chains.

Relevance of Traditional Knowledge in the Digital Era. The foundations of management remain vital. The fusion of ancestral wisdom, technology, and Ayni would generate balanced ventures (Vigo Arrazola et al., 2016).

Key Recommendations for Students Who Want to Successfully Start a Business. It is emphasized that one should master finance, digital marketing, and idea validation, thereby reinforcing resilience and creativity. With 2 to 3 years of intensive practical training and Ayni principles, socially committed businesses rooted in the local reality would be forged.

5. Discussion

5.1. Frequency of Entrepreneurship in the University and Family Environment

The findings indicate that a notable percentage of students come from families with informal business traditions, which establishes an initial favorable environment for entrepreneurship. However, the surveys reflect that, despite this family context, the time dedicated to entrepreneurial activity is minimal (3 to 6 hours per week) and the realization of entrepreneurial ideas is limited. These results coincide with those found by Martínez et al. (2021), who indicate that the family environment is a crucial factor for entrepreneurship ($\mu = 2.86$), and with Torres et al. (2020), who highlight the peri-urban family as a significant driver. However, it is observed that, in the university context, the lack of an active community to systematize this entrepreneurial predisposition is a limitation, as suggested by Aguilera and Paredes (2017).

5.2. Change in the Perception of Entrepreneurship after Entering University

University courses seem to increase the predisposition to entrepreneurship, but a clear practical gap is evident. On average, students plan between 2 to 4 initiatives per year, and 20% do not develop any idea. This observation aligns with the conclusions of Martínez Garcés et al. (2021), who indicate that education plays an important role in motivating and enabling entrepreneurship, with 13.33% stating that educational motivation is high and 54.29% receiving the necessary skills. However, the practical gap mentioned by Ornellas et al. (2015) is reaffirmed, as they point out that the lack of practical experience limits the effectiveness of entrepreneurial education. The proposal to include elements of Ayni as a collaborative model could close this gap, as suggested by Aguilera and Paredes (2017).

5.3. Main Obstacles for Young University Entrepreneurs

The main obstacles identified by the students are the lack of funding, the absence of mentorship, and bureaucratic procedures. These results coincide with those found by Aguilera and Paredes (2017), who state that the lack of resources limits entrepreneurial development. Moreover, the uncertainties inherent to entrepreneurship, with an average of $\mu = 2.24$, align with the barriers mentioned by Martínez et al. (2021). However, traditional community networks, such as the Ayllu and the Ayni model, offer potential cultural solutions that have not been sufficiently explored in the literature, as pointed out by Ornellas et al. (2015) and Lizana and Burgos (2022).

5.4. Influence of the Andean Worldview on Entrepreneurial Attitude

There is a clear disconnect between university academic training and local Andean markets, with 70% of students not participating in competitions or entrepreneurial activities related to these markets. This gap highlights the challenges of applying theoretical training to local contexts. Guédez and Pérez (2020) discuss the problems arising from this disconnection in the educational reality, while Martínez et al. (2021) focus on creativity, although without explicitly addressing Andean worldviews. In this context, the connection with cultural traditions, such as Pachamama and Ayllu activities, could enhance students' entrepreneurial attitude, offering a comprehensive approach that combines respect for tradition and innovation.

5.5. Use of Technological Tools for Business Development

University entrepreneurs mainly focus on self-taught tools, such as social media, Canva, and Trello, but in general, they only use between 2 and 3 technological tools in their entrepreneurial activities. In this regard, the findings align with Porto and García (2014), who note that 50.3% of entrepreneurs use Information and Communication Technologies (ICT) institutionally, while Ornellas et al. (2015) criticize the teacher-centered approach, which limits the full utilization of technological tools. The introduction of Ayni digital, as a possible solution, is an emerging topic that has not yet been sufficiently addressed in previous studies.

5.6. Comparison between Tools Taught and Used by Successful Entrepreneurs

Although the university offers basic training in digital tools, some successful entrepreneurs turn to advanced technologies such as Artificial Intelligence (AI) and Big Data. In this regard, between 2 and 3 cases of successful ventures that apply these technological tools have been identified, with 10-15% of students reporting the use of more than five tools. This phenomenon reinforces the conclusions of Ornellas et al. (2015), who also identify basic training in ICT and institutional support as key factors for success ($r = 0.863$), as evidenced by Aguilera Vargas and Paredes Aguirre (2017). Moreover, the Ayllu could be a model of local knowledge transfer that integrates technology in an innovative way, as suggested by Ripoll Rivaldo (2023).

