



CONSEJO NACIONAL DE RECTORES



2023
Universidades Públicas
ante el Cambio Climático

NATIONAL ATLAS 2022 OF INNOVATION

EXECUTIVE SUMMARY

Developed by

Silvia Sáenz León
Allan Campos Gallo
Víctor Gabriel Carvajal Vega

Translator

Carolina Roldán Roldán



MINISTERIO DE CIENCIA,
INNOVACIÓN, TECNOLOGÍA
Y TELECOMUNICACIONES

GOBIERNO
DE COSTA RICA



PROMOTORA COSTARRICENSE
DE INNOVACIÓN E INVESTIGACIÓN

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Dedication



In memory of Luis Alonso Jiménez Silva, former director of PROINNOVA and AUGE from Universidad de Costa Rica.

We will always remember him for his creativity, dedication, positivism, empathy, talent and charisma.

He left us an extraordinary legacy in the field of innovation and entrepreneurship.

His work made a difference in the ecosystem of entrepreneurship in Costa Rica, creating new projects and supporting others to achieve theirs.

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Acronyms

**CONARE**

Consejo Nacional de Rectores (National Council of University Deans)

CeNAT

Centro Nacional de Alta Tecnología (National Center for High Technology)

MICITT

Ministry of Science, Innovation, Technology, and Telecommunications

OCDE

Organization for Economic Co-Operation and Development

SBD

Development Banking System

SNI

National Innovation System



Foreword

The National Atlas of Innovation 2022 is an effort that precedes the “National Atlas of Innovation” published in 2007, in which the first mapping of innovation in Costa Rica was achieved through the analysis of what at that time was called: the “National Science, Technology, and Innovation System”, a vision that is also combined with the 21st Century Strategy, specifically its innovation-oriented baseline. This document served as a platform and promotion of strategic activities in science, technology, and innovation.

The current 2022 edition shares that motivation, delving into the analysis and description of what can now be called the Costa Rican National Innovation System, which details the trajectory and relative maturation. When it comes to the structure and role of each stakeholder, although they require greater articulation, it is undeniable that a significant degree of evolution has been experienced since the first mapping in 2007, as an outcome of policies and debates surrounding the need to generate spaces that enable and exploit Costa Rican ingenuity.

Under this same spirit of improvement and development of knowledge, this new edition seeks not only to provide an update but also to describe, considering specialized and recent documents, the reality of the National Innovation System, without neglecting the considerations of experts from each area belonging to the system. It is important to mention that the positioning in the practical reality of what is inherent to innovation may allow the development of public policies and participatory strategies, considering the particularities of the multiple stakeholders inherent to the NIS, which manage to accelerate the maturation and correct functioning of the system for the sake of sustainable development of the country.

This edition of the 2022 National Atlas of Innovation is an effort and example of the joint work of the Consejo Nacional de Rectores (CONARE), the Centro Nacional de Alta Tecnología (CeNAT), the National Ministry of Science, Innovation, Technology and Telecommunications (MICITT) and the financing of research by the Innovation Promoter. This raises the possibility of a successful linkage between the government and academia.

It is important to emphasize that, from now on, the more efforts are added to the correct functioning of the National Innovation System, the more possibilities for achieving agreements, alliances, and national cohesion around one of the most fascinating topics in the human experience, such as the invention. Under this motivation, it is expected, in the most hopeful way, that the exercise and success of this activity can be extended to other Costa Rican realities to form agreements through dialogue and desirable and common national objectives.

Theoretical Pillars

Also, OECD (1997, p. 10) defines it as follows:

For the development of this edition of the National Atlas of Innovation, some basic theoretical-conceptual pillars were established, seeing innovation as an outcome and linked to the concept of national innovation systems. Innovation is the result of applying knowledge leading to the creation of new products, services, or processes.

According to OECD (1997), through the importance of knowledge applied to development, the need to study innovation within a systemic approach has grown. This approach is based on the understanding of innovation systems. Lundvall (1998, p.2) mentions that; "An innovation system is constituted by the interactions between various elements and relationships in the production, dissemination, and use of new and economically useful knowledge, ... and are situated either inside or firmly attached to the territory of a nation-state".

“

"The concept of national innovation systems rests on the premise that understanding the linkages among the actors involved in innovation is key to improving technology performance. The concept of national innovation systems rests on the premise that understanding the linkages among the actors involved in innovation is key to improving technology performance" (OECD, 1997, p. 10).

National Innovation Systems (NIS) are based on the exchange of knowledge flows that take place among stakeholders in a complex network, which interact with each other. Within this context, companies, people, government, universities, and research centers, among others, stand out (Nelson, 1993). Basically, their objective is to make use of the production of knowledge, to facilitate its access, to promote learning among the stakeholders involved, and to develop innovations that improve the competitiveness and growth of the various sectors of the economy.



Lundvall (1998) and Chung (2002) emphasize the importance of the necessary dimensions and conditions for NIS development. Undoubtedly, both authors highlight that the institutional framework is a key component of the fundamental system responsible for regulating interactions between stakeholders. It encompasses all the standards, laws, habits, and customs that define the "rules of the game" and translate into trust and incentive schemes, among others.

