

Line 1

University-Company-State: Shared Responsibility

Abstract

The chapters proposed in this line lay the foundations for the University-State-Relationship alliance and highlight the social responsibility that must now be taken on by each of these three sectors. The texts take into account the prevailing trend of globalization in the 21st century, which necessitates the creation of human capital for the progress of an enterprising culture that revolves around associative principles and processes of research and innovation. In this culture, universities are considered to have a leading role in human evolution, and implement strategies that influence the construction of a just, equitable, participative, and democratic society.

The texts provide a vision that invites us to reflect on the countless opportunities and new paths that the University-Company-State triad has as it continues consolidating itself as a leading figure in the country's growing ecosystem that integrates offerings of universities with the needs of the business sector and creates open innovation processes that are vital when prioritizing knowledge generation for the productive sector. It is worth highlighting that in a linear model, the role of the university is limited to creating knowledge to contribute to scientific development, the quality of which is assessed by the same scientific community. Today, the actions, decisions, and practices in this field are moving to a participative and interactive model in which the university establishes itself as a participating entity, initiating the process by conducting basic and applied research. The university thereby becomes the academic and investigative space for the socioeconomic environment.

Keywords: regional development, innovation, research, University-Company-State relationship, social responsibility.

Línea 1

Universidad-Empresa-Estado: responsabilidad compartida

Resumen

Los capítulos propuestos en esta línea fundamentan la alianza Universidad–Empresa–Estado y corresponden a resultados de investigación y reflexión crítica consciente en este campo, priorizando la responsabilidad social que deben cumplir en la actualidad los actores involucrados en cada uno de estos tres sectores, teniendo en cuenta que la tendencia de globalización imperante en el siglo XXI, requiere la formación de capital humano para el avance de una cultura emprendedora a partir de principios asociativos y procesos de investigación e innovación como eje articulador. La universidad se considera protagonista en los procesos de evolución de la humanidad, implementando estrategias que impactan la construcción de una sociedad justa, equitativa, participativa y democrática.

Los textos aportan una visión que invita a reflexionar sobre las incontables oportunidades y nuevas trayectorias que tiene el trabajo de la tríada Universidad-Empresa-Estado, para consolidarse como protagonista del creciente ecosistema de innovación en el país, donde se integra la oferta de investigación de la universidad con las necesidades del sector empresarial, permitiendo generar procesos de innovación abierta, esenciales en el momento de priorizar la generación de conocimiento para el sector productivo. Se destaca que del modelo lineal, en el que el papel de la Universidad se limita a crear conocimiento para aportar al desarrollo de la ciencia, cuya calidad es evaluada por la misma comunidad científica, hoy las acciones, decisiones y prácticas en este campo se mudan a un modelo participativo e interactivo en el cual la universidad se erige como un agente que se integra, dando inicio al proceso mediante el desarrollo de investigación básica y aplicada, y se convierte en el escenario académico e investigativo de cara a su entorno socioeconómico.

Palabras clave: desarrollo regional, innovación, investigación, relación Universidad-Empresa-Estado, responsabilidad social.

The University-Company-State Dynamic: A Collaborative Effort for Driving Open Innovation in Cauca

Dinámica Universidad-Empresa-Estado: un esfuerzo de colaboración para encaminar la innovación abierta en el Cauca

Luz Stella Pemberthy-Gallo and Adolfo Plazas-Tenorio

Abstract

The spaces for meeting, relationship building, knowledge management, and coordination among stakeholders that have facilitated University-Company-State initiatives in the Cauca department have also resulted in the development and consolidation of a collective and participative strategy for social and productive innovation. This strategy is known as “Innovation hubs based on knowledge management to promote the development of innovative products in Cauca.”

The strategy is a collaborative effort among the stakeholders in the region and is founded on trust, dialogue, partnerships, and the signing of agreements for driving open innovation in Cauca.

This participative building process occurs through a methodology that involves conducting workshops to raise awareness and spread and systematize information, training programs, business innovation conferences, and research meetings, formulation and execution of projects, and exchange of knowledge and experiences.

Keywords: knowledge management, open innovation, innovation hubs, ucs dynamics, experience exchange.

Resumen

Los escenarios de encuentro, relacionamiento, gestión del conocimiento y articulación de actores que han propiciado las dinámicas Universidad-Empresa-Estado en el departamento del Cauca muestran como resultado la proyección y consolidación de una estrategia colectiva y participativa de innovación social y productiva denominada “Núcleos de innovación fundamentados en gestión del conocimiento para promover el desarrollo de productos innovadores en el Cauca”.

Esta estrategia es un esfuerzo de colaboración de los actores de la región, y se fundamenta en la confianza, en procesos de diálogos, en alianzas y en la firma de pactos para encaminar la innovación abierta en el Cauca.

