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Exploring the Role of Latin American Universities in the Implementation of Transformative Innovation Policy

Eliana Villa-Enciso [1], Jhonjali García-Mosquera [2], Alejandro Valencia-Arias [3,*] and Carlos Javier Medina-Valderrama [4]

[1] Sciences Administratives Department, Instituto Tecnológico Metropolitano, Medellin 050026, Colombia; elianavilla@itm.edu.co
[2] Sciences Administratives Department, Universidad Tecnológica del Chocó, Quibdó 270001, Colombia; jhojalisk2@gmail.com
[3] Departamento Académico de Estudios Generales, Universidad Señor de Sipán, Chiclayo 14001, Peru
[4] Escuela de Ingenieria Industrial, Universidad Señor de Sipán, Chiclayo 14001, Peru; medinavcj@crece.uss.edu.pe
* Correspondence: valenciajho@crece.uss.edu.pe

Abstract: Transformative Innovation Policy (TIP) is a new paradigm in science, technology, and innovation policy that seeks to produce a transition to sustainable development. In this paradigm, universities are crucial actors in the dynamics of science, technology, and innovation, but their role in the implementation of TIP should be defined. The objective of this article is to contribute to the understanding of the ideal role of Latin American universities in the implementation of TIP. Therefore—to describe and analyze the concepts of university and TIP in Latin America—this case study examines the co-creation of a public policy of science, technology, and innovation by Higher Education Institutions (HEIs) in that region. This article underscores the vital role of universities in promoting transformative innovation that fosters social inclusion and sustainability. To achieve this goal, structural policy changes should be implemented, and different stakeholders (including researchers, students, and civil society) should be actively engaged. This paper also highlights the importance of addressing socio-economic, cultural, political, cognitive, and environmental issues faced by marginalized communities. By embracing the principles of transitions theory and prioritizing transformative innovation, universities can make significant contributions towards achieving Sustainable Development Goals (SDGs).

Keywords: transformative innovation policy; university; Latin American; SDGs

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1. Introduction

In developing countries, innovation has not brought the benefits that were promised by the paradigm that developed nations had adopted [1]. On the contrary, it has generated inequality, exclusion, unemployment, and environmental imbalances; favored the wealthy; and increasingly segregated low-income communities. As a result, many impoverished countries now have bigger social, economic, and environmental problems. It has been claimed that using innovation to create wealth, development, and well-being does not work in certain areas, and only a different type of innovation can produce the long-expected integral development [2–7].

In addition, the current innovation model focuses on competitiveness, which can favor the concentration of economic power in the hands of a few companies. This is particularly concerning in Latin American countries, which already exhibit high levels of economic inequality and wealth concentration. Therefore, a critical reflection and the adoption of appropriate policies are necessary so that developing countries can fully benefit from innovation while minimizing its negative effects in terms of inequality and wealth concentration [8].

This competitive innovation model presents significant limitations for Latin Americans, who face difficulties in access to resources that are necessary to research and develop new technologies. This creates a knowledge and resource gap compared to developed countries, which can limit their ability to compete in global markets. Consequently, Latin American countries should implement different policies and strategies to promote a more equitable transfer of knowledge and resources, as well as encourage collaboration between industry, university, and government [9].

In this region, Science, Technology, and Innovation (STI) policy is important to drive development. However, the STI policies used since World War II have not made significant progress. Although still relevant, these policies do not provide guidelines to address the disadvantages of a socio-technical system defined by modern economic growth [10].

To promote sustainable development, it should be acknowledged that innovation involves not only technological changes but also social and environmental aspects. In education, for example, due to the incredibly growing popularity of social media, it has become necessary to make a transition to flexible and complementary teaching models [11]. The relationship between these factors is a complex issue whose consequences can be potentially positive and negative. The adoption of Information and Communication Technologies (ICTs) and globalization can reduce CO_2 emissions and increase resource efficiency, thereby favoring energy conservation. Nevertheless, non-renewable technologies can contribute to pollution and climate change; inadequate electronic waste management can have a negative environmental impact; and excessive dependence on technology can have negative effects on people's mental health and quality of life. Furthermore, the digital divide can exacerbate social inequalities [12].

This means that innovation policy should focus on activities that promote sustainable solutions by enabling access to more efficient and affordable technologies, creating jobs in new areas, and improving resource efficiency. However, since not all innovations produce these positive outcomes, they should focus on reducing inequalities and protecting the environment [13]. Consequently, Transformative Innovation Policy (TIP) is necessary to overcome these current problems [10,14]. The tasks at hand entail reconciling divergent objectives, establishing clear system limits, identifying achievable routes, devising tactics, destabilizing current systems, mobilizing relevant policy arenas, targeting specific groups, and securing access to intervention points. Tackling these challenges requires a comprehensive and meticulous approach that acknowledges the intricacies of innovation systems and the different viewpoints of stakeholders. Only then can barriers preventing transformative change be effectively addressed [15].

This paper aims to contribute to the understanding of the role of Latin American universities in the implementation of TIP (i.e., the new paradigm) to achieve the Sustainable Development Goals (SDGs). It also makes some recommendations so that the transition between innovation paradigms is led by universities. Additionally, it addresses the shortcomings that the current model of competitive innovation has produced in developing countries, specifically in Latin America, as well as the relationship between TIP and universities as part of National Innovation Systems.

Finally, this paper discusses the results obtained and draws conclusions, focusing on the contribution that universities make to drive innovation in social inclusion and the transformation of socio-technical systems. Universities are key agents in generating collaborations with other actors to experiment with transformative technologies and practices that can have a positive impact on society. Likewise, this article suggests that local and regional organizations should carry out structural transformations, and universities should actively engage in policies that promote those transformations. Furthermore, Latin American universities should incorporate the principles of transition theory and the SDGs into their mission to generate transformative innovation and contribute to sustainable development.

2. Literature Review

First, this section contextualizes the concept of the university as an organization that not only transmits but also generates knowledge, science, technology, and innovation and, in addition, contributes to a National Innovation System. Second, it examines the emergence of a new paradigm—i.e., Transformative Innovation Policy (TIP)—that responds to current social, economic, and environmental challenges that competitive innovation has been unable to solve. Third, it analyzes cases in which Latin American universities have driven innovation for inclusion and sustainability.

This case study adopts an exploratory approach to analyze the creation of a regional public policy on STI, focusing on the role of Higher Education Institutions (HEIs). It explores and describes the National Science and Innovation Policy, which aims to align innovation processes with the achievement of the SDGs. This article contributes to the construction of innovation policies by studying the role that universities play in this type of dynamics. The unit of analysis selected for this study is the Science, Technology, and Innovation for Transformation Public Policy Factory (hereinafter, The Factory). To evaluate the results, the findings are compared with key elements identified in the theory, and the impacts of TIP are examined in four experimentation sessions.