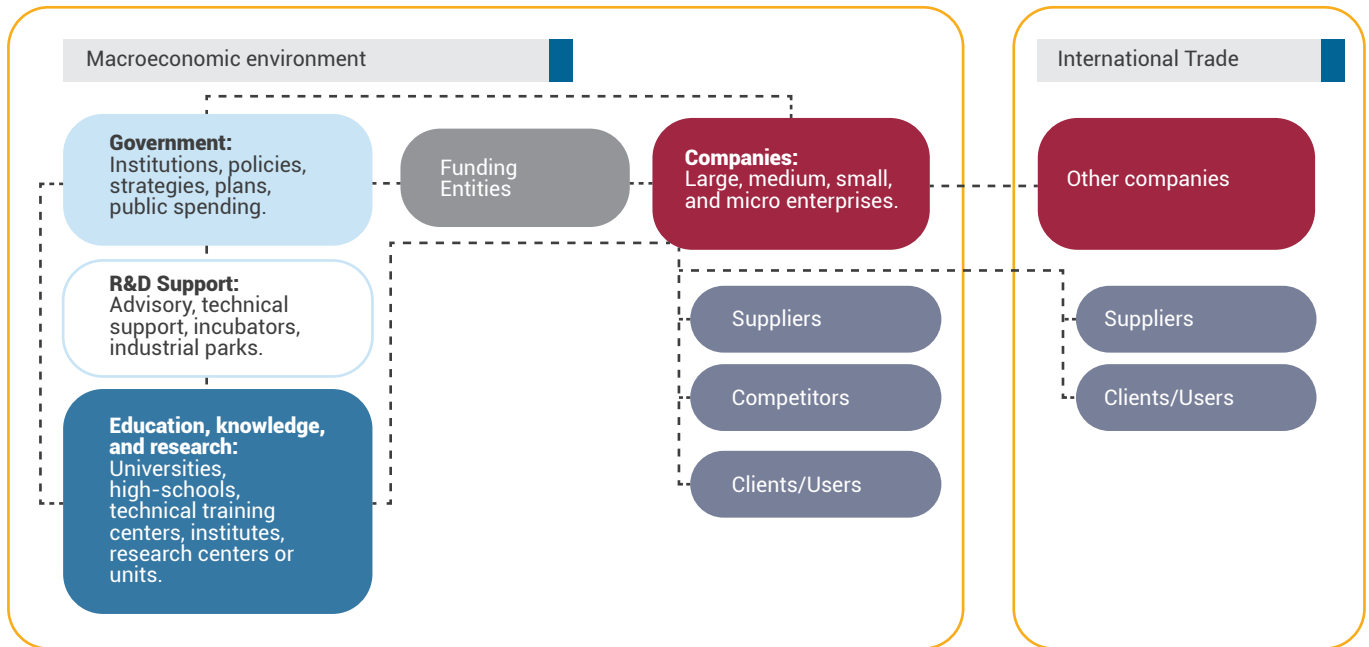
The innovation processes in this system are cumulative, interactive, iterative, and gradual. They are cumulative because the stock of knowledge increases over time. Furthermore, the stakeholders involved improve their interaction processes, thus meaning they are interactive because relationships are established for the exchange of knowledge. At the same time, they are iterative since they are translated from the result of a repetition of actions and are achieved slowly and gradually.

Figure1 shows the company (large, medium, and small) in the center of the diagram as the fundamental cell of innovation. The government also appears, whose relevant role is to facilitate and drive interactions between system stakeholders through policy formulation.



Figure 1.

Outline of a National Innovation System (Base)



Source: Own development with information from the SNI Coordination Division.

Financial organizations are also a fundamental part of the NIS since they provide funding to promote innovation and various projects of this nature, with R&D&I resources. They are the organizations that “connect” the business environment with the activities of R&D whether incubators, industrial parks, and technical support, among others. Their role is to provide support to strengthen the system, improve relationships between stakeholders, and promote the use, absorption, modification, and generation of knowledge. “These organizations are key for building trust and certainty among stakeholders, which are essential to promoting information exchange and network formation, such as associations and clusters” (Leda Peralta, 2019).



Methodological Description

The research conducted in this edition of the National Atlas of Innovation responds to a mixed study. It encompasses quantitative and qualitative variables as the primary source of insight into Costa Rica's current state of innovation, identifying barriers, and creating a framework for action to guide policies or strategies.



Figure 2.
| Stages of the Research Process

Conceptualization of the study:
2007 baseline analysis

Presentation of methodological proposal to the Council of the Costa Rican Innovation Promoter

Information gathering:
Review of specialized literature on innovation issues

Process for establishing a base of institutions and key informants on the innovation topic

Delivery of information collection instrument

Analysis of emerging information:
Analysis by segmented information

Analysis of barriers and improvements to innovation in Costa Rica

Quantification of the qualitative analysis of barriers and improvements

Analysis by stakeholders, barriers, and improvements with informed triangulation

Socialization of the Innovation Atlas:
Socialization workshop with experts

Improvements to the final report

Delivery of the 2022 Innovation Atlas document to the Costa Rican Innovation Promoter

Source: Own elaboration.

Information Sources

To prepare a general context for innovation in Costa Rica, secondary sources such as the Central Bank of Costa Rica (BCCR), the Ministry of Science, Technology, Innovation, and Telecommunications (MICITT), the Consejo Nacional de Rectores (CONARE), the State of the Nation Program (PEN), and the National Institute of Statistics and Census (INEC) provided the information and statistics.

Also, to describe the institutional framework for innovation, laws related to innovation or management strategy, and financing of the NIS were used. Finally, the laws that include knowledge infrastructure served as fundamental regulation pillars for stakeholders producing and utilizing knowledge.

Furthermore, a sample consisting of 181 specialists in knowledge creation and innovation was selected by NIS stakeholders, based on the following criteria.

Figure 3.
Criteria for Selection of Experts

Subject-type criteria:

It made it easier to consult people who work in the fields of science, technology, and innovation in Costa Rica

Discrimination criterion:

This allows exclusive consideration of people with knowledge of innovation at the government, academic, and private sector levels

Expert judgment:

This type of sample made it possible to improve the information collection process

Variation criterion:

Which answered the question - Who is missing? This arose in the information collection process, where the team deduced that some sectors were missing, which were not represented in the initial process

Political relevancy:

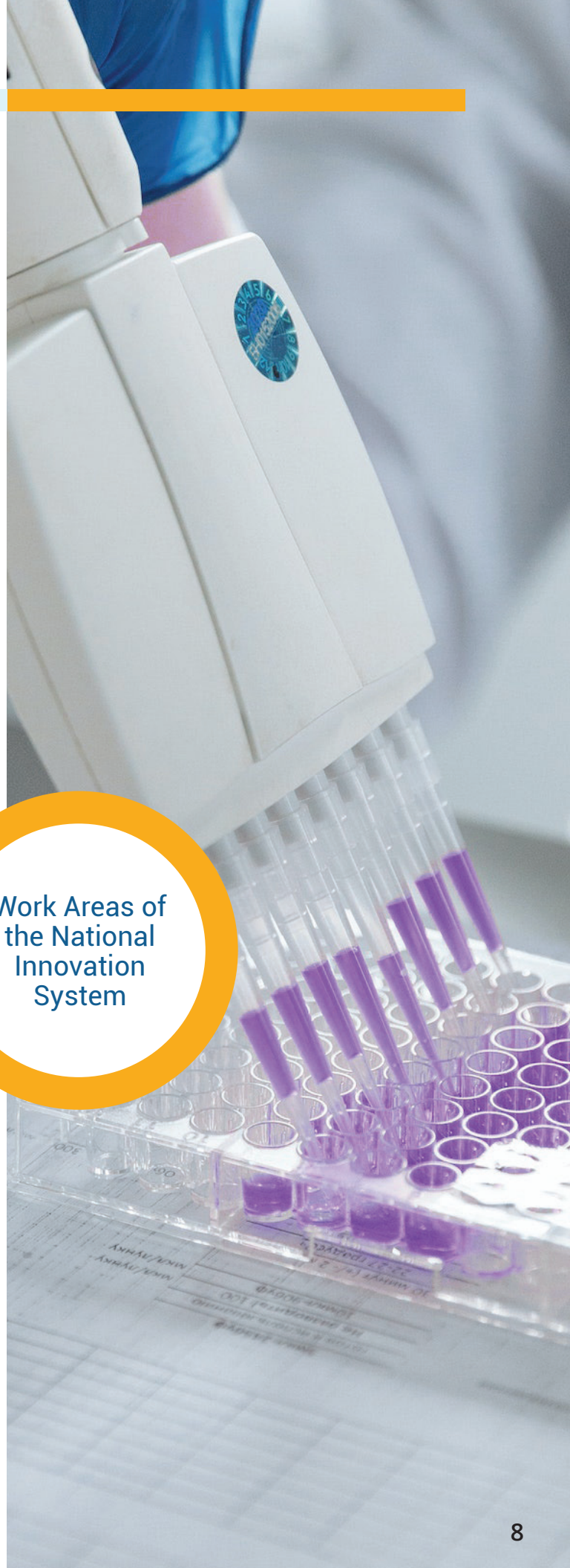
This aspect considered the relevance for the study, which is why people who are immersed in policy formulation or decision making were also included