La metodología empleada para este proceso de construcción participativa se hace por medio del desarrollo de talleres de sensibilización, socialización y sistematización, al igual que de programas de capacitación, ruedas de negocios de innovación, formulación y ejecución de proyectos, encuentros de investigación e intercambio de conocimientos y experiencias.

Palabras clave: gestión del conocimiento, innovación abierta, núcleos de innovación, dinámicas UEE, intercambio de experiencias.

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Introduction

In line with the goals of strengthening the Regional Systems of Science, Technology, and Innovation (SRCTI) set out by law 1286 of 2009, and with the proposal of the Pact for Innovation 2011 that presents and endorses the creation of innovation hubs, the Cauca department is attempting to generate innovative and sustainable processes for closer relationships and collaborative work between academia, business, and the State. The goal is to create innovative products from some of the technological prototypes and developments that have been the successful results of many emblematic partnerships among stakeholders in this system, and that offer high potential for commercialization in domestic and global markets.

Using collaborative learning strategies, the most critical aspects are dealt with in order to progress from a prototype to a product. These include: implementing innovation management processes; assessing the market and competition using competitive intelligence; technological vigilance; aspects of intellectual property; creating shared goals between researchers and entrepreneurs; and jointly managing R&D projects, technology-based entrepreneurship, and product development, among others.

In a turbulent environment subject to constant and unpredictable change, a company's competitive capacity is increasingly built on introducing new practices into the market, or in other words, on implementing innovations. Possible innovations include the development of new products and production processes, changes in marketing approach, new distribution methods, and even new management systems and organizational structures. Similarly, new management theories state that the capacity to innovate increasingly lies in knowledge and, above all, in the ability of companies and business associations to manage this knowledge in order to add value for the customer (Pérez Sedeño & Cimoli, 2009).

It is this idea that impels and underpins the third-generation knowledge management (KM) strategy known as "Innovation Hubs" in different business and social associations in Cauca. It is important to clarify that first-generation KM focuses on gathering and storing knowledge in a digital format; second-generation KM centers on the flow and circulation of this knowledge; and finally, third-generation KM places importance on the context and capitalization of knowledge in the organizational environment (Rica Pérez & Arbonies Ortiz, 2003).

The road ahead is not clear, however, and Cauca faces many challenges in becoming an innovative region. A diagnosis of regional business innovation can be summarized as follows:

- 1) Companies with a commitment to strategic production work in an isolated manner, making it difficult for the SRCTI to support these processes. It also leads to duplication of effort and hampers the identification of common problems that could be solved collectively; that is, the sectors do not have mechanisms for partnering among businesses that would allow them to advance in processes of open innovation.
- 2) The productive sector lacks the knowledge, capacity, and skills to develop its own initiatives and projects with an emphasis on research and development for innovation—a vital aspect if it hopes to be competitive.
- 3) On top of this, there is a lack of enterprise and innovation culture. Few innovative business initiatives can be seen, slowing business growth and development in the region.

In this context, innovation is the coming to fruition of collective efforts to build in the medium- and long-term. Accordingly, a strategy must be defined and a KM model adopted that allows the region to reach its ambitious goals (Arbonies Ortiz, 2001). To exploit competitive advantages in knowledge, changes in business culture are required; isolated organizations must evolve into interconnected ones, and traditional organizations into knowledge-based ones. In line with this premise, Cauca's social and economic situation requires new strategies to be developed so that open innovation is built through the confluence of social knowledge networks and with the involvement of communities, municipal authorities, and NGOs, representing an effort driven by all.

Background and experiences

Since 1996, when the Regional Plan for Colombian Pacific Science and Technology was devised, the stakeholders in the Cauca SRCTI have conducted collective and participative value-adding exercises, allowing them to drive open innovation in the department. Table 1.1 presents a brief chronological description of the local initiatives and exercises that have been most significant in achieving this objective in Cauca.

The common element in these initiatives is a knowledge management approach that facilitates processes of business and social innovation in the region through strategies of awareness raising, communication, training, promotion, technical support, and coordination among stakeholders in the University-Company-State relationship. These stakeholders include the industrial sector in northern Cauca; small-scale rural agri-chains; higher education institutions; research groups;

government authorities; scientific, technological, and innovation interface institutions; and the National Innovation System (SIN).