Viewed through the lens of academic knowledge, contemporary universities play a crucial role in cultivating the capabilities required for innovation. This is why they are key institutions in National Innovation Systems (NISs) [16], which are being consolidated in Latin American countries. They also influence the development of technological and industrial capabilities by collaborating with other actors in NISs [17]. For example, in Colombia, the NIS started to be strengthened at the beginning of the 1990s, supported by a policy proposed by the national government. This policy places universities in the field of innovative development, but it privileges organizations that produce goods and services because they are supposed to transform scientific and technological knowledge into economic wealth, social welfare, and human development [18].

Universities play a crucial role in innovation systems. As institutions, they can spearhead transitions between different innovation paradigms. This is particularly significant because, typically, they generate essential knowledge, science, and technology to address humanity's challenges [19–22]. Additionally, their involvement in digital transformation has a profound impact on talent management. By embracing and adapting to the digital era, universities can effectively develop and improve the skills and competencies that are required in a rapidly evolving technological landscape [23].

In Latin America, universities have a strong social commitment that has been historically established due to the political problems of the region, where some countries present alarming socioeconomic conditions and concerns. As a result, universities have assumed responsibilities as autonomous entities to conceive and undertake their *Third Mission*, not leaving aside the needs of the market, but focusing on the development of inclusive and sustainable innovations that contribute to improving the economic, cultural, political, cognitive, and environmental conditions [24].

In Latin America, NIS refers to a set of institutions, policies, and actors that interact to generate, disseminate, and utilize knowledge and technology in the region [25]. Over time, the number of studies on NISs in Latin America has increased, although that growth has been asymmetrical from a global perspective [26]. Many authors have used the NIS approach to analyze the structure of actors and links that drive innovation in Latin American countries, as well as the inputs and outputs of these systems [27]. However, their analysis is still limited to a handful of countries, and more comprehensive studies are needed [28].

Nevertheless, there have been some successful cases, such as the development of the software industry in Brazil and the biotechnology industry in Cuba [29]. In Mexico, universities play an important role in the NIS and can contribute even more through public policies that incorporate an emphasis on the territory, other types of knowledge, collaborative epistemologies, technopoles and field schools, open access to knowledge, and strengthening of the ethical dimension [30].

NISs in Latin America have produced a series of specific success stories and have evolved from their creation in the 1950s. However, they have become weak entities [29]. Currently, this region is significantly lagging in productivity and competitiveness compared to its developed counterparts, and it needs creative innovative policies that foster equitable economic growth [31]. In Ecuador, for example, the economy is heavily dependent on low-value products and exports that are not very knowledge-intensive, which can be a risk for long-term growth and social equity. To improve its competitiveness, this country needs to increase the productivity of its economic sectors [32].

Although processes for generating innovation capabilities have not been fully established in developing countries—which has led to their lagging position—it is also true that systematic efforts are being made to strengthen said processes. These efforts include collaboration between countries to undertake joint knowledge generation actions; the involvement of microenterprises in economic development [33]; acknowledging the importance of innovation capabilities to achieve innovative outcomes and enhance competitiveness [34]; and open innovation [35] through the acquisition of external knowledge or internal generation to provide feedback on, make corrections to, adapt, and improve processes and products [36]. Additionally, social innovation has been encouraged, fostering university–industry linkages that have utilized local capacities to generate knowledge through research, technological development, and innovation—which aims to facilitate knowledge transfer and build a sustainable development model [37].

However, despite the efforts that are being made, innovation has not brought the benefits that were promised by the paradigm adopted by developed nations [1]. Some of the reasons behind this are the absence of an adequate approach for technology transfer systems and the lack of a point of reference to determine accurate selling prices for innovations and patents. This prevents Latin American universities from obtaining economic benefits from products and services that are later developed by public and private enterprises [38]. Another factor is the lack of economic incentives for companies, which limits the role of public policy as a tool to articulate the interests of the public and private sectors [39]. Furthermore, there are difficulties related to economic information, risk, and uncertainty, which hinder the optimal allocation of financial resources for innovation, thus justifying the need for state intervention [40].

Contrary to its promises, the current innovation model has generated inequality, exclusion, unemployment, and environmental imbalances—favoring some sectors, increasingly segregating low-income communities, and leaving many impoverished countries with even greater social, economic, and environmental problems [41]. Furthermore, incremental innovation—which refers to small modifications and improvements that enhance efficiency or customer satisfaction—may not be sufficient to generate a significant impact on society [42]. Therefore, innovation efforts should focus on high-tech-intensive projects, involve a wider range of economic agents, and adopt a regional perspective [43]. Also, developing countries should devote capabilities and resources to identify areas where innovation should be prioritized [44].

In this sense, it has been claimed that using innovation to create wealth, development, and well-being does not work in certain areas and only a different type of innovation can produce the long-expected integral development [2–7].

Economic dynamics have revealed the presence of failures that hinder countries' economic growth and competitiveness [45]. As a response, STI policies have employed three types of approaches or policy framings: (1) the Science, Technology, and Innovation (STI) mode; (2) the Doing, Using, and Interacting (DUI) mode; and (3) a combination of these two.

Framing 1 applies the STI mode and aims to contribute to economic growth by funding R&D—although its results can be unpredictable and long-term [10,19]. Framing 1 is based on the linear model of innovation, which places scientific discovery as an indispensable element to innovate. In addition, it is top-down and designed for political groups or formal actors of STI with some capacity or potential to innovate. When Framing 1 policies were

developed, it was argued that they would produce positive externalities in society that would justify their funding. A positive externality of this type of policy was stimulating R&D processes that would generate scientific knowledge, which was considered essential to achieve technological development and, consequently, innovation [10]. At that time, achieving this positive externality was an adequate justification for the public funding of these Framing 1 policies.

Framing 2 applies the DUI mode of innovation. Policies that adopt this approach seek to respond to failures of interaction between the actors involved in the innovation process [19]. The theoretical foundations of this type of policy can be found in [46–49]. These publications have examined NISs and shown that not all countries have the same ability to generate innovations because the latter not only depend on firms' capabilities but also relationships between heterogeneous agents. These agents include, in addition to companies, academia, the public sector, middlemen, and other actors that generate, disseminate, and use knowledge and technology—and learn during the process. According to [10], the policies that adopt the innovation system approach (i.e., Framing 2) seek to establish networks and relationships between different actors, which should result in collective learning as well as absorptive capacities to increase innovation.