The purpose of identifying these stakeholders was to obtain updated information around the critical areas defined in the National Atlas of Innovation published in 2007, which are set out below:

Figure 4.
Critical Areas of The National Atlas
Of Innovation Published In 2007



Source: Own elaboration with data from the National Atlas of Innovation, 2007.



Description of the Research Stages

In the first stage, an exhaustive review of specialized literature on innovation issues was carried out. The national innovation systems approach was defined as the base theoretical pillar, which identifies Costa Rican stakeholders who participate in the process of creation, management, and development of innovation.

These stakeholders are:

- Productive sector
- Financial sector
- Support for R&D&I
- Knowledge infrastructure

They interact under an institutional framework that regulates the different interactions that derive from the system.

Afterwards, a qualitative instrument consisting of open-ended questions was established and then delivered.

Preparation of the instrument, delivery and response rate

The information collection instrument was a guide of open-ended questions (see Annex 1) to find the barriers and improvements for each of the pillars contained in the 2007 Atlas (see Table 1). It consisted of 16 questions divided into three blocks: general information, barriers, improvements, and a free opinion question.



Socialization and validation with experts

The final stage of the study involved organizing a participatory consultative validation workshop with the creators of the 2007 Atlas of Innovation and other strategic stakeholders. In this workshop, various results were presented to encourage the exchange of ideas and opinions, enriching the work carried out. Also, individual interviews were conducted with the participants and stakeholders of the 2007 Atlas to enrich and enhance this document.


Finally, the validated information was incorporated into the study document to update the dimensions of the Atlas of Innovation 2022.



Synthesis of the Institutional Analysis of Innovation in Costa Rica

From an institutional perspective, the vision of Costa Rican innovation has been provided with a formal framework, seeking to establish guidelines that encourage the interaction between stakeholders involved in the country's innovative dynamics. However, there are two major problems that stand out, which may be affecting the process of linking and prioritizing within the NIS. The first has to do with the way in which innovation is understood, given that each law has its own definition and interpretation. The result is that the concept lacks a national consensus to delimit and dimension its existence, related both to what is expected of its possible realization and the resources or tools that are provided for its development.

The concept of innovation has two ends. One, where it becomes equated with entrepreneurship and loses its lower limit. The other, where it is found in the abstraction of the idea itself, losing its upper limit. The above factors create differences among stakeholders who require attention and impulse and others who are not clear about their actions or do not execute them, because they are outside their scope.




This becomes a limitation because the strategy seeks the promotion of innovation as a way for economic development. However, it is not possible to clarify what constitutes innovation without an integrated vision and understanding of its foundations. Therefore, after the analysis it is proposed that the innovation should adapt to the Costa Rican reality and to the possible support options available in the System. In this way, the term's abstraction can be emptied based on the political and material possibilities and planned objectives of the country. That is, there is a need to provide a practical and at the same time challenging basis to promote the notion of innovation.

The second problem found in the analysis of the institutional framework is that the legal framework itself may be undermining the opportunity to innovate. This contradiction is evident in the analysis of advanced innovation systems. The efforts and investments of successful international experiences show companies as logical and correct platforms for innovation, responding to market problems, through new product development and improving existing production processes.

On the contrary, in Costa Rica, it seems that the notion or desire to innovate is intended to be developed or directed from the public sphere, thus delegating responsibility to a government institution, which in this scenario is the Costa Rican Promoter of Innovation and Research, on the whole dynamic system. This leads to poor results and confusion, risking the improvement opportunity to political stagnation and institutional wear and tear due to its nature, thus resulting in very little progress towards innovation and risk management. What has been said above is made evident when more new laws are created on a subject that has already been addressed, thus lacking results and concentrating efforts on achieving an unrealistic strategy. Ultimately, this focuses on strengthening the political process and concentrates efforts on improving the failures of previous laws.

The existence of entities such as the National Innovation Council, National Innovation Technical Committee, and Innovation Technical Secretariat, mentioned in decree 35313-MICITT-COMEX, caught attention. However, their approach exemplifies the confusion of directing innovation from the public sector, since it was not possible to find information on the activity of government bodies, which could make a significant difference in coordinating and articulating various stakeholders. If there were the possibility of understanding and solidifying the National Innovation System as a practice that involves dynamic interaction between stakeholders, we could foster a positive and strong cohesion that has never been witnessed in the recent history of the country. This would involve industries, the government, universities, research and development, centers, and individuals working together towards the development of skills and efforts related to innovation.




It should be noted that this same dynamic would contribute to reducing information asymmetries, and under that logic, the system itself would account for the results of noteworthy endeavors, such as the creation of institutions that currently could be considered essential or advanced to the effects of NIS. It could also provide details about the development of inventive initiatives at universities, small and medium-sized businesses, and scientific development centers such as CeNAT, Cedes Don Bosco, National Learning Institute (INA), etc. According to the interviewees, research and innovation projects are not adequately visible, thus

requiring a greater effort to disseminate the results of research and innovation projects.


Regarding financing, it was found that the Development Banking System (SBD) does not effectively provide resources for innovation in terms of availability and access, and instead allocates resources to traditional companies. This fact goes against the intended purpose of SBD's creation, whose regulations allow for the possibility of innovation in ideas or methods that are perceived as new. It should be noted that, facing the impossibility of banking logic, the risk involved with innovative

activities exceeds banking capacity. It is believed that the abstraction of the notion of innovation contributes for projects that seek financing (for example, from the idea) not to be candidates for financing. On the other hand, the same system, by granting resources to commercial banks, may be making the mistake of putting SBD resources and bank resources in competition at the discretion of each banking entity, which, from the business logic, naturally, will allocate resources that leave profits to the commercial banks.