Table 1.1 ucs initiatives in the Cauca department

ucs Initiatives	Participants	Scope
Science and Technology Plan for the Pacific Region of Colombia, 1996-2006	Stakeholders in the ucs triad in the Chocó, Valle, Cauca, and Nariño departments	Contribute to increased competitiveness in strategic regional and departmental sectors
Network of regional science and technology stakeholders in the Pacific departments of Colombia: RedpacíficoCyT, 2000-2001	Stakeholders in science and technology initiatives in the Chocó, Valle, Cauca, and Nariño departments	Broaden the concept of human networks, virtual communities, and support portals. Decision to work on consolidating the Cauca Regional System of Science, Technology and Innovation
Departmental Board of Science, Technology, and Innovation (Codecti), 1994	Stakeholders in the ucs triad and the Cauca Regional System of Science, Technology, and Innovation	Incorporate science and technology practices into economic, social, and environmental activities in Cauca in order to promote integral development
Cauca's Vision: Our path to the future, 2000-2003	Social organizations; stakeholders in the ucs triad; the Cauca Regional System of Science, Technology, and Innovation; and interface institutions	A work space and neutral reflection to recover identity and sense of belonging, focusing on six key ideas: 1. Environment and eco-region; 2. Cultural and intercultural coexistence; 3. Development model; 4. Concept of the public: the State-citizen relationship; 5. Education; 6. Citizen coexistence
Cauca Agenda for Science, Technology, and Innovation, CaucaCyT, 2004-2005	Social organizations, ucs stakeholders, interface institutions, and stakeholders in the Cauca Regional System of Science, Technology, and Innovation	Build networks of regional stakeholders around eight central themes: 1. Human development and quality of life; 2. Food security; 3. Production development, chains and cluster; 4. Clean production and sustainable use of biodiversity; 5. Eco-region and environment; 6. Land-use planning; 7. Cultural identity and intercultural coexistence; 8. The public: State-citizen relationship. Each of these are supported by education, science, and technology, which cut across all eight networks to facilitate social appropriation of new and traditional knowledge and promote development in the Cauca department.

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ucs Initiatives	Participants	Scope
Internal agenda for productivity and competitiveness in the Cauca department, 2004-2006	National and regional government, business sector, associations, interface institutions, and leaders of production initiatives: agri-chains; special coffees; forestry; fruit and vegetables; livestock; handicrafts; software industry; mining; knowledge region; tourism; and the Pacific Cauca	Identify strategic productive sectors and strengthen them by prioritizing actions and projects that mark out the economic and social development of the region
Cauca regional competitiveness commission, 2007-2012	Stakeholders in the ucs triad in Cauca, with the support of the national government; interface institutions	Neutral space for discussing and agreeing on priorities for the business and productive sector in the Cauca department
University-Company-State dynamics, Cauca and Nariño, 2009-2013	Stakeholders in the ucs triad; associations; interface institutions; and stakeholders in the Cauca Regional System of Science, Technology, and Innovation	Strengthen University-Company-State (ucs) relationships in Cauca and Nariño based on social network theory and the adopting of methodologies related to the creation of business and institutional networks
Business innovation conferences: Cauca and Nariño ucs partnership, 2011 and 2013	Stakeholders in the ucs triad; associations; interface institutions; and stakeholders in the Cauca and Nariño Regional Systems of Science, Technology, and Innovation	Interaction between companies and university research groups to jointly create relevant innovation projects and consolidate the Regional System of Open Innovation in Cauca and Nariño
Departmental Development Plan: Cauca, every opportunity, 2012-2015	Cauca Departmental Government Team, Cauca Autonomous Regional Corporation (CRC), and approximately 6,000 people from all social and community sectors as well as leaders from Cauca's diverse social, political, and cultural fabric	"A route map that will allow us to successfully face the challenges of the complex and rapid world of today and create, side by side, the material conditions to live in a society that is open, inclusive, democratic, fair, and peaceful" (Gobernación del Cauca, 2012)
Regional Innovation Pact: a collective vision of development in Cauca, 2011-2013	Stakeholders in the ucs triad, associations, interface institutions, and stakeholders in the Cauca Regional System of Science, Technology, and Innovation	Strengthen the Cauca Regional System of Science, Technology, and Innovation in order to generate, coordinate, and facilitate social appropriation of knowledge, thus cementing social and productive innovation as a fundamental strategy that allows information and knowledge to be regionally introduced into society
Strategic Departmental Plan for Science, Technology, and Innovation in the Cauca department (ConCIENCIA) Cauca, 2012-2020	Organizations and social knowledge networks, stakeholders in the ucs triad, interface institutions, and stakeholders in the Cauca Regional System of Science, Technology and Innovation	Guiding instrument for creating a social and productive model that is Cauca's own and that will address and resolve critical issues in this area. In this way it will contribute to the structuring of the Regional System of Science, Technology, and Innovation, in which institutional, environmental, educational, sociocultural, productive, and economic aspects are given fair weight and involvement

Source: The authors.