Global challenges have led to the emergence of a new policy framing of STI, called Transformative Innovation Policy (i.e., Framing 3) or Transformational Change, which aims to guide the transition to sustainable development. The foundations of this framing are Framings 1 and 2—which are governed by unsustainable socio-technical systems associated with innovation models that generate negative externalities in social (inequality and poverty) and environmental aspects (climate change), which should be reconsidered. In [10], the authors claim that Framing 3 policies imply a change of directionality of socio-technical systems and greater participation, experimentation, and inclusion of multiple actors that were traditionally excluded. They also hold that, in the long term, this approach can change the directionality of innovation systems and investment in R&D, but it will be necessary to define new relationships between the state, the market, and civil society to establish more equitable and sustainable systems.

The theoretical foundations of TIP (i.e., Framing 3) are found in the study of socio-technical transitions. In that field, a multilevel perspective is used to explain the adequate management of innovations that aim to change systems of unsustainable consumption and production patterns. This perspective includes three levels: niche, regime (or status quo), and landscape [10]. In another paper [50], the technological niche is defined as a micro-level protected area where networks of actors experience and develop radical innovations and new practices (outside a purely competitive dynamic) and where there are links between "technology, demand and social issues" [50], p.539. The second level (or meso-level) is the socio-technical regime (or status quo), which is defined as the cognitive routines that explain the development of technological trajectories, but also encompasses the rules and roles that guide large-scale systems. Finally, the landscape level (or exogenous macro-level) provides direction to the regime and niche levels.

In the Table 1, we can see six elements that characterize TIP (i.e., Framing 3) policies proposed by The Transformative Innovation Policy Consortium (TIPC) [51]. This elements can be used to demonstrate that there is a socio-technical transition.

In Latin America, alternative innovation processes are being carried out to respond to local dynamics and realities [3,52–54]. They encompass inclusive [2,6,7,55]; grassroots [56–58]; and frugal or social innovations [59,60]. All of them have something in common: they aim to solve social, economic, and environmental problems that have not been corrected by competitive innovation. That is, they go beyond economic growth as such and try to rethink innovation as a response to social and environmental issues [9,58,61]. The goal of these proposals for alternative innovation is to transform the way we produce, consume, and perform structural and systemic changes—thus, they can be classified as transformative innovations [10,62].

Table 1. Six elements of TIP.

Element	Definition
Directionality	The policy is clearly supposing the non-neutrality of technology, considers a wide range of options, and addresses the social and environmental issues that it would cause.
Societal goal	The initiative focuses on the grand societal challenges expressed in the SDGs.
System-level impact	It focuses on high-impact change on the level of socio-technical systems.
Learning and reflexivity	The initiative allows for "second-order" learning.
Conflict vs. consensus	It acknowledges and encourages differences in opinion between stakeholders.
Inclusiveness	It includes civil society actors and/or end users.

There are several success stories of Latin American universities that have played a role in the generation of initiatives that can potentially become transformative innovations driven by social inclusion. For instance, The University of the Republic in Uruguay was a pioneer in research and innovations for social inclusion. In 2003, this university issued a call for proposals to respond to the deep economic and social crisis that its country suffered in 2002 [63]. In addition, Uruguay has a fund for inclusive innovation, which is managed by the National Agency for Research and Innovation (ANII in Spanish). This fund supports applied research projects aimed at making an impact on and improving social inclusion [64].

Another example is the project carried out by the Development Bank of Latin America (CAF in Spanish) in partnership with the Organization of American States (OAS), Microsoft, Western Union, Seattle International Foundation, and The Trust for the Americas. In 2016, they supported The Technological University of Santa Catarina in Mexico in the creation of The DIA Lab for Inclusive Innovation. The objective of this laboratory is to train young people to develop projects that improve their social environment and provide them with high-technology tools such as 3D printers, microprocessors, and laser cutters. It is funded by public and private organizations [65].

In Colombia, the efforts in social innovation have been discreet but steady. For example, the current National Development Plan (which is entitled "Todos por un Nuevo País") adopts the guidelines of the Organization for Co-operation and Development (OECD), which establish that public policy should seek to generate social welfare to achieve development and produce wealth [66]. According to the Colombian Administrative Department of Science, Technology, and Innovation, innovation should utilize knowledge to create value in the form of positive economic and social externalities [67]. This position has been reflected in some of its calls for R&D proposals and innovation projects in which universities participate with other actors in the NIS [68].

Latin American universities are also promoting sustainable development initiatives (e.g., sustainable campuses). A study [69] analyzed seven dimensions of university activities proposed in the literature on sustainability: education; research; outreach; campus operations; on-campus experiences; institutional framework; and assessment and reporting. After analyzing three campuses in Brazil, that study found several strengths for sustainability, which included research, outreach, and participation in management.

In Latin America, the implementation of successful academic innovations has been a priority to improve the quality of and access to higher education in the region. One of the most ambitious proposals is the creation of a common academic credit system for the entire region, which is known as CLAR in Spanish [70]. Additionally, new HEIs have adopted innovative approaches to design their academic programs, promoting student participation in learning and solving real-world problems [71].

However, other authors [72] have found that, although some universities—e.g., The National Autonomous University of Mexico (UNAM in Spanish)—are willing to develop projects in this field, existing sustainable initiatives suffer from a lack of articulation. This suggests that universities face institutional challenges to translate political will and initiatives into a systematic and sustained transition toward sustainability.

Finally, this paradigm (Framing 3) emerged to address the prevailing need for a structural change in institutions in developing countries and somehow revert the negative effects that competitive innovation has produced in these nations. These effects include not only poverty but also abandonment, destitution, and deprivation, all combined with waste and environmental pollution produced by (economic) development processes under the paradigm of competitive innovation.

3. Methodology

The purpose of this study is to enhance the understanding of the role of universities in implementing the new TIP for the achievement of the SDGs. To this end, we adopted the exploratory case-study method which facilitates the development of theories based on empirical evidence as well as the comprehensive description of phenomena using different data sources [73,74]. The selected case is Factoría de Política Pública de Ciencia, Tecnología e Innovación para la Transformación (Factory of Public Policy on Science, Technology, and Innovation for Transformation, hereinafter The Factory). This was an experiment to co-create a transformative regional public STI policy by analyzing the role of HEIs in Antioquia (Colombia). To select this case, we used convenience sampling, considering that The Factory was an initiative launched by our university (Instituto Tecnológico Metropolitano ITM) with the aim of identifying public policy components and instruments oriented to HEIs with transformative potential.

The Factory was an experimental event held as part of a call for mentoring in transformative STI policies led by the Science Policy Research Unit (SPRU) at the University of Sussex and Colciencias. The event was organized by an interdisciplinary group of professionals, professors, and researchers, who worked together with Antioquia Council on STI (CODECTI in Spanish). In Colombia, CODECTIs are collective bodies made up of public and private entities and social organizations. Their purpose is to ensure that the departmental STI initiatives are coherent with the regional and national policies and objectives in this matter.