In this regard, the topic of financing is suggested to be explored in depth by examining existing research works, with a particular focus on the potential to establish the foundations or diagnose the Costa Rican capital market as a functional financing option. This should be coupled with the implementation of a real-time communication policy for projects with market success potential. It is striking that many stakeholders within the National Innovation System (NIS) have consistently highlighted the issue of financing. Therefore, it is crucial for public policymakers to conduct a thorough analysis and consider restructuring institutional guidelines, in response to the identified problems.

Finally, regarding the knowledge infrastructure and framework, there are multiple proposals that talk about the generation of a culture for innovation. Several institutions such as INA, the Ministry of Public Education, or the Universities themselves seek to create conditions to ensure that young Costa Ricans achieve better performance in using ingenuity and creativity; however, reality shows that the public educational system in elementary and high schools has profound deficiencies in more concrete and basic areas, such as writing, linguistic skills, mathematics, and science.



Public universities are increasingly investing in leveling programs to be able to have students with minimum levels of acceptance, for good university performance. In that sense, seeking a disruptive education must overcome, at a minimum, the reality of an education based on rote processes and overloaded with procedures. Creativity precisely responds to being able to identify problems, while the rule, by itself, does not find problems, unless it is addressed.

This goes in hand with the fact that the stakeholders within the system respond to their own interests, which can vary from the assumption that students should be trained and ready to be employed, preferably in some STEAM area (without thinking about real demand and market absorption) or the belief that students should be trained to be capable of developing the necessary skills to solve with ingenuity, not only what is inherent to what is

presented as problematic in the market, but also, with the ability to take actions that can help the country, in multiple areas.

In the opinion of both ends, as highlighted throughout the analysis of the institutional framework, what has been found under the reality of disarticulation and suspicion within the sectors, is the waste of time and efforts between the different positions. Therefore, it results in many processes and few results, thus having an institutional framework that is clearly inefficient.



Main Findings Related to the National Innovation Context

The 2007 Innovation Atlas of Costa Rica was the first effort to contextualize innovation in the country. In this regard, intuition warns that an atlas should be associated with the image of a map with political, economic, or social information about a specific territory. However, the information contained in the 2007 version of the Atlas should be better understood as an analysis of graphs and nodes that explained the interaction and complex relationships between the variables and stakeholders it contains, which at that time the authors defined as the Science, Technology, and Innovation System.



From the first effort to contextualize innovation in Costa Rica, no specific studies have been recorded that can account for the advances or development of innovation in the country, given the complexity of the variables, the abstraction inherent to the topic, and the lack of data. The best effort that is available is the one carried out by the University of Costa Rica in the document entitled: Cantonal Competitiveness Index (ICC) of 2018, which includes a specific dimension for the capacity for innovation and proposes a classification of the topic, according to the empowerment that each Costa Rican canton has for the development of innovative ideas. The variables considered to carry out this approach were:

- Quantification of the degree of concentration of high-tech exports of the corresponding canton.
- Enrollment at universities in science and technology majors in the corresponding canton.
- Percentage of schools and universities with internet access in the corresponding canton. (UCR, 2018).

The intention of the authors of said Index was to measure the capacity for innovation using those variables, which according to their criteria reflect the sophistication of the knowledge that is applied in production and the potential to transmit it to the industries of each canton. With the second and third variables, an attempt was made to quantify the capacity of the human resources of each canton to acquire, process, and take advantage of the externalities of more complex knowledge (School of Economics-UCR, n.d.).

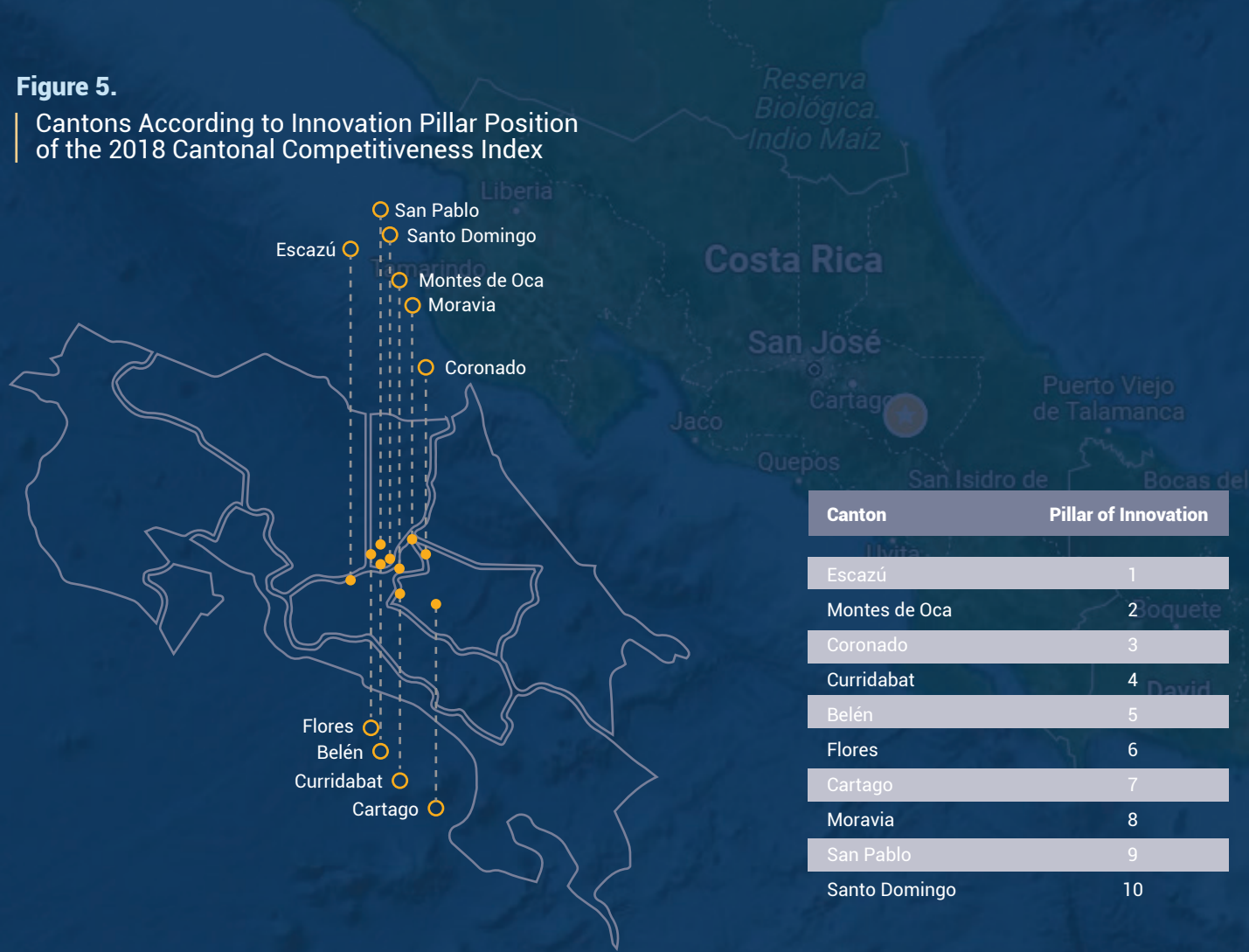
It is worth mentioning that under the NIS approach and given the complexity described and contained in this document regarding innovation, the variables presented by the ICC 2018 are not considered sufficient to provide with certainty a vision of what innovation implies.