University-Company-State: A collective coordination and dynamizing strategy

Business conferences

Business conferences are spaces of coordination and relationship building for stakeholders searching for innovative processes to drive regional progress. With the experience gained from conducting the First and Second Conferences of Business Innovation in Cauca and Nariño in 2011 and 2013—events which demonstrated the great potential of universities in both regions to address the productive sector's wide range of needs—it is considered pertinent to sustain this process in order to continue advancing with important activities such as: 1) Identifying and defining the technological capacity of research groups and the building of a service portfolio through technological dossiers—a marketing tool that contains information on a technology to be sought or promoted with the aim of reaching technological cooperation agreements (Pemberthy, Castillo, & De la Rosa, 2012, p. 94); 2) Identifying and raising technological demand of the region's companies by filling out Request for Proposal (RFP) forms with the aim of gaining providers of creative solutions for business issues or problems in a particular area (Sánchez, Calvo, & Obando, 2012, p. 70); and 3) Coordinating supply and demand to optimize collective formulation of innovative projects.

This experience of conducting business conferences is useful for understanding the aspects that impede or facilitate open innovation in settings such as those of Cauca and Nariño. These contexts have a recognized capacity for generating knowledge, but its application is limited in products and processes that reach the market and effectively benefit it and create a positive impact.

In this context, alternatives must be developed to continuously reinforce the coordination between academic research in the work of research groups, and the needs and opportunities in the regions' productive sectors.

Innovation discussions and meetings

Innovation discussions and meetings are spaces created in Cauca to present, discuss, and reach agreements on development alternatives and strategies for the region. Participants include associations; businesspeople; researchers; stakeholders in the Regional System of Science, Technology, and Innovation (SRCTI); and regional and national governments. The spaces are legitimized by the signing of an agreement of intentions titled "Innovation pact: a collective vision of development in Cauca," which expresses the need to strengthen productive competitiveness in the region based on R&D results, and the integration of scientific and technological

development and its applications to social and productive innovation as a fundamental strategy of regional development plans. In this way, strategic royalty resources can be channeled towards Cauca's economic and social development.

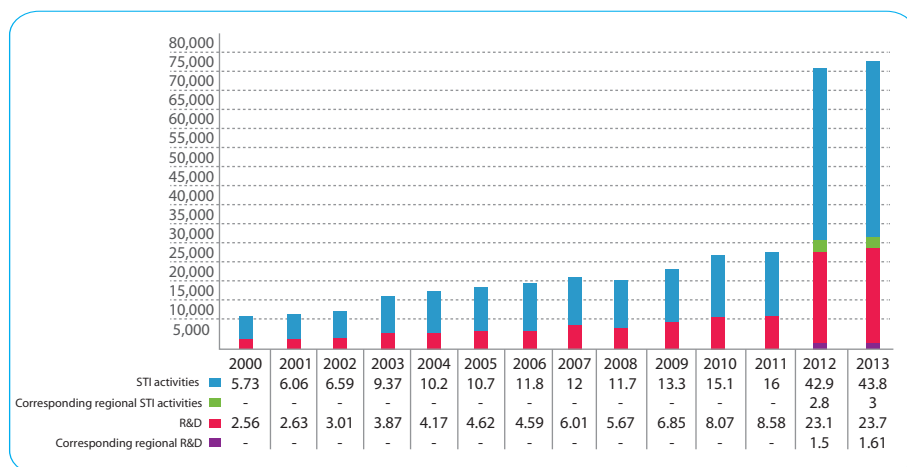
The innovation pact is an initiative of Cauca's people that has the unanimous support at the national level of Colciencias; the Ministry of Education; the Office of the High Counselor for Public and Private Management; and the Ministry of Industry, Commerce and Tourism, among others. At the regional level it receives support from the business, government, academic, and social sectors. The pact was officially signed in May 2011 and represented a preliminary agreement to recognize and support seven priority innovation hubs related to: 1) Information and communications technology; 2) small-scale agri-chains; 3) bioplastics; 4) water; 5) large industry and its inclusive business model; 6) knowledge-based enterprise; and 7) cultural industries. All of these are in accordance with historical dynamics of knowledge generation in the region, with clear leadership of public and private organizations, academic researchers and entities, associations, and companies that commit to converting these hubs into symbols of a vision of Cauca's business future (Actores del Sistema Regional de Ciencia, Tecnología e Innovación del Cauca, 2011).

Progress made in the Cauca region in terms of science, technology, and innovation and in the building of the University-Company-State relationships includes the following:

