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The academy ignores the culture of productivity and can ruin sustainable projects

La academia ignora la cultura de la productividad y puede arruinar los proyectos sostenibles.

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Abstract

This research work aims to demonstrate the need for the duality of academic-social interaction, as a professional source to address successful sustainable ventures. Through the teaching experience provided by undergraduate institutions and social interaction, we will update the approach of debating and transforming traditional conditions in academic engineering programs, promoting sustainable projects with high social impact. The research is in line with SDG 4: Quality Education. Our projection analyzes, within the Norte de Santander region, Colombia, the design of a personalized and varied productive culture in each undertaking, emphasizing the particular regional conditions and its constant evolution to guarantee and improve people's lives and sustainable development.

Keywords: Sustainability, Engineering, Industry, Technology, Society.

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Resumen

Este trabajo de investigación pretende demostrar la necesidad de la dualidad de la interacción académico-social, como fuente profesional para abordar emprendimientos sustentables exitosos. A través de la experiencia docente proporcionada por las instituciones de pregrado y la interacción social, actualizaremos el enfoque de debatir y transformar las condiciones tradicionales en los programas académicos de ingeniería, promoviendo proyectos sostenibles con alto impacto social. La investigación está en línea con el ODS 4: Educación de Calidad. Nuestra proyección analiza, dentro de la región Norte de Santander, Colombia, el diseño de una cultura productiva personalizada y variada en cada emprendimiento, haciendo énfasis en las condiciones particulares regionales y su constante evolución para garantizar y mejorar la vida de las personas y el desarrollo sostenible.

Palabras clave: Sostenibilidad, Ingeniería, Industria, Tecnología, Sociedad.

Introduction

Colombia registered 307,679 new companies in 2021, increasing startups by 10.6% compared to 2020 [1] Of these, 95% of current businesses are generated by small businesses, which contribute 79% of the workforce and 40% of GDP [2] It is important to note that of the total population, The Global Economy reports that 18.26% live in rural areas. Therefore, small businesses cover both the countryside and the Colombian cities [3]

To meet the demand of growing companies, young people are needed who are prepared to face current and future challenges. In the case of Colombia, we can highlight the high youth rate; a quarter of the national population is made up of young people less than 24 years of age.

In Colombian technical universities, generating a business idea is part of the academy. In a current program in accordance with the guidelines of the Sustainable Development Goals, the future engineer accesses the bases on strategic projection, design, implementation, monitoring, and evaluation and projection capitalization [4]
From the sixth semester, the undergraduate student begins to train with modern planning, evaluation and management tools in investment projects [5] Subjects such as project engineering, management, plant design and other related subjects make up the curricular framework of applied techniques.

With them, among others, knowledge is sought in profitability, risks, strategies, environmental and legal aspects. The result must be a successful, sustainable and feasible company.

The vast majority of undergraduate projects emphasize project tools from planning to closure, from different points of view and with attractive and documented solutions. An engineering graduate approaches the world of work prepared to solve unmet needs in the field of entrepreneurship.

From objectives, diagrams (Ishikawa, Pareto, flow charts), Porter's forces, management, methodologies, matrices, variables, strengths, opportunities, weaknesses and threats, market, technical, organizational and financial analysis; nothing is left to chance.

However, less than 30% of new ventures manage to survive more than 5 years [6] What should be the exception becomes the rule, despite academic efforts.

This research analyzes the academic approach, focused on the value chain of

projects: theory, in our opinion, outdated and insufficient for current challenges.

SMEs, we will try to demonstrate, incur in little investigated characteristics, referring to: the personalization and variation of each undertaking, the particular regional conditioning factors and their constant evolution.

Research

SMEs currently group 90% of companies globally, generate between 60% and 70% of formal employment and add up to around 50% of GDP. As an economic boost, these small companies support economies and livelihoods, especially in poor and vulnerable regions [7]

The 17 Latin American countries under study group a total of 13 million small businesses [8] generating more than 60% of formal jobs. Paradoxically, the participation in the Gross Domestic Product (GDP) is only 25%. The increase in bankruptcies in small and medium-sized companies worries and affects the Hispanic-American labor market.

Table I. SMEs in Latin America in 2021.