However, the information contained in ICC 2018 does meet the criterion of approximation of cantonal performance, which allows us to comply with the vision of a map and be able to illustrate said geographical classification.




Below are the 10 cantons (Figure 5) with the best position according to the ICC 2018, whose complete classification can be consulted in the innovation pillar in Annex 2, for the Costa Rican cantons that existed in 2018.

Figure 5.
Cantons According to Innovation Pillar Position of the 2018 Cantonal Competitiveness Index



Source: Cantonal Competitiveness Index 2018. University of Costa Rica.



The section below is dedicated to exposing the panorama of innovation in Costa Rica, with the purpose of presenting some of the most relevant findings in terms of innovation.

Business sector

1. According to the data found, Costa Rican companies (mostly micro or small businesses) are not generally established with a purpose of innovation, but with a desire to undertake for subsistence. Furthermore, the innovation that is developed in the country's business park is mainly incremental, that is, from improvements that respond to certain needs identified within the production process.
2. Regarding investment in scientific and technological activities, the contribution of the business sector has historically been lower than in the rest of the studied sectors. The largest R&D component comes from the academic sector; with an investment of 111.8 million dollars in 2018. On the other hand, the business sector is the second most important for R&D, which has maintained a relatively consistent investment in the period of time analyzed, closing the year 2018 with an investment of 86.9 million dollars, with a decrease of -0.45% compared to the previous year.
3. Costa Rica's performance in promoting startups is located in group B, called "development paths." It is characterized by countries that generate pro-startup initiatives from the public sector; however, the coverage of these initiatives is mainly established in the early stages of the business cycle.



Innovation Funding

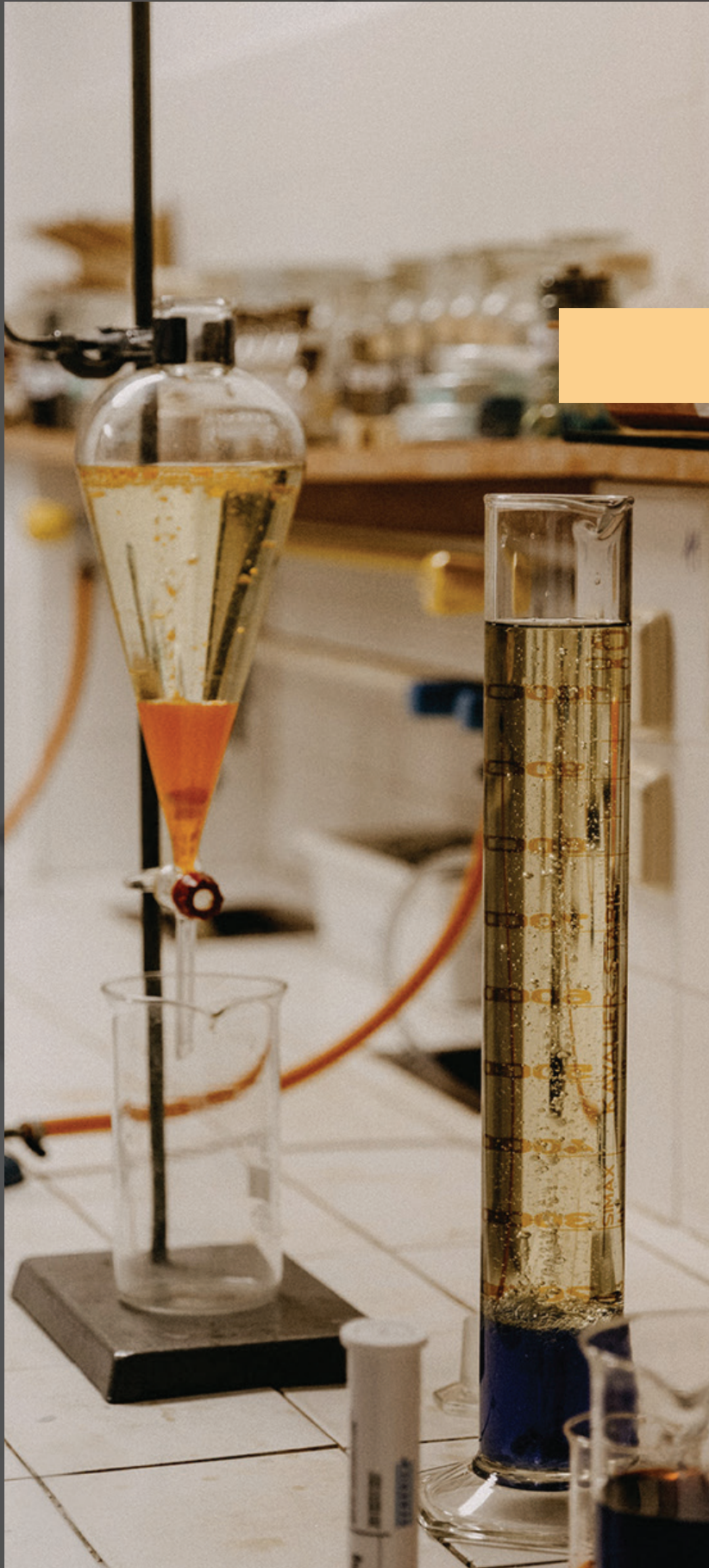
1. According to data from the HIPATIA portal, as of 2022, financial support for the different phases of technology-based companies shows that, in the idea phase (initial phase) it is essential to have seed capital, with the support of government funds. and some type of funding for acceleration, with the understanding that there are few or no guarantees for ideas.
2. Commercial banking is insufficient to promote innovation, since fiduciary guarantees are required to undertake any type of project; not even the Development Banking System can ensure financing for these types of projects.

3. Some sources of resources were identified that could drive innovation, especially in the ideation phases. Funds come from non-profit organizations, state institutions such as PRONAMYPE, FODEMIPYME bank, and finally, funds from incubators and promoters of innovation and entrepreneurship, both at the state university level and private incubators, such is the case of Carao Ventures, among others.
4. Funding, according to the latest national science and technology consultations by (MICITT), appears as the main obstacle to innovation in the manufacturing and agricultural sectors. Furthermore, it has been perceived historically as the main limitation to the accomplishment of innovations.