- The development of the seven hubs proposed and endorsed in the Innovation Pact 2011
- The prospect of a new development model for Cauca with the formulation, presentation, and enabling of nine projects by the General System of Royalties (SGR) in 2012, which were conceived and managed in the framework of the First Conference of Business Innovation: University-Company-State Partnership in Cauca and Nariño. Figure 1.1 shows that investment in science, technology, and innovation for Cauca increased by almost 300% from 2012, rising from less than COP\$25,000 million in 2011 (approximately us\$13 million as of January 2011), or 0.27% of gross departmental product, to more than COP\$70,000 million (approximately us\$36 million as of January 2012), or 0.78% of gross departmental product in 2012 (Grupo de Investigación Modelos Regionales de Competitividad, 2013).
- The forming of three new innovation hubs focused on the topics of coffee, health, and tourism
- The definition, structuring, and consolidation of the Strategic Departmental Plan for Science, Technology, and Innovation (Plan ConCIENCIA) in Cauca (Figueroa, Plazas, Bernal, Pemberthy, Martínez et al., 2013). This

plan proposes a management model for innovation and knowledge, with the aim of: stimulating the Regional System of Science, Technology, and Innovation (SRCTI); guiding the creation of innovative abilities in society and the productive sectors; allowing the dissemination of learning systems and knowledge tools; mapping out stakeholders, technologies, and knowledge relevant to the region; and learning to manage intellectual capital in order to create value and share criteria, methodologies, and lessons learned among all of Cauca's social stakeholders.

Figure 1.1 Investment growth in science, technology, and innovation (STI) in Cauca, 2000–2013. Figures in billion pesos.



Source: The authors.

Note: based on data from the Colombian Science and Technology Observatory (OCyT), and the Collegiate Body of Administration and Decision for the General System of Royalties' Science and Technology Fund.

There is a proposal for a second coordination meeting, UCS Innovation Pact: a collective vision of development in Cauca 2013, in order to:

- 1) Present a detailed account of the first meeting of University-Company-State (UCS) relationship building and the results of the signing of the Innovation Pact established in May 2011 in the Cauca department to Cauca's society, researchers, higher education institutions, businesspeople, associations, national and regional governments, and rural communities, among others.
- 2) Share the results of projects financed by the General System of Royalties (SGR) through the audiovisual presentation "Working in coordination for the progress and development of Cauca."

- 3) Authorize and revalidate the Innovation Pact 2013 as a touchstone for continued progress in consolidating the Regional System of Science, Technology, and Innovation in Cauca. Additionally, present the expectations for future work.

Innovation hubs: A knowledge management initiative for regional progress

The regional coordination and advancement strategy titled “Open innovation hubs founded on knowledge management” involves a wide range of committed stakeholders from the University-Company-State triad in Cauca. It seeks to promote and consolidate innovative products in the department along strategic productive lines whose products offer greater market potential.

Innovation hubs are network structures for managing and accompanying innovation processes within an organization or a productive sector. These processes are supported by the effective knowledge management of stakeholders in the networks, thereby creating competitive advantages from the knowledge (Pemberthy, Plazas, & Castillo, 2012).

Table 1.2 shows each hub formed, entities that are deeply committed to or coordinate the hubs, the different research groups that support the scientific processes according to their identified technological capacity, the large-scale projects that drive the hubs and link them with other initiatives and projects in the region, the businesspeople interested in developing innovative products, and, of course, the State, with its financial support and national promotion.

Table 1.2 Progress in coordinating innovation hubs in Cauca

University-Company-State Dynamic in Cauca					
Focus of hubs	Coordinating entities	Participating research groups	Central project for hub	Committed businesses	Committed government teams
• Agri-chains	• Regional Center of Productivity and Innovation in Cauca (CIEPIC)	• Environmental engineering • Asoagroin • Rural Development Research Group (RUL)	• Strengthening CIEPIC	• Carrefour • Grupo la 14	• Ministry of Agricultural Development and Mining
• Water	• Universidad del Cauca	• Environmental Study Group (GEA)	• International Center of Water Research and Innovation (CIAgua)	• Cenicafé • Cenicaña • Supracafé • Popayán water and sewer systems	• Ministry of Agriculture and Rural Development • General System of Royalties (SGR)
• Biopolymers	• Regional Center of Productivity and Innovation in Cauca (CIEPIC)	• Citbia	• Research into and development of biodegradable packaging	• Fundación Intall-Representing Alico, Tecnas, and CITalsa	• Ministry of Agriculture and Rural Development • General System of Royalties (SGR)
• Enterprise	• National Training Service (SENA) • Agriinnova • Cauca Chamber of Commerce	• Natural product chemistry	• Forming innovation hubs and foundations of knowledge management to promote the development of innovative products in the Cauca department	• Lauvid-Microenterprise	• Popayán Secretariat of Planning
• Cultural industries	• Institución Universitaria Colegio Mayor del Cauca – Art Department	• Art and Design Group		• Manos de Oro	• Cultural Coordination Unit, Cauca Department
• Business model	• National Association of Colombian Businesses (ANDI)	• Regional Competitiveness Models	• Building business models for social innovation	• Members of the National Association of Colombian Businesses (ANDI)	• Association of Municipalities of Northern Cauca (AMUNORCA) • General System of Royalties (SGR) • Departmental government
• ICT	• Universidad del Cauca • National Training Service (SENA)	• Telematics Engineering Group	• Cauca Digital Living (Cauca Vive Digital)	• Alianza Creativ	• Departmental Secretariat of Planning • Ministry of Information and Communications Technology