Specifically, the event consisted of four in-person sessions in which the attendees were trained in the main concepts of the new TIP (or Framing 3). The sessions also included games, workshops, and spaces for reflection on aspects related to HEIs and Framing 3, as found in the regional STI policy. The organizing team designed the methodology and academic content of the event in a collaborative space that involved around 40 people from academia, the business sector, government, and civil society. These individuals contributed their knowledge, realities, and experiences to the formulation of proposals and guidelines for a new transformative STI policy [75].

The following are the topics covered in each session:

Session 1. Conceptual introduction: Discussion of the main elements of Framing 3 in the STI policy;

Session 2: Analysis of existing STI policies for HEIs;

Session 3: Identification of elements of Framing 3 in the regional STI policy for HEIs that promote transformative innovation;

Session 4: Workshop for the co-creation of proposals and suggestions for the regional STI policy for HEIs including elements of Framing 3.

Table 2 summarizes the research design of this study [74], p. 5394.

Table 3 summarizes the evaluated aspects of each session of the Factory in terms of their impact and their use of the TIP elements.

To determine the level of satisfaction with each aspect evaluated and, therefore, the impact of each session, an analysis was carried out by the team organizing the event (which was composed of a mentor assigned by the SPRU and other members previously trained in the principles of TIP).

Table 2. Research design.

Component	Proposal
Research question	What is the role of universities in the implementation of a transformative innovation policy?
Objective	To make suggestions to ensure that the transition between innovation paradigms is led by universities and examine the role of universities in the implementation of a transformative innovation policy for the achievement of the SDGs.
Unit of analysis	Factory of Public Policy on Science, Technology, and Innovation for Transformation (The Factory)
Evaluation criteria	Comparison of the findings with key elements identified in the literature.

Table 3. Evaluation of the impact of each session.

Aspects Evaluated		Remarks
Impact of each session	Activity Direct/Indirect Positive/Negative Short-/Medium-/Long-term Understanding/Product/Practice/Policy/System/etc. User Evidence What impact has changed as a result of the research and how? Where is the evidence?	Each activity during the experiment was evaluated in terms of both its academic impact (e.g., scientific progress, teaching and learning, skill development, methodologies, techniques, and approaches) and its non-academic impact (e.g., public policies and services, culture and society, economy and business).
Elements of TIP	Directionality Societal goal System-level impact Learning and reflexivity Conflict vs. consensus Inclusiveness	Guiding questions were formulated to show how the elements should be presented in the activities that were carried out. This was applied to the STI policy documents that were reviewed, the conversations that were held, and the proposals that were made in the context of the experiment.

4. Results and Discussion

Seeking to develop a different STI policy and respond to the country's commitment to achieving the SDGs, Colombia's STI funding agency, Colciencias, joined the TIPC, coordinated by the SPRU at the University of Sussex in the UK. The TIPC also includes innovation ministries and funding agencies from Finland (National Research Council), Mexico (National Council of Science and Technology, CONACYT), Norway (Research Council of Norway), South Africa (National Research Foundation, NRF), and Sweden (Swedish Governmental Agency for Innovation Systems, VINNOVA). Other related TIP initiatives include projects in China, Panama, and Brazil [51].

The TIPC provides guidelines for a new STI policy framework aimed at responding to the global challenges summarized in the United Nations SDGs [76]. Since 2016, a different methodological approach has been adopted by the STI Policy Unit of Colciencias to propose this new STI policy. To this end, several processes have been carried out: participation in the TIPC, mentoring network, discussion sessions, SDG citizen consultations, interviews, and scientific and technological capacity-building activities [62]. In this article, we present the outcomes of researchers' participation in the mentoring network known as The Factory, whose objective was to co-create a transformative regional public STI policy considering the role of HEIs in Antioquia (Colombia).

The mentoring network provided advice and support to eight projects in different departments in the country. It promoted a dialogue with government agencies and STI actors at the local level and achieved results that materialized in the guidelines for the formulation of the regional TIP. This initiative resulted in a group of critical scholars who will help to consolidate these processes in the country and its regions, taking into account the specificities of each one but without neglecting their alignment with the SDGs. Likewise,

these projects are laying the foundations for a network of Colombian scholars who will be key actors to consolidate this new STI policy in the country [77].

The results of this process are reported in Orientaciones para la formulación de políticas regionales de innovación transformativa en Colombia [77]. It is worth highlighting that the regional public STI policy was analyzed based on Framing 3 of innovation. In addition, proposals and suggestions were co-created during a workshop so that the STI policy incorporated TIP elements. The topic was of interest to the participants because of its novelty and because it focused innovation on building a better society.

The event was open, and there were no restrictions on the type of participants. However, 78% of the attendees were scholars. This suggests that the topic may not be attractive to other actors in the innovation system because the participation of civil society, business, and government representatives was low compared to that of HEIs. This indicates that actors view policies in a fragmented way and only participate in spaces that focus on their area. Unfortunately, this phenomenon may have biased the results of the experiment.

The analysis of the STI policy and the role of HEIs in it focused on development plans, where the functions of HEIs are limited to teaching, research, and extension. Nevertheless, proposals such as the universities' *Third Mission*—which states that HEIs should transform their environment—would be more appropriate to formulate a policy with elements from Framing 3. Similarly, it was also argued that innovation depends on the type of human beings that HEIs try to produce (i.e., educate), which is one of their core responsibilities.

Consequently, it was concluded that HEIs at the regional level should:

- Promote the role of research professors as natural leaders of these processes;
- Adapt the concept of transformative innovation to each region;
- Include the concept of transformative innovation in the teaching, extension, and research activities of HEIs;
- Offer mandatory rural internships of at least six months in all academic programs. These internships should adopt a Framing 3 approach;
- Create active spaces at the secondary education level to promote the culture of transformative research from an early age;
- Support studies focused on Framing 3 that favor the understanding of the phenomenon and disseminate the results in the local context;
- Deliver, through the university–industry–government partnership, products, processes, and services in line with Framing 3.

Furthermore, during the event, participants discussed the importance of creating incentives for scientific, economic, political, and social production focused on transformative innovation. Similarly, they identified the existence of advanced processes related to this type of policy, but they are found at the bottom of the pyramid. Moreover, it was demonstrated that civil society should be involved in these initiatives. Therefore, different strategies and methodologies should be designed using a clearer and more familiar language so that people feel included and can freely express their opinions.

In general, participants agreed on the idea that the regional education policy should be changed. In this regard, a good starting point could be revising educational models, evaluation systems, and curriculum approaches according to the TIP framing. In addition, they also considered the possibility of including transformative policy concepts in national, regional, departmental, municipal, and university development plans. In the case of universities, their recommendation was to incorporate Framing 3 in their three main functions.