Knowledge infrastructure

1. Most of the R&D activities are carried out by the academic sector. According to MICITT (2019), the largest contribution is made by state universities, which on average are attributed 36% of the national share, placing the IESUEs as preponderant stakeholders in the country's R&D dynamics.
2. In terms of human resources in science and technology for the Frascati areas, according to the latest State of Capabilities in Science, Technology and Innovation report of the State of the Nation Program (PEN) 2015, in the case of exact sciences and engineering, university enrollment has not changed in recent decades, the pool of personnel is insufficient, and the proportion of doctorates remains a minority.
3. 77% of the active researchers in Costa Rica are people who work in public universities and the remaining 33% are part of other institutions or companies based in the country, which reflects that the greater mass of researchers is concentrated within the IESUEs, who also face the investment situation in R&D.
4. With respect to academic networks, several studies have shown that in Costa Rica there are important scientific groups; however, due to some factors, the link they manage to make with the productive sectors is limited. Nevertheless, the creation of new knowledge, and the country's performance in terms of scientific publications and evolution in this field, are undeniable.





R&D&i activities

1. According to data from the Hipatia Platform, 3,108 linkage projects were identified at state universities by 2021. These projects correspond to services that are provided by universities to the productive sectors aiming to improve production, advise, and provide technical or research support to various companies that require it.
2. In the private scope, advice and support is generated by some business chambers, and producer or development associations, among others. The work of the Costa Rican Investment Promotion Agency (CINDE) is highlighted in its approach to the business sector for advice to identify various technological capabilities in some sectors in Costa Rica. There are also initiatives promoted by incubators such as Parque La Libertad, Parque TEC, and Carao Ventures, among others.
3. In Startups, the main need for non-financial support relates to internationalization.
4. The phases of a business that most require non-financial support are ideation and start-up, which precisely also record the greatest need for financial support.

Synthesis of Barriers or Limitations to Innovation

This section points out and describes the barriers that prevent the advancement and proper functioning of the NIS, according to the consultation posed to the experts. The results are presented, corresponding to the five stakeholders identified in the literature review of the National Innovation System. They are still linked to the strategic pillars described in the 2007 version, namely catalyzing, strategy, culture, funding, and articulation. The identified stakeholders are government sector, knowledge infrastructure, support for R&D&I, funding, and companies, which are regulated by an institutional framework that is positioned as a first level of analysis.

For the analysis of these barriers, the seven ones that reached the greatest number of mentions were chosen, which are presented in order of appearance and under the criteria of the consulted experts. In this synthesis, we will only mention the barriers by sector.



Institutional Framework

- Disincentives to generate innovation.
 - Confusion, abstraction, or lack of clarity in the concept of innovation.
 - Uncertainty in innovation processes.
 - Static institutional framework.
 - Limitations in the design of laws linked to innovation.
 - Lack of a systemic vision for innovation.
- Limitations related to the enforcement of laws within the NIS.

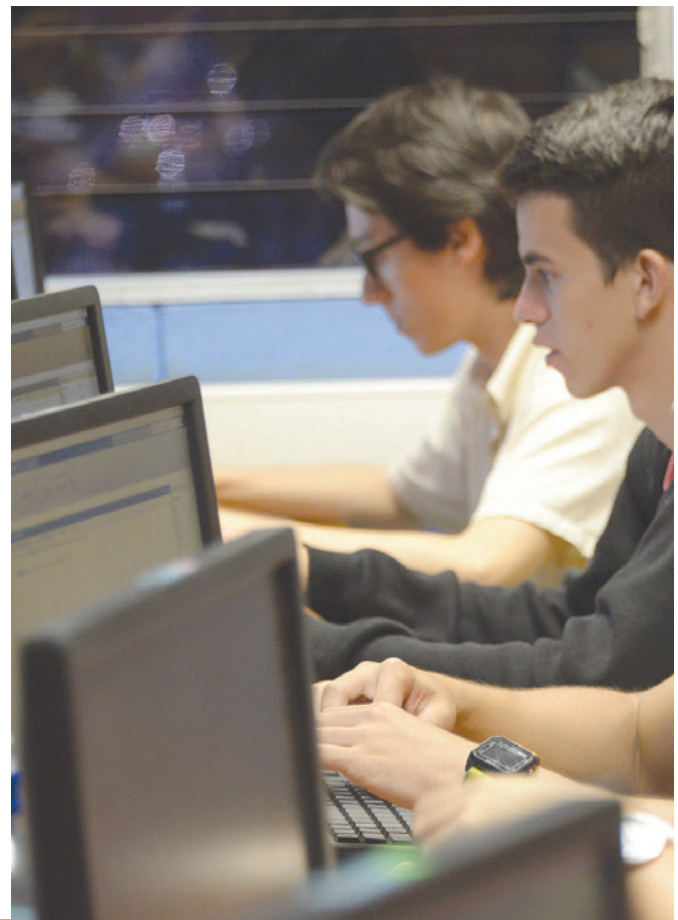


Government Sector

- Limitations in the design of the innovation strategy.
- Insufficient linkage or coordination mechanisms between stakeholders.
- Insufficient infrastructure and services that support innovation.
- Excess paperwork or bureaucracy in innovation processes.
- Limitations in the allocation of resources for innovation.
- Insufficient support or support for innovation programs or initiatives.
- Difficulty in identifying those responsible for executing actions within the NIS.

Knowledge infrastructure (Costa Rican educational system)

- Insufficient training of human talent.
- Weakness in the development of design and innovation thinking.
- Insufficient training in technological skills and competencies.
- Misalignment of study or training programs with the reality of the country.
- Lack of curricular update.
- Deficit in access to educational infrastructure.
- Setback in the development of the educational system and model.



Knowledge infrastructure (Research and Development Centers)

- Difficulties in academic links with the socio-productive sectors.
- Insufficient resources to generate R&D.
- Limitations in the dissemination of knowledge.
- Barriers to research policies.
- Insufficient education to undertake.
- Administrative limitations to generate research.
- Brain drain.

Funding

- Lack of resources to promote the operation of innovation projects.
- Excessive paperwork and red tape to formalize loans.
- Difficulty in accessing financial resources for innovation.
- High-risk assessment of innovative ideas.
- Insufficient information on financial resources.
- Obsolescence of the financial system in the face of innovation.
- The Banking System for Development seems insufficient for innovation.