Progress in coordinating innovation hubs in Cauca

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University-Company-State Dynamic in Cauca					
Focus of hubs	Coordinating entities	Participating research groups	Central project for hub	Committed businesses	Committed government teams
<ul style="list-style-type: none"> • Coffee 	<ul style="list-style-type: none"> • Universidad del Cauca 	<ul style="list-style-type: none"> • Accounting, Economic, and Administrative Sciences Research Group (GIEA) • Economic thought • Society and culture • Accounting, society, and development • Rural Development Research Group (RULL) • Communications studies 	<ul style="list-style-type: none"> • Research promotion and social innovation center for the development of Cauca's coffee sector 	<ul style="list-style-type: none"> • Cauca Committee of Coffee Growers • Universidad Autónoma de Taxcala de México 	<ul style="list-style-type: none"> • Cauca Departmental Government • General System of Royalties (SGR)
<ul style="list-style-type: none"> • Health 	<ul style="list-style-type: none"> • Colombian Association of Micro, Small, and Medium-sized Enterprises, Cauca (ACOPM Cauca) • Regional Center of Productivity and Innovation in Cauca (CIEPIC) 	<ul style="list-style-type: none"> • Telematics Engineering Group • Regional Competitiveness Models • Applied Human Genetics Research Group 	<ul style="list-style-type: none"> • Technological plan for the involvement of Universidad del Cauca in the innovation hub's health initiatives in Cauca 	<ul style="list-style-type: none"> • Clínica La Estancia • Hospital Susana López • Hospital San José • Fisiocenter • Fundación Innovagen • Agualluvia S.A.S. 	<ul style="list-style-type: none"> • Departmental Secretariat of Health • INNpula
<ul style="list-style-type: none"> • Tourism 	<ul style="list-style-type: none"> • Universidad del Cauca • Cultural industries (Comfacauca) • Environmental Experience Foundation-Network (FREA) • Holy Week Standing Committee • Cauca Chamber of Commerce 	<ul style="list-style-type: none"> • Tourism and Regional Development (GITUR) • Telematics Engineering • Applied Multilingual Studies Group (GEMA) 	<ul style="list-style-type: none"> • Strengthening regional tourism as an innovation hub through world-class events 	<ul style="list-style-type: none"> • Cotelco. • Anato • Acodrés • Totems LTDA. (Technology Company) • Colombian Federation of Eco-Parks, Ecotourism, and Adventure Tourism (FEDIEC) • Mixed Corporation of Tourism in Cauca 	<ul style="list-style-type: none"> • Cauca Departmental Government • Popayán Mayor's Office • National Training Service (SENA)

Progress in coordinating innovation hubs in Cauca

Source: Adapted from Pemberthy, Plazas, & Castillo, 2012, p. 111

A significant contribution of this coordinating strategy is the adaptation and enrichment of the “innovation hub” concept achieved by integrating and applying different knowledge management tools. An example of such a tool is the “Communities of Practice” (CoPs) that allow business collectives to form around subjects of interest, including innovation management, product development, and competitive intelligence.

This strategy contributes to the analysis, adaptation, integration, and application of different approaches to knowledge and innovation management in order to form innovation hubs involving companies of different sizes, facets of production, organizational cultures, etc. Their innovation centers on organizational matters and the development of each hub’s technological package, although there is the possibility of applied technological innovation in three product development pilots. These could be applied in other parts of Colombia with similar conditions to Cauca in terms of the desire to create innovative capacity where companies from the same sector may not necessarily be able to come together.

Views of a successful coordination process in Cauca

The innovation hubs are presented taking into account the proposed goals, the partner stakeholders and institutions, and the contributions made by the hubs to Cauca’s development.

Agri-chain innovation hub¹

The goal of the agri-chain hub is to provide small-scale rural producers in Cauca with technological development centers and researchers that will make clean and efficient technologies more accessible to farmers. These technologies improve the profitability of land and support the creation of new inclusive business models that allow entry into more lucrative markets. Partners helping to drive the development of agri-chain hubs include the municipal and departmental governments, business associations, the farmers’ association, Regional Center of Productivity and Innovation in Cauca (CREPIC), Apropesca, Centro Comercial Campanario, rural producers, Universidad del Cauca, and Agroinnova.

The contributions made to Cauca’s development by the agri-chain hubs are essentially aimed at improving a strategy of associativity. This involves finding

¹ The agri-value chain concept refers to the manner in which a group of stakeholders forms relationships around a specific product to add or increase its value through each link of the chain, from production to consumption, including sales, marketing, and distribution.

common threads through which the department can improve its indices of production and competitiveness and access new and better markets (Rivera, 2013).