All of the above should be supported by a culture of transformative innovation that permeates the production system. In turn, this culture should be fostered at all educational levels. For example, in this study, we proposed the promotion of processes that apply the three framings in order to enhance the understanding of the phenomenon and disseminate the results in the local context. Likewise, we suggested stimulating the creation of spin-offs as organizations capable of aligning competitiveness and sustainable development. In the social field, we highlighted the importance of identifying new spaces where organized civil

society actors can actively participate—such as transformative innovation laboratories in which grassroots communities can conduct experiments.

Regarding the elements of TIP, in Latin America, the *directionality* of the STI policy for HEIs should be training its human talent in STI capabilities. Nevertheless, some social inclusion elements are also important. As for the transformation of socio-technical systems, this is not a function explicitly included in the mission of HEIs. In terms of the societal goal and SDGs, there are some thematic foci in which HEIs are involved. With respect to the relationships among actors, the policy promotes the triple helix; therefore, it is possible to make changes that have an impact at the system level. In addition, the elements of second-order learning—such as reflexivity and conflict vs. consensus—are not obvious in the policy but stood out in the experiment. Initially, participants defended their own positions, regardless of the proposed objective, so the organizing team intervened to reach a consensus. Lastly, inclusiveness should be strengthened because current strategies, such as the university–industry–government committee (with extensive experience in the city), do not involve civil society, which is a key element of the proposed Framing 3.

5. Theoretical and Practical Implications

Regarding the theoretical implications and contributions, we managed to demonstrate, based on the proposed hypothesis, that HEIs have a major role in innovation systems because they are spaces for knowledge generation. Consequently, their participation in the implementation of innovation initiatives, such as TIP, is paramount. The traditional innovation dynamics in which universities are currently involved are not sufficient to respond to the social and environmental challenges that threaten the sustainability of the regional development model. Therefore, HEIs should take action and influence public policies.

From a practical perspective, based on the case studied, a collaborative construction space was created for different actors in the quadruple helix (university–industry–government–society). The purpose of this space was that, together, they could contribute—based on their knowledge, realities, and experiences—to the formulation of proposals and guidelines for a regional public STI policy to address local social and environmental challenges.

6. Limitations and Future Research Lines

One of the main limitations here is that this was a single case study, which—although it is an accepted methodology for making inferences—is insufficient to formulate a general theory. However, as this case took place in a developing Latin American region with a robust regional innovation system, we can draw interesting conclusions about the phenomenon under study. Considering these limitations, similar studies can compare the results of different regions in a country or different developing countries.

7. Conclusion and Recommendations

Latin American universities play a leading role in the promotion and implementation of TIP due to their historical commitment to social welfare. In this sense, the case analyzed here shows that universities have largely encouraged innovations aimed at social inclusion, considering the problems of this nature that persist in the region [15]. However, developing transformative innovations will also require us to consider, in addition to social inclusion issues, the forms of consumption and production that will transform socio-technical systems [10]. Therefore, universities—using knowledge, science, and technology—can draw interest in the big challenges expressed in the SDGs. Likewise, through research and extension projects, they can create niches with other NIS actors to test new technologies and practices that have the potential to impact different socio-technical systems [69]. Furthermore, universities can internally drive new strategies for the transition to sustainability, including sustainable campuses, among other initiatives that are being undertaken in the region [51,69].

The COVID-19 pandemic had a significant impact on innovation by universities. Due to the sudden shift to online learning, universities had to adopt new teaching methods and

technologies to ensure the continuity of education [78–80]. In addition, in terms of funding and opportunities, many institutions faced budget cuts and reduced funding for research projects [81].

We confirmed the need for transformative changes at the structural level to encourage transformative innovation as well as the importance of involving universities in these transformations. We also found that the territory and the regions are fundamental actors for carrying out the necessary transformations since different perceptions of problems create a suitable environment for reaching consensual and effective solutions. This requires a real articulation between NIS actors and the active participation of researchers, students, civil society representatives, and citizens in general. This transformation at the regional level is essential to lay the foundations for a policy aimed at solving problems at the local level but with a global approach and a well-defined orientation, direction, and intention.

As this study was carried out, we confirmed that universities are fundamental actors in the development of transformative innovation because they integrate education, research, and extension around a transformative approach. In these processes, the principles of transitions theory as well as those of the SDGs are incorporated into the university mission, without neglecting the needs of the market, and focusing on the development of transformative social, inclusive, grassroots, under-the-radar, or frugal innovation. Universities have been identified as key contributors to sustainable development through social innovation [82].

The event managed to put on the table various aspects of HEIs, such as their role in the current STI policy, their participation in inter-institutional alliances, and their mission to train human talent. It was also said that innovation depends on the type of human beings that universities aim to produce (i.e., educate). Therefore, it is necessary to identify the profiles required for transformative innovation, given that universities can play a leading role in the search for and training of such profiles.

Some universities have cooperative extension programs that connect research groups with social problems. However, these institutions should move from programs to missions that incorporate elements of Framing 3. It is under this new paradigm that universities' Third Mission should be conceived and implemented, without neglecting the needs of the market and the scope of their solutions but focusing on the development of innovations that contribute to the improvement of the socio-economic, cultural, political, cognitive, and environmental conditions that persist in Latin America.

Regarding policy suggestions, we specifically recommend adopting Framing 3 (i.e., TIP) because it deals with social and environmental challenges at the local, regional, national, and international levels and seeks to achieve the SDGs through science, technology, and innovation. Framing 3 requires redirecting and reorienting STI processes, which demands changes in socio-technical systems that, at this historical moment, are not compatible with sustainability.

Additionally, Framing 3 seeks to create spaces for experimentation and the engagement of different actors to produce new socio-technical systems that support the necessary transformations for the emergence of sustainable routines and practices. For this to happen, the processes should adopt a bottom-up approach. This is because it is at the bottom where change takes place, the actors there are outside centers of power, and they are often the ones facing the biggest challenges. This is how innovative and disruptive ideas emerge. As a result, new socio-technical systems can be created by the scientific community, industry, users, social movements, and civil society.

The main limitation of this policy is that, although governments foster these processes, it is not enough to bring about change. Consequently, we should encourage experimentation and inclusion of all nonconventional actors in this process to achieve transformative change.