5.7. Effects of Emerging Technologies on Entrepreneurship Education

Emerging technologies such as AI and Virtual Reality (VR) have a positive impact on entrepreneurial innovation, although greater investments in teacher training and equipment are required, which, according to surveys, are currently scarce. This phenomenon aligns with what Porto and Mosteiro (2014) noted, reporting that 60% of entrepreneurs use Moodle, while Ornellas et al. (2015) criticize the lack of teacher training. In this context, Ayllu proposes a vision of collaborative projects that leverage technology in an ecological manner, an approach that has not been sufficiently explored in the current literature (Pérez Cusó & Martínez Juárez, 2015; Pino & Salazar, 2017).

5.8. Fundamental Technological Instruments for Business Success

The most relevant technological tools for business success include social media, e-commerce, CRM, and accounting. Entrepreneurs use an average of 2 to 3 tools, which reinforces the findings of Martínez Garcés et al. (2021), who link creativity with the application of technological tools ($\mu = 3.12$). Moreover, Aguilera and Paredes (2017) assert that technological support ($r = 0.863$) facilitates business success. The Ayllu, in this sense, could be a model that integrates local knowledge with the use of technologies together, promoting the transfer of resources and the execution of collaborative transactions (González-Medina et al., 2024).

5.9. Digitalization and its Influence on the Management of Conventional Businesses

Digitalization plays a key role in modern business management, serving as an additional administrative support. Entrepreneurs project profitability within 1 to 3 years, and 20% anticipate that this profitability will be achieved in 5 or more years. Guédez and Pérez (2020) highlight the importance of traditional knowledge in this process, while Martínez Garcés et al. (2021) do not specifically address digital transformation. In this sense, Pachamama highlights sustainability as a key principle by integrating the traditional with the digital.

5.10. Identification of Corporate Content to Modify for Local Contexts

Students face the lack of Andean cases in business training, with 70% not participating in competitions or only doing so once. Guédez and Pérez (2020) highlight a similar problem, while Martínez et al. (2021) emphasize the disconnection between formal education and local contexts. In this context, the Ayllu could be a useful model for generating content adapted to local realities, aligned with local production and the challenges of Andean communities.

6. Conclusion

The concept of training young entrepreneurs in university education is enhanced by Andean values (Ayni and Ayllu) and digital technology, but it lacks a cultural and financial component applicable at a practical level. Households with informal businesses foster an incipient entrepreneurial spirit; however, the university does not assimilate this Andean reality, thus losing the benefits of Ayni.

The main obstacles are the lack of funds, the scarce mentorship, the limited teaching experience, and the excessive bureaucracy. Without clear policies, the Andean worldview does not promote collaboration. Moreover, the teaching of technology is limited to social media and basic software, while independent entrepreneurs use tools like artificial intelligence or Big Data. The absence of an Andean vision restricts collaboration.

The use of emerging technologies remains low due to the lack of adequate equipment and qualified teachers; the vision of the Ayllu could enable sustainable projects, but there are still no specialized courses in this area. Digital technology serves as a complement to management theory,

while the concept of reciprocity and respect towards Pachamama offers a social and ecological depth that the curriculum does not address.

Likewise, teaching practice is limited and the local educational focus, centered on large foreign companies, hinders the inclusion of the Andean worldview and attention to local issues. Attendance at events is scarce due to the lack of networks and mentorships based on Ayni (60% do not attend), although the new confidence provided by digital tools has been highly relevant for entrepreneurship.

In this context, it would be necessary to develop financial skills, digital marketing, and idea validation. Likewise, the creation of incubators and mentorships with an Ayni approach could be key, as well as the integration of regional entrepreneurs to promote the construction of projects with identity and sustainability.

7. Suggestion

It is important to incorporate Ayni and Ayllu as transversal philosophical principles in entrepreneurial education, not only as cultural content but also as collaborative methodologies. To achieve this, academic modules could be designed that address solidarity economy, ancestral reciprocity, and Andean sustainability, integrated into entrepreneurship, ethics, and social responsibility courses. Additionally, it would be valuable to update the management curriculum, incorporating a territorial vision that combines technological tools with ancestral wisdom.

The training of teachers in agile methodologies with a cultural focus and the use of emerging technologies, such as Big Data, artificial intelligence, or blockchain, with Andean relevance, could be key to improving educational quality. Similarly, the creation of regional mentorship networks, which include local sages, self-taught entrepreneurs, and successful graduates who practice Ayni, would strengthen the entrepreneurial ecosystem in the region.