Information and Communications Technology (ICT) research hub

The goal of the Information and Communications Technology research hub is to transform Cauca by building a knowledge industry through the creation of technology companies in the area of ICT. Companies based on university-generated knowledge represent a new industry that creates high-quality employment, boosts GDP, and drives the economic and social development of the department (Erazo, 2013).

Partners of the hub include: Cauca Departmental Government, Secretariat of Planning, Universidad del Cauca, National Training Service (SENA), Regional Center of Productivity and Innovation in Cauca (CREPIC), ICT companies incubated in ParqueSoft Popayán, and the Ministry of Information and Communications Technology.

The objective of this hub is to create quality employment. Progress is being made in the formation of high-impact, innovative, and dynamic companies that generate substantial income and contribute to the department's development (Erazo, 2013).

Health innovation hub

The aim of this hub is to assist Cauca's cluster of health companies to improve quality and competitiveness through critical processes such as international standards certification and the possibility of creating employment (Martinez, 2013).

The partners of the hub are: departmental and municipal governments; Colombian Association of Micro, Small, and Medium-sized Enterprises (ACOPM) Cauca; Innpulsa; Hospital San José; Fundación Innovagen; Clínica Hispanoamérica; Agualluvia S.A.S; Banco de Sangre del Cauca S.A.; Clínica La Estancia; Servicios Integrales en Salud Fisiocenter IPS S.A.S.; Hospital Susana López de Valencia E.S.E.; and Universidad del Cauca.

The area of health boasts a vigorous business sector that must begin to position itself. The opportunities seen by businesspeople must also be combined with the options offered by Cauca's academic sector, as great potential exists there.

Coffee innovation hub

The goal of the coffee hub and the Innovation and Research Center for Coffee Sector Development is to attend fundamentally to families in Cauca's coffee sector using a comprehensive development approach. This population would thus receive benefits in terms of: education, with the development of undergraduate programs,

workshops, seminars, and diploma courses; the economy, with the improvement of production, land use, and food sovereignty; and the environment, in the establishing of a sustainable coffee sector based on agroecology (Tobar, 2013).

The partners of the coffee hub include Universidad del Cauca and six of its research groups: Accounting, Economic, and Administrative Sciences Research Group (GICEA); Economic thought; Society and culture; Accounting, society and development; Rural Development Research Group (TULL); and Communication studies. The other partners are the Cauca Departmental Government, Cauca Committee of Coffee Growers, and Universidad Autónoma de Tlaxcala de México (Tobar, 2013).

The contribution of the hub to Cauca's development is reflected in a stronger coffee community in terms of education, the economy, the environment, and research.

Tourism innovation hub

The goal of the tourism hub is to promote various initiatives that look to a different environment characterized by clear multiculturalism and astonishing megadiversity (Castrillón, 2013).

The hub's partners are: the Cauca Departmental Government; the Popayán Mayor's Office; the Chamber of Commerce and Hoteliers Association of Cauca; Universidad del Cauca and other universities representing the academic sector; Anato; Acodrés; Totems Ltda. (technology company); Colombian Federation of Eco-Parks, Ecotourism, and Adventure Tourism (FEDEC); Mixed Corporation of Tourism in Cauca; National Training Service (SENA); Colombian Association of Micro, Small, and Medium-sized Enterprises (ACOPÍ); and Environmental Experience Foundation-Network (FREAN) (Castrillón, 2013).

Some of the hub's most significant contributions to Cauca's growth have been promoting the development of innovative tourism products for special market segments. One example is bird watching, as this region has more bird species than any other in Colombia.

Biopolymer innovation hubs

The goal of the biopolymer innovation hub is the growth of environmentally-friendly materials, particularly those related to biodegradable packaging. It also aims to promote environmental responsibility in small-scale rural productive sectors.

The hub's partners are: the Cauca Departmental Government; Universidad del Cauca, Universidad de Antioquia, Universidad del Valle, and Universidad Nacional de Colombia; private universities such as Universidad de San Buenaventura,

Universidad de los Andes, and Universidad EAFIT; companies in the plastics sector such as Suprapac, Laseryet, etc.; and the Regional Center of Productivity and Innovation in Cauca (CREPIC), which provides coordination processes (Villada, 2013).

The studies, research, and advances of the biopolymer hub offer Cauca the opportunity of major development, as they bring together cassava producers, highlight the launch of new projects, and present new environmentally-friendly trends, technologies, applications, and products (Villada, 2013).

This hub will strengthen small-scale rural productive sectors through the promotion of environmental responsibility.

Business models innovation hub

The goal of the business models hub is to facilitate links with more lucrative markets. Equitable conditions will be prioritized to ensure recognition for the work of producers involved and allow differentiating factors to be found, such as environmental aspects, specialized markets, and organic certification similar to that used for coffee (Pabón, 2013).