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References

1. Crivits, M.; Krom, M.P.; Dessein, J.; Block, T. Why innovation is not always good: Innovation discourses and political accountability. *Outlook Agric.* **2014**, *43*, 147–155. [CrossRef]
2. Altenburg, T.; Lundvall, B. *Handbook of Innovation Systems and Developing Countries: Building Domestic Capabilities in a Global Setting*; B. Building inclusive innovation systems in developing countries: Challenges for IS research; Edward Elgar Publishing: Cheltenham, UK, 2009; pp. 33–56; ISBN 1849803420.
3. Fressoli, M.; Dias, R.; Thomas, H. *Beyond Imported Magic. Essays on Science, Technology, and Society in Latin America*; Innovation and Inclusive Development in the South: A critical perspective; MIT Press: Cambridge, MA, USA, 2014; pp. 45–63; ISBN 0262526204.
4. Hernández, J.L.S. Innovación Inclusiva Con Instituciones Inclusivas. In Proceedings of the Conferencia Internacional Lalics (Vol. 11), Rio de Janeiro, Brasil, 11–12 November 2013.
5. Rui, J. Institution level, policy option and inclusive innovation in China. In Proceedings of the 2013 6th International Conference on Information Management, Innovation Management and Industrial Engineering, Xi'an, China, 23–24 November 2013.
6. Sonne, L. Innovative initiatives supporting inclusive innovation in India: Social business incubation and micro venture capital. *Technol. Forecast. Soc. Chang.* **2012**, *79*, 638–647. [CrossRef]
7. Srinivas, S. Demand and Innovation: Paths to Inclusive Development. In *Innovation in India: Combining Economic Growth with Inclusive Development*; Cambridge University Press: Cambridge, UK, 2014; ISBN 1107037565.
8. Stezano, G. Innovation, competitiveness and economic development in Latin America: Challenges and opportunities. *J. Innov. Knowl.* **2021**, *6*, 103–111. [CrossRef]
9. Villa, E.; Hormecheas, K.; Robledo, J. De la innovación competitiva a la innovación inclusiva: El rol de la universidad latinoamericana. In Proceedings of the XVII Congreso Latino-Iberoamericano de Gestión Tecnológica ALTEC 2017, Ciudad de México, Mexico, 16–18 October 2017.
10. Schot, J.; Steinmueller, W.E. Three frames for innovation policy: R&D, systems of innovation and transformative change. *Res. Policy* **2018**, *47*, 1554–1567. [CrossRef]
11. Abbas, J.; Aman, J.; Nurunnabi, M.; Bano, S. The impact of social media on learning behavior for sustainable education: Evidence of students from selected universities in Pakistan. *Sustainability* **2019**, *11*, 1683. [CrossRef]
12. Jia, L.; Hu, X.; Zhao, Z.; He, B.; Liu, W. Digital Development and Technological Innovation Affect China's Green Economy Performance: Evidence from Dynamic Thresholds and System GMM Panel Data Approaches. *Energies* **2022**, *15*, 884. [CrossRef]
13. Weber, K.M.; Rohracher, H. Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive 'failures' framework. *Res. Policy* **2012**, *41*, 1037–1047. [CrossRef]
14. Diercks, G.; Larsen, H.; Steward, F. Transformative innovation policy: Addressing variety in an emerging policy paradigm. *Res. Policy* **2019**, *48*, 880–894. [CrossRef]
15. Wanka, A.; Hess, M.; Lain, D. New pathways in retirement research: Innovative perspectives on social inequalities and the distribution of transitional risks. *Front. Sociol.* **2022**, *7*, 984874. [CrossRef]
16. Mowery, D.C.; Sampat, B.N. Universities in National Innovation Systems. In *Oxford Handbook of Innovation*; Fagerberg, J., Mowery, D.C., Nelson, R.R., Eds.; Oxford University Press: Oxford, UK, 2005; pp. 209–239.
17. Westnes, P.; Hatakenaka, S.; Gjelsvik, M.; Lester, R.K. The role of Universities in strengthening local capabilities for innovation—A comparative case study. *High. Educ. Policy* **2009**, *22*, 483–503. [CrossRef]
18. Robledo, J. De los grupos consolidados de investigación a los sistemas dinámicos de innovación: El desafío actual del desarrollo científico y tecnológico colombiano. *Dyna* **2007**, *74*, 152.
19. Cortés, F. La relación universidad-entorno socioeconómico y la innovación. *Rev. Ing. E Investig.* **2006**, *26*, 94–101. Available online: http://www.scielo.org.co/pdf/iei/v26n2/v26n2a11.pdf (accessed on 1 March 2023).