Support for Research, Development, and Innovation

- Insufficient instances for support, training, and R&D&I support.
- Insufficient non-financial support for innovation.
- Difficulties in advice for innovation management.
- Insufficient resources to support the R&D process.
- Limitations in training and knowledge transfer aimed at SMEs.
- Limitation in inter-institutional linkage and coordination to support R&D.
- Bureaucracy or procedures to receive financial support.

Business sector

- Difficulty in generating technological overflows.
- Lack of competitive intelligence studies.
- High costs of formalizing enterprises.
- Insufficient understanding of the advantages of business differentiation through innovation.
- The organizational context of companies limits innovation.
- Counter-systemic behavior when carrying out innovation.
- Insufficient training in technological skills and competencies.



Synthesis of lines of action for innovation

This section briefly highlights the lines of action or recommendations that the experts proposed, as alternatives to solve the problems found in the barriers. Using the same structure proposed for the barriers (sectors and pillars), the findings are presented below:

Institutional Framework

- Review of the legal framework related to innovation, in favor of improvements in aspects such as flexibility and the number of procedures, protection of knowledge, forms of exploitation, and marketing of inventions.
- Create an institutional framework whose design considers the social, economic, educational, and cultural penetration of innovation in society.
- Laws must be reviewed and adjusted from time to time, considering technological dynamics and change.
- Review of costs of the intellectual protection process of an invention.
- Clarification of the benefits of innovation in the linkage between academia and productive sectors, to enhance the link between instances and exploitation, and appropriation of inventions.
- Encouragement of greater recognition and acceptance of the intrinsic value of research, development, and innovation.

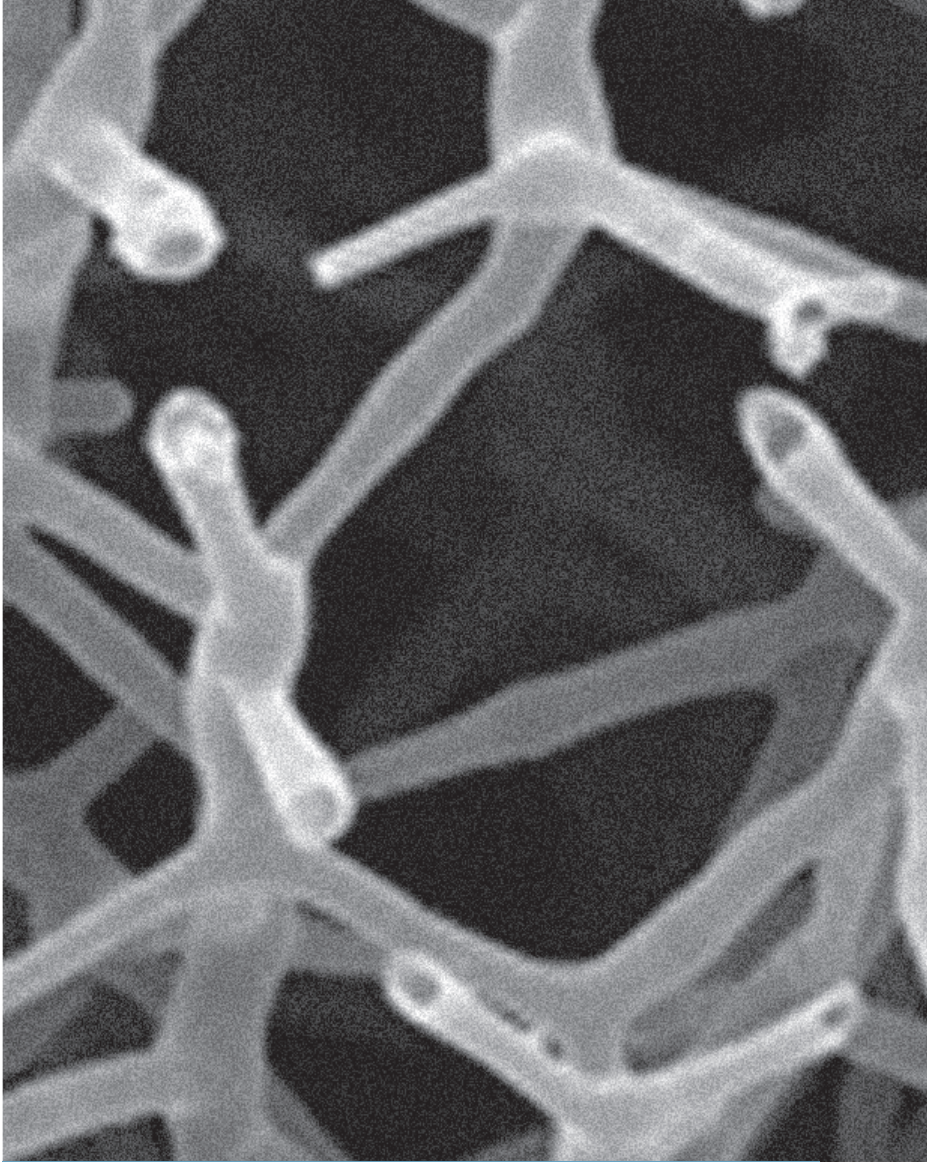
Government Sector

- Greater leadership of government innovation bodies is key to improving the formulation, execution, and monitoring of policies and initiatives.
- Orientation of the government's role towards promoting and supporting the generation and application of knowledge in the productive sectors.
- Refine, define, and contextualize a clear and measurable innovation policy.
- Involvement of regional innovation systems, which, in their productive dynamics, generate information and innovation in a different way.
- Strengthening of the Promoter of Innovation and Research, which has the legal and operational support to be able to form a network of R&D&I stakeholders.
- Assessment of the country's innovation strategy with the aim of proposing clear objectives, achievable goals, and direct managers.
- Promotion of spaces for dialogue between stakeholders and create specific coordination mechanisms.
- The government has the duty to facilitate and mediate between the sectors, which are in search of resources, both human and financial, to achieve greater and better linkages.
- Promote development through phased innovation.
- Work to reduce the connective gap, especially in peripheral areas of the country.
- Review each of these processes to be able to dismiss activities of the bureaucratic process that detract from value.



Knowledge infrastructure

- Strengthen the concept and notion of innovating at an educational level.
- Teaching must be associated with the use of technological tools and data management.
- Strengthen training and human talent in STEAM without losing sight of the market's absorption capacity.
- Promote critical thinking and required skills in the development and maturation of the NIS.
- Provide sufficient training so that training programs are aligned with technological change.
- Encouraging training in technical skills provides support for R&D&I processes.
- Incorporating innovation to promote creativity and the materialization of ideas in many fields in a curricular design.
- Promote opportunities, knowledge, or training in new businesses or ventures among young people.