The hub's partners include: the National Association of Colombian Businesses (ANDI) and the industrial conglomerate of northern Cauca; companies such as Agropesca, Rescate Cacaotero, and Productores Cafeteros de Inza; the Regional Center of Productivity and Innovation in Cauca (CREPIC); and Centro Comercial Campanario.

The hub contributes to Cauca by providing management technology that allows any organization to access more lucrative markets. Additionally, the hub's stakeholders hope to record the social innovations that rural producers have been using over many years and that could receive recognition internationally (Pabón, 2013).

Water innovation hub

The aim of this hub is to achieve comprehensive management of water resources for social development and sustainable production through CIAgua's R&D activities. Working with the Ministry of Information and Communications Technology's tablet project, the hub has developed educational content related to water, climate change, and ecosystems so that children learn about the process and truly take ownership of water management (Figuerola, 2013).

The hub's partners are: Universidad del Cauca, Cinara, MADR, International Center for Tropical Agriculture (CIAT), Cenicafé, Cauca Autonomous Regional Corporation (CRC), Popayán Software Business Incubation Corporation (ParqueSoft), Universidad Tecnológica de Pereira, Universidad del Valle, Cenicaña, Popayán water and sewer systems, and the Regional Center of Productivity and Innovation

in Cauca (CREPIC) (Corporación Centro Internacional de investigación e innovación del Agua, Corporación CIAgua, 2012).

The significant contributions made by the hub and the International Center of Water Research and Innovation Corporation (CIAgua) to the Cauca department consist of generating innovations for appropriate management of water for human consumption, production processes, poverty reduction, and environmental sustainability of the country's strategic ecosystems. Similarly, the initiatives represent workspaces for the large number of highly qualified professionals in Cauca with top-level scientific skills, thereby keeping them in the region (Figueroa, 2013).

Enterprise innovation hub

According to the enterprise network coordinated by the Cauca Chamber of Commerce, this hub aims to encourage institutional coordination in order to promote and provide direction for a culture of enterprise. This, in turn, strengthens the creation and continuation of innovative enterprises that improve quality of life for Cauca's people (Cámara de Comercio del Cauca, n.d.).

The hub's partners include: Agroinnova, Popayán Mayor's Office, Cauca Chamber of Commerce, Regional Center of Productivity and Innovation in Cauca (CREPIC), Colegio Mayor del Cauca, Comfacauca, Coomeva, Fenalco, Panamerican Development Foundation (FUPAD), Fundación Universitaria de Popayán, the Cauca Departmental Government, Popayán Software Business Incubation Corporation, Institución Universitaria Tecnológica de Comfacauca, National Learning Service (SENA), Uniautónoma, Universidad Abierta y a Distancia, Universidad Cooperativa de Colombia, and Universidad del Cauca (Valverde, 2013).

The enterprise network seeks to provide an example of integration and leadership to generate a multicultural identity that will strengthen regional development, thus improving quality of life for Cauca's people (Cámara de Comercio del Cauca, n.d.).

Cultural industry innovation hub

This hub is still in its early stages in terms of goals and achievements; nevertheless, there are various processes, initiatives, and interested stakeholders in the region that operate separately and without coordination. Thus, in line with the general approach of the innovation hub project, approved by the General System of Royalties (SGR), this hub's goal is to stimulate creativity and new ideas, and highlight, recover, and realize the full potential of Cauca's cultural richness. This is achieved through partnerships and coordinated links between local companies, regional and national

governments, universities, and other organizations, thereby leading to innovation in production and culture.

Conclusions

The innovation hub strategy aims to contribute in various ways to development in the Cauca department. Firstly, and most importantly, it strengthens a regional innovation system, which is created not in the abstract but specifically in each area of knowledge where innovation is sought. Secondly, it allows these areas of knowledge to play an important part in the development of Cauca's production.

One of the greatest strengths of the hubs is their ability to bring together and coordinate regional stakeholders in the University-Company-State triad, as well as include the common interests of stakeholders in Cauca's Regional System of Science, Technology, and Innovation (SRCTI) to strengthen the system itself.

One vital aspect of this is that the UCS initiatives drive regional development. They encourage creativity and the establishing of spaces and settings that promote coordination processes based on trust, partnerships, and collaboration agreements for innovations in production and generating wealth in the region. They also propel the creation of employment and income for communities, and boost the development of cleaner technologies and the consolidation of competitive innovation hubs in the territory.

The ongoing activity of the innovation hubs increases the technological capacity of research groups, establishes learning communities focused on specific topics, and widens the landscape and network of relationships among the region's stakeholders. It also builds the intellectual capital of the organizations involved in the hubs, encouraging the training of rural businesspeople through the creation of seminars and diplomas, university researchers and professors through master's and doctorate programs, and students through young researcher processes and research incubators.

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