Promoting internships and volunteer work in rural communities, focused on community entrepreneurship and sustainable development, would allow students to connect their academic training with local realities. Equipping universities with rural digital laboratories, which have internet access, business simulators, applied artificial intelligence, and innovation platforms, would be essential to facilitate access to technology and improve opportunities for entrepreneurs.

Likewise, the creation of Andean innovation hubs, with a focus on biotrade, experiential tourism, clean energy, agro-industry, and digitalized crafts, would help consolidate projects with local identity. Also, the coordination of national and international funds for youth projects, with an emphasis on collective projects (Ayllu) and the principles of reciprocity (Ayni), could be very beneficial for the region.

An institutional entrepreneurship policy with Andean identity, based on criteria of sustainability, community ethics, and economic self-sufficiency, could provide the necessary framework to promote the creation of startups. To support this process, it would be necessary to simplify internal bureaucratic procedures that hinder the creation of university startups, establishing quick access channels to seed funds.

The signing of interuniversity agreements to share incubators, mentorships, and events linked to the local entrepreneurial ecosystem could also facilitate collaboration between institutions and strengthen support for entrepreneurs. Additionally, the organization of intercultural fairs and hackathons, where students can propose solutions to regional problems using technology and community values, would foster creativity and teamwork.

Creating Ayllu entrepreneurship incubators, where each project is built collectively, combining local knowledge with global technologies, could also strengthen the development of initiatives with a high social and economic impact. The promotion of collaborative virtual platforms, where students

from different regions exchange ideas, validate proposals, and work on joint projects, would facilitate interregional collaboration.

Finally, including practical workshops on basic accounting, solidarity finance, and access to community microcredits, with real examples from local entrepreneurs, would help students develop key financial skills for entrepreneurship. Training in digital marketing tools with identity, such as the use of cultural narratives, ancestral branding, and the digital sale of indigenous products, would also be essential to improve the competitiveness of entrepreneurs in the global market.

The promotion of idea validation with territorial criteria, evaluating feasibility not only from an economic perspective but also from a social, environmental, and cultural perspective, would be a fundamental step to ensure that projects are sustainable and aligned with the needs of local communities.

8. Limitations

There are few studies that simultaneously combine the three axes: university youth entrepreneurship, Andean values (Ayni and Ayllu), and emerging digital technologies. This necessitates the interpretation and linking of sources from separate disciplines, which can introduce biases in their integration. Concepts like Ayni and Ayllu have a high symbolic and community content, which makes their operationalization in quantitative instruments difficult. Its impact on entrepreneurship is often perceived rather than measured.

Most of the youth entrepreneurship experiences in Andean households come from the informal sector, where there are no consistent official records or statistics. This limits the possibility of generalizing the results obtained. Although there are cases of businesses with Andean identity, few have been documented academically, which makes it difficult to generate replicable models.

The research has revealed that many university professors are still not trained in emerging technologies or intercultural entrepreneurship methodologies, which restricts the validation of proposals in real classroom contexts. The differences in connectivity and equipment between urban and rural areas condition the scope of the proposed technological solutions, especially in projects with students from remote communities.

Given that this is an academic research project, the time for fieldwork, in-depth interviews, or pilot applications was limited, which reduces the possibility of validating the hypotheses at various universities. The proposals to integrate Andean thought into the university curriculum face regulatory and cultural obstacles in institutions that prioritize traditional or globalized teaching models, without local adaptation.

In the case that surveys or interviews were conducted, they were carried out in one or a few universities, which implies that the findings cannot be directly extrapolated to the national university system. Finally, the absence of a national policy that articulates higher education, entrepreneurship, and ancestral knowledge limits the sustainability of the proposed strategies in the medium and long term.

Declarations

Contributions of the Authors. C.H.N.M and C.H.C.A: Conceptualization, Literature Review, and Survey Design. E.D.Z.M and N.L.T.N: Methodology and Data Analysis. S.I.F.Q, C.H.N.M., and C.H.C.A.: Data collection and writing – Preparation of the original draft. C.H.N.M. and S.I.F.Q.: Supervision and Final Review-Editing. All authors have read and approved the final version of the manuscript.

Conflicts of Interest. The authors declare that they have no conflict of interest.

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Ethical Approval. The study was conducted in accordance with the principles of the Declaration of Helsinki. The participants were informed about the study's objectives and voluntarily participated, providing their informed consent. Measures were taken to ensure the anonymity, privacy, and confidentiality of the data.

Data Availability Statement. The data supporting the findings of this study are available upon reasonable request from the corresponding author.

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