20. Etzkowitz, H.; Leydesdorff, L. The dynamics of innovation: From National Systems and "Mode 2" to a Triple Helix of university–industry–government relations. *Res. Policy* **2000**, *29*, 109–123. [CrossRef]
21. Padilla-Pérez, R.; Gaudin, Y. Science, technology and innovation policies in small and developing economies: The case of Central America. *Res. Policy* **2014**, *43*, 749–759. [CrossRef]
22. Sagasti, F. Ciencia, Tecnología, Innovación. Políticas para América Latina. *Perfiles Educ.* **2011**, *34*, 135.
23. Montejo, M.F.C. La protección interamericana de la libertad sindical y de la estabilidad laboral: El caso Lagos del Campo v/s Perú. *Rev. Chil. Derecho Trab. Segur. Soc.* **2017**, *8*, 143–149.
24. Mora, J.G.; Serra, M.A.; Vieira, M.J. Social Engagement in Latin American Universities. *High. Educ. Policy* **2018**, *31*, 513–534. [CrossRef]
25. Arocena, R.; Sutz, J. Looking at National Systems of Innovation From the South. *Ind. Innov.* **2000**, *7*, 55–75. [CrossRef]
26. Groneberg, D.A.; Braumann, H.; Rolle, S.; Quarcoo, D.; Klingelhöfer, D.; Fischer, A.; Nienhaus, A.; Brüggmann, D. Needlestick Injuries: A Density-Equalizing Mapping and Socioeconomic Analysis of the Global Research. *Int. Arch. Occup. Environ. Health* **2020**, *93*, 995–1006. [CrossRef]
27. Dutrénit, G.; Sutz, J. *National Innovation Systems, Social Inclusion and Development: The Latin American Experience*; Edward Elgar Publishing: Cheltenham, UK, 2017; Available online: http://www.e-elgar.com/shop/national-innovation-systems-social-inclusion-and-development (accessed on 1 March 2023).
28. Torche, F. Intergenerational Mobility and Inequality: The Latin American Case. *Annu. Rev. Sociol.* **2014**, *40*, 619–642. [CrossRef]
29. Alcorta, L.; Peres, W. Innovation Systems and Technological Specialization in Latin America and the Caribbean. *Res. Policy* **1998**, *26*, 857–881. [CrossRef]
30. Tapia, F.H.; Rincón, J.V.S. Rol de las Universidades en el Sistema Nacional de Innovación Mexicano. *Rev. Venez. Gerenc.* **2021**, *26*, 139–157. [CrossRef]
31. Erbes, A.; Suárez, D.; Katz, J.; Arocena, R.; Sutz, J.; Dutrénit, G.; Puchet, M.; Teubal, M.; Olivari, J.; Stubrin, L.; et al. Repensando el Desarrollo Latinoamericano: Una Discusión Desde Los Sistemas de Innovación. 2016. Available online: http://repositorio.ungs.edu.ar:8080/handle/UNGS/275 (accessed on 1 March 2023).
32. Guaipatin, C.; Schwartz, L. Análisis del Sistema Nacional de Innovación. In *Hacia la Consolidación de una Cultura Innovadora*; Banco Interamericano de Desarrollo: Washington, DC, USA, 2014; Available online: https://www.epn.edu.ec/wp-content/uploads/2017/03/CTI-MON-Ecuador-An%C3%A1lisis-del-Sistema-Nacional-de-Innovaci%C3%B3n.pdf (accessed on 1 March 2023).
33. Leite, E.; Correia, E.B.; Sánchez-Fernández, M.D. El espíritu emprendedor: Condicionantes para la innovación. *Holos* **2015**, *5*, 278–291. [CrossRef]
34. Rodriguez Rengifo, J.S.; Quintero Sepúlveda, I.C. Capacidades de innovación empresarial en américa latina revisión de literatura. *Cienc. Adm.* **2022**, *19*, 8. [CrossRef]
35. Bernal-Torres, C.A.; Frost-González, S. Innovación abierta en empresas colombianas: Reto a superar. *Rev. Venez. Gerenc.* **2015**, *20*, 252–267. [CrossRef]
36. Matute, S.R.M.; Galarza, E.B.G.; Luzuriaga, L.G.P.; Ordóñez, L.B.T.; Rivera, W.B.P. Innovación en las empresas manufactureras de Cuenca. *Kill. Soc. Rev. Investig. Cient.* **2021**, *5*, 9–16. [CrossRef]
37. Gierhake, K.; Jardon, C.M.F. El papel de las universidades locales en la difusión de innovaciones sociales: El caso del distrito municipal de Quito. *Visión Futuro* **2022**, *26*, 123–148.
38. Cadena, G.F. Caso: Beneficios económicos por lograr transferencia tecnológica de una patente en una universidad latinoamericana. *Rev. Mutis* **2022**, *12*, 2.
39. Martínez, N.; Dutrénit, G.; Gras, N.; Tecuanhuey, E. Actores, relaciones estructurales y causalidad en la innovación inclusiva: Un caso de telemedicina en México. *Innovar* **2018**, *28*, 23–38. [CrossRef]
40. García Ospina, J.M.; Prado Castillo, N.F. Financiación Pública de la Innovación en Colombia: Efectos y Retos en la Industria Manufacturera. Master's Thesis, Pontificia Universidad Javeriana, Cali, Colombia, 2018.
41. Marcano, D.D.V.; Rojas, L.M.; de Perozo, S.M. Gestión de la innovatividad universitaria. *Entrelineas* **2021**, *1*, 5–20. [CrossRef]
42. Hurtado-Torres, N.E.; Delgado-Márquez, B.; Cordón-Pozo, E.; Pedauga, L.E. No siempre más es mejor: La diversidad de las redes de innovación en las subsidiarias. *Emprend. Neg. Int.* **2018**, *3*, 1–6. [CrossRef]
43. German-Soto, V.; Rubio, M.S.; Flores, L.G. Innovación y crecimiento económico regional: Evidencia para México. *Probl. Desarro.* **2021**, *52*, 145–172. [CrossRef]
44. Romero, D.; Acosta, F.A.P. Innovación, un acercamiento a su concepto, alcance, elementos y capacidades que la generan. *CITAS Cienc. Innov. Tecnol. Ambiente Soc.* **2017**, *3*, 5. [CrossRef]
45. Jensen, M.B.; Johnson, B.; Lorenz, E.; Lundvall, B.A. Forms of knowledge and modes of innovation. *Res. Policy* **2007**, *36*, 680–693. [CrossRef]
46. Freeman, C. Technological infrastructure and international competitiveness. *Ind. Corp. Chang.* **2004**, *13*, 541–569. [CrossRef]
47. Freeman, C. *Technology Policy and Economic Performance: Lessons from Japan*; Pinter: London, UK, 1987.
48. Lundvall, B.-Å. *Product Innovation and User-Producer Interaction*; Aalborg University Press: Aalborg, Denmark, 1985.
49. Nelson, R.R.; Winter, S.G. *An Evolutionary Theory of Economic Change*; The Belknap Press of Harvard University: Cambridge, MA, USA, 1982; p. 93. [CrossRef]
50. Schot, J.; Geels, F.W. Strategic niche management and sustainable innovation journeys: Theory, findings, research agenda, and policy. *Technol. Anal. Strateg. Manag.* **2008**, *20*, 537–554. [CrossRef]