Country	Micro	Small	Medium	Total
ARGENTINA	514,976	72,702	15,146	602,824
BOLIVIA	305,250	16,500	8,250	330,000
CHILE	758,376	203,312	28,844	990,532
COLOMBIA	1,497,373	87,132	20,976	1,605,481
COSTA RICA	367,911	14,873	7,436	390,220
ECUADOR	802,696	63,814	13,693	880,203
EL SALVADOR	193,084	11,661	5,830	210,575
GUATEMALA	435,043	29,931	14,965	479,939
HONDURAS	20,289	84,685	42,343	147,317
MEXICO	4,057,719	94,513	18,523	4,170,755
NICARAGUA	183,406	7,492	3,746	194,644
PANAMA	43,695	5,656	2,828	52,179
PARAGUAY	193,478	10,458	13,314	217,250
PERU	2,283,105	81,777	2,853	2,367,735
REP. DOMINICANA	65,324	12,638	6,319	84,281
URUGUAY	129,188	18,544	4,178	151,910
VENEZUELA	13,413	725	363	14,501
	11,864,326	816,413	209,607	12,890,346

Note: Colombia ranks 4th among the countries with the largest number of SMEs in Latin America, for a total of 1,605,481 small businesses.[9]

It is not an exclusive fact of Latin America. In his work on entrepreneurship, Salas, justifies the fiasco of 85% of Iberian projects due to errors in the calculation of investment needs, lack of financing and products or services without obvious competitive advantages over the existing offer [10] Only 1 in 10,000 companies will reach 100 years of life, sentence.

The Project Management Institute differs from the previous errors. For his studies, he determines the bad or null planning, the lack of definition and the misuse of expectations, failures in project communications, untrained project managers, little experience and inexact leadership as the main causes of the ruin of small businesses.[11]

In 2018, the Chilean PMI itself dictates that the main reasons for mistakes in projects

are the incorrect identification of stakeholders, incomplete analysis of requirements and identification of risks, poor communication and unrealistic execution deadlines [12]

The OBS Business School, the first online business school in Spanish at an international level, attributes the failure of the projects to insufficient risk management, poor definition of the scope, lack of realism in our objectives, lack of margin when reacting to unforeseen events and inconveniences and communication failures in the progress of the project [12]. Therefore, referentially summarizing the main causes for the failure of investment projects, we can appreciate the existing distortion and the lack of unanimity.

Table II. Main causes of project failure.

According to	Causal
OBS CHILE PMI	insufficient management of risks
CHILE PMI ROOMS	Errors in investment calculations / Poor capture of requirements
OBS ROOMS	Products or services without obvious competitive advantages / Lack of realism when setting our goals
OBS PMI	Poor or no planning / Poor scope definition
OBS PMI	Failures in project communications
CHILE PMI OBS	Unrealistic deadlines / F high margin when reacting to unforeseen events and inconveniences
ROOMS	lack of financing
PMI	Untrained project managers
PMI	Little experience
PMI	Inaccuracy in leadership
CHILE PMI	Not identifying the interested parties correctly

Note: Therefore, referentially summarizing the main causes for the failure of investment projects, we can appreciate the existing distortion and the lack of unanimity.[13]

11 probable causes are identified, as the main causes of disappointment in entrepreneurship. Of them, only 6 are argued multiple times by various specialists and companies dedicated to management, the rest go through the consideration of each entity, individually.

SMEs use scarce funds and cannot be diverted, as they depend on their functionality over

time. No small business owner can afford to lose their business.

You should be wary of magic formulas for success, no matter how attractive and professional the alternatives are. Bill Gates insisted that finding ourselves surrounded by information does not mean that we are using it properly [14].

Figura 1. SMEs in the world. A growing business. [15]

Parallel to investments in SMEs, another similar phenomenon occurs with ventures destined for public calls with high social impact. State resources are allocated to later languish; some due to delays in their execution, others due to lack of maintenance and many plans whose concrete utility is scarce or null.

An investigation on social projects approved between 2012 and 2016, for about 700,000 million dollars, are classified today as high risk of functionality. Many have shortcomings in implementation, technical inadequacies and unjustified delays [16] The magazine Portfolio, catalogs 237 billion Colombian pesos in works for social purposes that are unfinished (455) or in critical condition (835) [17]. Among the causes that originate this phenomenon we have corruption, patronage practices and constructive inexperience. Specialists graduated from university centers worked on all the projects.

Figura 2. Unfinished works. Alianza Quiroga School in Suba.[18]

Methodological approach.

By creating a discourse on development in a country or region, the results are measurable according to the degree of industrialization, application of modern techniques and productivity, without having spaces for society. Strategic competitions between higher education centers, Bourdieu affirmed twenty years ago, continue to be the result of university-business interests. In this relationship, small and very small enterprises have almost "no contact with the knowledge generated in the university space"[19] At the same time, an inverse phenomenon occurs: there are small university centers and branches in rural regions, where the relationship with the industrial world practically disappears.

Our research highlights the decline of Colombian technological institutions in recent years. Much of this phenomenon is framed in obsolete educational models, where the response needs of SMEs are ignored in order to maintain obsolete capitalist patterns. Consequently, small-scale traders and entrepreneurs do not see engineering professionals as decision-makers.

Every day there are fewer graduates from technology centers. A report from the Observatory of the Colombian University, reports 59 higher technical institutions in 2001 [20] Twenty years later, these are the figures.