Knowledge infrastructure (Research and Development Centers)

- Strengthening the interdisciplinary approach to research.
- Universities must seek to transfer what has been achieved in research to society.
- The democratization of knowledge must be sought so that the academy is more accessible to people.
- Stakeholders within the National Innovation System must recognize the importance of R&D.
- Identify needs for information, solutions, training, and transfer from research centers to other stakeholders, such as local governments or communities.

Funding

- It is necessary to have resources and an alternative form of channeling that considers sources such as Angel Capital and risk funds.
- In-depth analysis of the projects and mediation, between individuals who have the ideas and the respective funders.
- Assess the structural heterogeneity of the country to provide funding options consistent with innovation.
- Unifying the funds and having them remain in the hands of the Promoter, under its supervision and monitoring, could help in supporting projects with innovative potential.
- Simplification of administrative processes.
- Accompaniment of an innovation manager, who would guide and advise people to channel requirements more quickly.
- Supervision of the use of resources, monitoring and evaluating the impact of projects once the execution time has passed.

Support for Research, Development, and Innovation

- Strengthen the figure of the innovation manager.
- Increase and strengthen innovation incubators.
- Improve training programs with a multidisciplinary approach and innovation as a transversal outcome of the productive sectors.
- Increased mediation capacity between the knowledge created, government support, available resources, and companies.



Business sector

- Improve asymmetries in territorial development and interconnections between productive sectors (industries), society, and academia.
- Strengthen the creation of chains, through economic reactivation strategies.
- Companies should make their needs clear within the NIS, to lead to the creation of productive clusters or conglomerates.
- Identify endogenous territorial capabilities, regarding the potential and shortcomings of innovation.
- Maintain a permanent dialogue between science and technology bodies and the various sectors, to contribute to their needs and promote new ideas.
- Adoption and promotion of formal agreements, in which each stakeholder is a counterpart and mutual incentives are generated, to carry out concrete actions around possible innovations.

Final Considerations

It is important to highlight in this executive summary that, although structural shortcomings and failures were found in the Costa Rican National Innovation System, this does not mean that the effort made by the different stakeholders from the country is negligible or recriminatory. On the contrary, having an institutional framework under constant review, with consolidated stakeholders, a Development Banking System, public and private universities, incubators, and the mission of the Promoter are examples of progress. Even the writing or the effort that has been made to build this version of the National Atlas of Innovation demonstrates the interest and level of debate that has been built and can be strengthened around this topic, which is both complex and relevant for the country.

The ability to generate products has also been demonstrated, although in isolated instances and without causing significant disruption, accompanied by the certainty that there are innovations in the country that, due to lack of dissemination or funding, have unfortunately remained undeveloped. Even so, the document must draw attention to the political will and citizenship to generate and correspond to the country's desire to travel the route of creativity, join forces, and strengthen the Costa Rican National Innovation System.



Annex

General distribution of the country's 81 cantons based on their relative position according to the "Innovation Pillar" of the Cantonal Competitiveness Index (UCR), Costa Rica 2018.

Socioeconomic Region	Canton	Relative position Innovation Pillar *
Central Region	Escazu	1
Central Region	Oca Mountains	2
Central Region	Vasquez de Coronado	3
Central Region	Curridabat	4
Central Region	Belen	5
Central Region	Flowers	6
Central Region	Cartago	7
Central Region	Moravia	8
Central Region	Saint Paul	9
Central Region	Santo Domingo	10
Central Region	Saint Barbara	11
Central Region	Saint Ana	12
Central Region	Athens	13
Central Region	Tibas	14
Central Region	San Isidro	15
Central Region	Greece	16
Central Region	The Union	17
Central Region	Barva	18
Central Region	Goicoechea	19
Central Region	Alajuela	20
Central Region	San Rafael	21
Central Region	Heredia	22
Central Region	Helpless	23
Central Region	Poas	24
Central Region	Valverde Vega	25
Central Region	The Guarco	26
Central Region	Orange tree	27
Central Region	Alajuelita	28
Central Region	Oreamuno	29
Central Region	Palmares	30
Chorotega Region	Cheek	31
Central Region	Alvarado	32
Central Region	Zarcoero	33
Central Region	Sawmill	34
Chorotega Region	Tilaran	35
Central Region	Paradise	36
Chorotega Region	Liberia	37

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General distribution of the country's 81 cantons based on their relative position according to the "Innovation Pillar" of the Cantonal Competitiveness Index (UCR), Costa Rica 2018.

Socioeconomic Region	Canton	Relative position Innovation Pillar *
Central Pacific Region	Saint Matthew	38
Central Region	San Ramon	39
Chorotega Region	Bagaces	40
Central Pacific Region	Esparza	41
Central Region	San José	42
Chorotega Region	Santa Cruz	43
Chorotega Region	Hojancha	44
Central Region	Tarrazu	45
Central Pacific Region	Orotina	46
Chorotega Region	Rods	47
Central Region	Blackberry	48
Brunca Region	Pérez Zeledón	49
Huetar North Region	San Carlos	50
Central Region	Jimenez	51
Huetar Caribbean Region	Pococí	52
Chorotega Region	Nandayure	53
Chorotega Region	Nicoya	54
Chorotega Region	Abangares	55
Huetar North Region	Sarapiquí	56
Central Region	Dota	57
Central Region	Acosta	58
Central Region	Leon Cortes	59
Huetar Caribbean Region	Guácimo	60
Central Region	Puriscal	61
Central Pacific Region	Golden Mountains	62
Central Pacific Region	Doodle	63
Brunca Region	Coto Brus	64
Huetar Caribbean Region	Morning	65
Central Pacific Region	Puntarenas	66
Central Region	Turrialba	67
Huetar Caribbean Region	Siquirres	68
Central Region	Turrubares	69
Chorotega Region	The Cross	70
Central Pacific Region	Quepos	71
Brunca Region	Runners	72
Huetar North Region	Upala	73
Brunca Region	Golfito	74
Huetar North Region	The Chiles	75

Annex

General distribution of the country's 81 cantons based on their relative position according to the "Innovation Pillar" of the Cantonal Competitiveness Index (UCR), Costa Rica 2018.

Socioeconomic Region

Canton

Relative position Innovation Pillar *

Central Pacific Region	Grill	76
Huetar Caribbean Region	Limón	77
Brunca Region	Ursa	78
Brunca Region	Buenos Aires	79
Huetar Caribbean Region	Talamanca	80
Huetar North Region	Guatuso	81

*Note: The cantons are in descending order according to their innovation capacity, where 1 corresponds to the value indicating the greatest innovation capacity and 81 to the lowest one.


Source: Own elaboration based on the Cantonal Competitiveness Index (ICC) built by the School of Economics, University of Costa Rica, 2018.



NATIONAL ATLAS 2022 OF INNOVATION

EXECUTIVE SUMMARY

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