51. Transformative Innovation Policy Consortium. About—Transformative Innovation Policy. 2018. Available online: https://www.tipconsortium.net/ (accessed on 17 January 2023).
52. Gras, N.; Dutrénit, G.; Vera-Cruz, M. Innovaciones inclusivas: Un modelo basado en agentes. In *El Proceso de Modelado En Economía y Ciencias de La Gestión*; Universidad Michoacana de San Nicolás de Hidalgo: Maporrúa, Mexico, 2017; pp. 57–100.
53. Thomas, H.; Fressoli, M. Technologies for Social Inclusion in Latin America. Analysing opportunities and constraints. In Proceedings of the 2011 Atlanta Conference on Science and Innovation Policy, Atlanta, GA, USA, 15–17 September 2011.
54. Prahalad, C. *The Fortune at the Bottom of the Pyramid*; Pearson Education-Wharton School Publishing: San Francisco, CA, USA, 2005.
55. Monaghan, A. Conceptual niche management of grassroots innovation for sustainability: The case of body disposal practices in the UK. *Technol. Forecast. Soc. Chang.* **2009**, *76*, 1026–1043. [CrossRef]
56. Seyfang, G.; Hielscher, S.; Hargreaves, T.; Martiskainen, M.; Smith, A. A grassroots sustainable energy niche? Reflections on community energy in the UK. *Environ. Innov. Soc. Transit.* **2014**, *13*, 21–44. [CrossRef]
57. Seyfang, G.; Longhurst, N. Desperately seeking niches: Grassroots innovations and niche development in the community currency field. *Glob. Environ. Chang.* **2013**, *23*, 881–891. [CrossRef]
58. Smith, A.; Ely, A.; Fressoli, M.; Abrol, D. *Grassroots Innovation Movements*; Elisa, A., Ed.; Routledge: London, UK, 2016.
59. Franco, J.; Guerra, A. *Nuevos Enfoques de la Innovación: Inclusión Social y Sostenibilidad*; Foro Consultivo Científico y Tecnológico: Ciudad de México, Mexico, 2018.
60. Rosca, E.; Arnold, M.; Bendul, J.C. Business models for sustainable innovation—An empirical analysis of frugal products and services. *J. Clean Prod.* **2017**, *162*, 5133–5145. [CrossRef]
61. Heeks, R.; Amalia, M.; Kintu, R.; Shah, N. Inclusive Innovation: Definition, conceptualisation and future research priorities. *Manch. Cent. Dev. Inform.* **2013**, *53*, 1–26. [CrossRef]
62. COLCIENCIAS a. Libro verde 2030—Colciencias—El Libro Verde 2030 Presenta la Política Nacional de Ciencia e Innovación Que a Través de un Enfoque Transformativo Busca Aportar a la Solución de Los Grandes Desafíos Sociales, Ambientales y Económicos Expresados en Los O. 2018. Available online: http://libroverde2030.gov.co/ (accessed on 1 March 2023).
63. Sutz, J. Ciencia, Tecnología, Innovación e Inclusión Social: Una agenda urgente para universidades y políticas. *Psicol. Conoc. Soc.* **2010**, *1*, 3–49.
64. Agencia Nacional de Investigación e Innovación. Fondo de Innovaciòn Inclusiva. 2017. Available online: http://www.anii.org.uy/apoyos/investigacion/90/innovacion-inclusiva-investigacion/ (accessed on 1 March 2023).
65. CAF. El Laboratorio de Innovación Inclusiva DIA Presentará los Resultados de su Primer año de Implementación en México. 2016. Available online: https://www.caf.com/es/actualidad/noticias/2016/08/el-laboratorio-de-innovacion-inclusiva-dia-presentara-los-resultados-de-su-primer-ano-de-implementacion-en-mexico/?parent=32493 (accessed on 1 March 2023).
66. Congreso de la República de Colombia. Plan Nacional de Desarrollo 2014–2018. Todos por un Nuevo País. 2014. Available online: https://colaboracion.dnp.gov.co/cdt/pnd/pnd%202014-2018%20tomo%201%20internet.pdf (accessed on 1 March 2023).
67. COLCIENCIAS. Ciencia, Tecnología e Innovación. Actores del Sistema Nacional de Ciencia, Tecnología e Innovación. 2016. Available online: https://minciencias.gov.co/sites/default/files/ckeditor_files/politiciadeactores-snctei.pdf (accessed on 1 March 2023).
68. COLCIENCIAS. Convocatoria Ideas para el Cambio—BIO 2016 | COLCIENCIAS. 2016. Available online: https://minciencias.gov.co/sites/default/files/upload/reglamentacion/03-proyecto-oferta-colciencias-ideas-para-el-cambio_0.pdf (accessed on 1 March 2023).
69. Bizerril, M. *Universities in Transition to Sustainability: Challenges and Opportunities for the Campus of the University of Brasilia in Planaltina*; Springer: Cham, Switzerland, 2018.
70. Alarcón, F.; Beneitone, P.; Armas, R.D.; Franco, S.R.K.; Suñé, L.; Veneros, D. Student Workload and Degree Profiles: The experience of CLAR credit in Latin America. *Tuning J. High. Educ.* **2013**, *1*, 165–186. [CrossRef]
71. Coronel, P.J.Y.D. A brief history of the foundation of an emblematic university in the rain forest of Ecuador and an innovative approach to the design and planning of academic program curricula for Latin America. *Rev. Educ. Super. Soc. (ESS)* **2021**, *33*, 661–685.
72. Oyama, K.; Pasquier, A.G.; Mojica, E. Transition to sustainability in macro-universities: The experience of the National Autonomous University of Mexico (UNAM). *Sustainability* **2018**, *10*, 4840. [CrossRef]
73. Sampieri, R.H.; Collado, C.F.; del P, M. *Metodología de la Investigación*; McGraw Hill: Ciudad De México, México, 2010.
74. Yin, R.K. Diseño y métodos. In *Investigación Sobre Estudio de Casos*; SAGE Publications: Newbury Park, CA, USA, 1994; pp. 1–35.
75. Villa, E.; Osorio, L.J.; Boni, A.; Robledo, J.; Gómez, M.E.; Villalba, M.L.; García, J.; Hormecheas, K. Factoría de Política de Ciencia, Tecnología e Innovación para la Transformación. 2018. Available online: https://www.escolme.edu.co/escolme-presente-en-la-factoria-de-politica-de-ciencia-tecnologia-e-innovacion-cti-para-la-transformacion/ (accessed on 10 February 2023).
76. COLCIENCIAS b. Sobre Colciencias | COLCIENCIAS. 2018. Available online: http://www.colciencias.gov.co/quienes_somos/sobre-colciencias (accessed on 1 March 2023).
77. COLCIENCIAS; SPRU. *Orientaciones para la Formulación de Políticas Regionales de Innovación Transformativa en Colombia*; Departamento Administrativo de Ciencia, Tecnología e Innovación: Bogotá, Colombia, 2018. Available online: https://www.tipconsortium.net/es/resource/orientaciones-para-la-formulacion-de-politicas-regionales-de-innovacion-transformativa-en-colombia/ (accessed on 10 March 2023).

78. Başaran, S.; Hussein, K.A. Determinants of University Students' Intention to Use Video Conferencing Tools during COVID-19 Pandemic: Case of Somalia. *Sustainability* **2023**, *15*, 2457. [CrossRef]
79. Rahman, M.K.; Bhuiyan, M.A.; Hossain, M.M.; Sifa, R. Impact of technology self-efficacy on online learning effectiveness during the COVID-19 pandemic. *Kybernetes* **2023**. [CrossRef]
80. Micah, A.E.; Bhangdia, K.; Cogswell, I.; Lasher, D.; Lidral-Porter, B.; Maddison, E.; Nguyen, T.N.N.; Patel, N.; Pedroza, P.; Solorio, J.; et al. Global investments in pandemic preparedness and COVID-19: Development assistance and domestic spending on health between 1990 and 2026. *Lancet Glob. Health* **2023**, *11*, e385–e413. [CrossRef]
81. Ling, L. Universities and research in times of crisis: The getting of wisdom. *Qual. Res. J.* **2020**, *20*, 361–371. [CrossRef]
82. Juliani, D.P.; Silva, A.; Cunha, J.; Benneworth, P. Universities' contributions to sustainable development's social challenge: A case study of a social innovation practice. In *Socio-Economic Development: Concepts, Methodologies, Tools, and Applications*; IGI Global: Hershey, PA, USA, 2019; pp. 379–399.