Table III * Technical and technological education in Colombia. Professional Technical Institutions (ITP)

Denomination	Quantity	% of total
Professional Technical Institutions	29	10%
Number of students in technological careers	44, 685	2%
With more than 500 students	8	
Institutionally accredited	0	0
Number of professional technical undergraduate degrees	40	

Source: [21]

Going deeper into the causes of the disinterest shown by technical graduates, another phenomenon in Colombia is that, contradictorily, careers dedicated to engineering are hardly offered by ITPs. Currently, approximately 62% of graduates from professional technical programs study at Higher Education Institutions (HEIs), other than ITPs.

Table IV. Students in professional technical careers.

IES	Students in professional technical careers	with professional technical programs
NO ITP	73.329	80
ITP (Including senior technicians).	45.464	29

Note: HEIs with better logistical resources for engineers, programs focused on SMEs, trained teaching staff, and updated curricula represent only 26.6% of the institutions that offer engineering programs [21].

Students from non-technological universities mostly access industrial production internships in companies that rarely belong to SMEs. Private HEIs, moreover, send future engineers to large companies or exchanges with educational centers abroad.

Vulnerable regions, the countryside and SMEs, are not part of the objectives.

Universities in Colombia are measured, among other parameters, by their capacity for student mobility, never by their ability to solve problems of poverty, vulnerability or generate small businesses. The culture of Colombian productivity, dependent on agriculture and SMEs, is being pushed aside.

Table V. Top of the best Colombian universities. How many are public and how many ITP.

Top	World ranking	IES	ITP	Impact	Opening	Excellence	Públic or Private
1	666	Universidad de los Andes Colombia	No	601	761	945	Private
2	1089	Pontificia Universidad Javeriana	No	999	977	1689	Private
3	1229	Universidad Nacional de Colombia	No	509	7521	876	Public
4	1420	Universidad del Rosario	No	1738	1204	1981	Private
5	1485	Universidad del Norte Barranquilla	No	1614	1341	2164	Private
6	1559	Universidad de Antioquia	No	905	7521	1066	Public
7	1729	Universidad de la Sabana	No	1054	1894	3007	Private
8	1760	Universidad ICESI	No	951	2315	3104	Private

Note: As can be seen, within the Top 8 only 2 are public educational centers and none belong to the Professional Technical Institutions.[22]

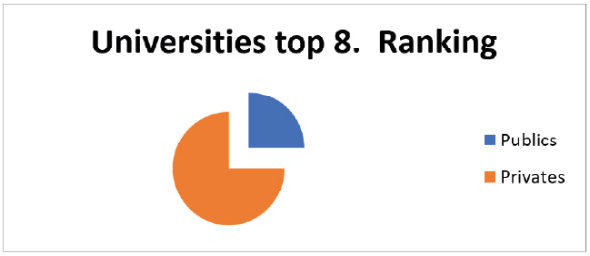

Figura. 3. Comparative status.[22]

For many of these future professionals, it is difficult to get rid of years of violence, guerrilla warfare and paramilitarism. Poverty, food insecurity and lack of access to housing or shelter remain major problems and future engineers prefer not to tackle projects with high social impact in areas of supposed risk [23]. Currently, education centers have insufficient approach to small businesses; there is a shortage of ITPs and a lack of positioning in the ranking of the best universities for public academia. Young people are unwilling and lack coherent training on SME projects. The need for professional practice is overlooked as a sine qua non criterion in the integrality of all those involved in a business, and it is perhaps the worst mistake: "the Professional Practices in the curricula at the university level constitute an important training reference; however, they are displaced from the theoretical debate" [24].

A topic incorporated in higher studies and that we believe we should investigate to review its impact on sustainable projects, is virtuality. Without downplaying the options applied during COVID 19, maintaining virtual platforms as the management of a definitive solution in technological universities can lead to a deterioration in the quality of teaching. Let's review the advantages and disadvantages of virtual environments in higher education, compared to traditional face-to-face education.

Table V. Advantages and disadvantages of virtual education.

Advantages.	Disadvantages
Development of problem solving skills, being able to create simulated environments close to reality.	A lack of real communication.
There appears to be an improvement in quality by using new approaches to teaching. The solutions they find can be effective.	Possibility of problems with the stability of the operation of virtual platforms.
Students can become interested in the process due to the interactive approach to learning	Big costs. Not all students, especially those from the lower strata, can afford an investment in technology and internet capacity.
	Virtual reality is not as flexible as it should be.

Note: We can infer that the main disadvantage of virtuality is that the personal human articulation and therefore the community are relegated.[25]

The lack of real contact on digital platforms can be aggravated by teachers' lack of interest or inexperience in creating useful environments, depending on the needs of the region. The consequences can be an engineering student without the development of interpersonal skills to be a future member of society. In addition, virtuality has shown that a large % of students use class time behind the scenes for matters unrelated to the educational process itself.

Although the cost of the logistics of a virtual education is important, the changes in the perception of education and the effects on university students are issues that should not be ignored. The journalist [26] writes about the anguish and antipathy towards virtual classes in the vast majority of students. As arguments they exposed problems of connection, participatory difficulty and distancing from the teacher [26].

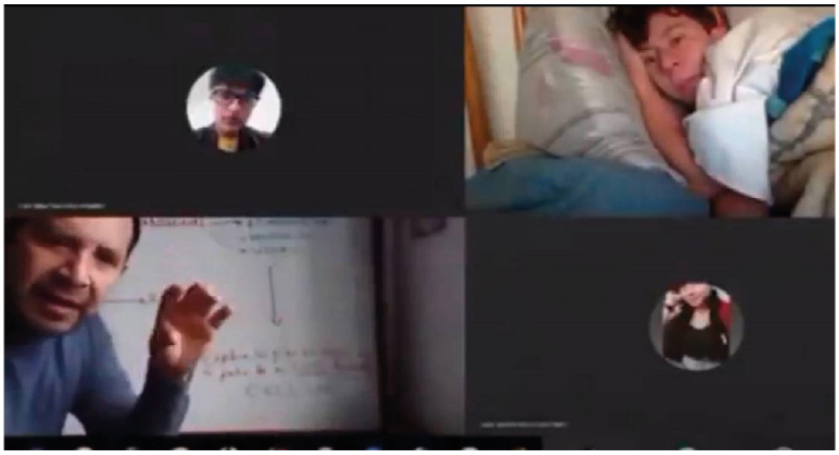

Figura 4. Sleeping student in a virtual class.[27]

In each region, the peasantry and small-scale enterprises require an undelimited link between the labor supply and higher education, to be covered by professional engineering programs. Unexplored local possibilities and research aimed at solving environmental problems are essential for regions whose main wealth lies in small and medium-sized businesses and the responsible exploitation of their natural resources.

There are gaps that distance the purpose of the academy with the professional's subsequent entry into the labor market without adequate sensitivity to the problems to be solved in the future. Similarly, the precepts on the environment and sustainable development are rarely analyzed.

The University of Pamplona makes an effort to use the characteristic of belonging to one of the regions with the highest unemployment rate in the country and to use it in the regional interest. Collaborating with the planning department of the mayor's office and the peasantry of Villa del Rosario, subjects such as engineering and project management find possibilities in unknown undertakings.

At the same time, the academy raises awareness by strengthening environmental management, biodiversity conservation, clean energy and sustainable development.

However, the so-called modernization process disadvantages local actors from the very beginning of the academy, focused on lean manufacturing and concepts applied to large

industries. If we add to that the little or no practice of university students in industries and pre-graduation fields, we lay the foundations for economic shortcomings before even thinking about an investment project.

A diagnosis of this nature distances the challenges and prevents visualizing the potential of technological programs. Conceiving youth prepared in a practical way as a solution to local, regional and national development can be the catalyst that a PMI certificate does not grant, favoring the community in the search for equitable, sustainable and feasible progress.

Results.

Education in our countries goes through integration with the community, its interests and needs. The time dedicated to educating should be used to promote participatory professionals in a world in need of sustainability. “The divorce between the education received at a time and the time is criminal"[29]

The academic world, focused on investment projects, requires in-depth analysis of the details and vast experience and practical skills.

Conclusions.

Technological higher education institutions must be taken as references in the progress of the society in which they develop their academic role. Configuring engineering careers whose graduates move away from the community threatens not only regional development, but also that of the country and the Sustainable Development Goals.

Graduates of technical careers need field practice, understanding of the Colombian reality and their role in the search for solutions. Likewise, it is necessary to obtain undergraduate experience, leadership and contact with indigenous communities, vulnerable strata and high-impact areas.

There are "black holes" in higher education today. A professional without understanding the sustainable development objectives and the internal problems of their community is an incomplete professional when it comes to focusing on a project and/or managing call resources. Infallibility and academic theorizing are stigmas that must be reviewed, updated and minimized.

The consequences of keeping the academy on a classroom blackboard or on a virtual platform will be the squandering, in the immediate future, of the few available resources and the appearance of new white elephants.

The so-called academic modernization process places local actors at a disadvantage. Focused on lean manufacturing and concepts applied to large industries, there is little space left to meet the needs of SMEs. If we add to that the little or no practice of the students, we lay the foundations for failure. Conceive young people prepared in the regional field as a solution to local, regional and national development can be the catalyst that a PMI certificate does not grant.

Favoring the community in the search for equitable, sustainable and feasible progress is the challenge for a productive culture.

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