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Master Dissertation in Engineering

**Living Labs as a Solution to
Increase Costa Rica's Innovation**

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Living Labs as a Solution to Increase Costa Rica's Innovation

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Abstract

Living Labs as a Solution to Increase Costa Rica's Innovation

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As part of its strategy to improve development and reduce the problems it has, Costa Rica is directing its efforts toward the use of key converging technologies such as info, bio, and nano. These technologies have the potential to help the country in solving problems optimally and sustainably.

Part of this strategy can be found in the plan developed by the Ministries of Science and Technology, which proposes the creation of a Knowledge-Based Economy Policy as the best integrating framework of policies that promote the formation of human capital, excellence in

science, outstanding research and development, entrepreneurship, and the implementation of innovation processes, and increase the competitiveness, productivity, and social welfare of the country.

According to the latest reports issued in the Global Innovation Indices report, Costa Rica ranks #56 worldwide and #3 in Latin America, despite having the development of several activities, Costa Rica still lags in infrastructure and market sophistication, which affects the development and increase of innovation within the nation.

The goal of this investigation is to identify living labs as a potential development-enhancing strategy and to assess the challenges to their implementation in the nation on the levels of technology, organizations, and context.

Keywords: Living Labs, open innovation, innovation, public innovation, innovation policies.

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Chapter 1. Introduction

1.1 Background

Costa Rica is known as a leader in environmental policy and achievement, which has helped the country become known for its Green Brand on an international scale (World Bank, 2021).

According to the National Development Plan 2018-2022 by Costa Rica's Ministry of Planning, our country faces several challenges, which are listed below (Figure 1):



Figure 1: Costa Rica's Seven Challenges
(MIDEPLAN, 2021)

The fight against poverty focuses on achieving social fairness, balanced growth, and a just society. The Costa Rican government recognizes it's necessary to increase the living situations of Costa Ricans in different areas of healthcare, accommodation, social-economic and environmental situations and human capital. The administration also highlighted the creation of new jobs and opportunities as a challenge, with the creation of economic policies to achieve significant wealth and well-being for the population being the greatest difficulty.

However, the greatest challenge in improving competitiveness is that there are many areas and industries where Costa Rica needs to increase its competitiveness through innovation. The two primary issues were recognized as being crucial for the nation to do so:

The first issue faces an obstacle that manifests itself as a significant logistical deficit; it should upgrade its infrastructure. Thus, low port quality, a lack of railroad growth, bad roadway conditions, and minimal public infrastructure investment are some of the nation's productivity disadvantages. The second issue is to improve banking and financial systems to enable them to offer timely credit and competitive interest rates (MIDEPLAN, 2021).

However, the government has generated a series of strategies to mitigate the country's challenges. These strategies are detailed below:

1.1.1 Strategy for Productivity, Competitiveness, and Innovation

Increase Costa Rica's competitiveness, economic growth, and proper enterprise development by promoting innovation, entrepreneurship, human resource training, international market entry, and labor rights compliance (MIDEPLAN, 2021).

1.1.2 Strategy for Infrastructure, mobility, and territorial planning.

Create conditions for resilient, sustainable, and inclusive urban and rural spaces through urban planning, land use, infrastructure, and mobility (MIDEPLAN, 2021).

1.1.3 Strategy for Human Safety

Ensure people's rights to live in dignity in their homes, in safe, protective, and inclusive environments that meet their basic needs and promote their human development (MIDEPLAN, 2021).

1.1.4 Strategy for Social Security and Health Care

Improve the population's health so that they can live longer, disease-free, and disability-free lives by providing health education and expanding to other healthcare areas (MIDEPLAN, 2021).

1.1.5 Strategy for Education for Coexistence and Sustainable Development

Increase the coverage and quality of the educational system, thereby contributing to the country's progress (MIDEPLAN, 2021).

1.1.6 Strategy for Economics for Growth and Stability

Maintain inflation near that of the country's main trading partners and promote fiscal consolidation, facilitating cost-of-living reductions, mitigating the trajectory of public debt, and decision-making by the national productive sector (MIDEPLAN, 2021).

1.1.7 Strategy for Territorial Expansion

Increase employment in outlying areas by implementing a participatory management model that promotes development (MIDEPLAN, 2021).

As part of its strategy to improve development and reduce the problems it has, Costa Rica is directing its efforts toward the use of key converging innovation and technologies, such as info, bio, and nano. These technologies have the potential to help the country in solving problems optimally and sustainably.

However, the Global Innovation Index's most recent study indicates that many of the evaluated nations have outperformed expectations in terms of innovation relative to economic development. Despite infrastructure and market sophistication gaps, Costa Rica is ranked number three in Latin America and 56 overall (GII, 2021).

Part of these national strategies can be found in the plan developed

by the Ministries of Science and Technology, which proposes the creation of a Knowledge-Based Economy Policy as the best integrating framework of policies that promote the formation of human capital, excellence in science, outstanding research and development, entrepreneurship, and the implementation of innovation processes, and increase the competitiveness, productivity, and social welfare of the country through innovation (OECD, 2022).

Therefore, previous research was carried out to find a tool that is useful, not only to achieve the objectives at the country level but that incorporates the needs of the population and the private sector therefore and after a long analysis, it was concluded that a tool that fits this need is the use of Living Labs, to increase the development of innovation.

1.2 Motivation

Comparative studies to evaluate living lab methodologies and success seem to be lacking in earlier research investigations. However, prior studies must consider the fact that although earlier academic studies have indicated the advantages, nature, and genuine contribution of living labs, the research has not focused on the barriers (Mokter Hossain, 2018).

The authors of earlier studies underlined a crucial point: it is vital to proceed cautiously while analyzing Living Labs. This is since few

studies have examined the effectiveness of Living Labs as institutions capable of producing knowledge that is applicable to the economy or society (Krassimira Paskaleva, 2021).

1.3 Description of the Problem

The main problem with increasing Costa Rica's innovation is the institutional collaboration that is highly required. The need for clarity about each person's role and how they interrelate is a cultural component of innovation. Our institutions were designed so that they ignore the interdisciplinary nature of public problems.

Despite government initiatives to build bridges or collaborative work processes to address problems holistically, they continue to rely on wills. It is critical to formalize collaboration and interoperability mechanisms that will allow public innovation to be managed harmoniously and evolve (Universidad de Costa Rica, 2021).

1.4 Research Objectives

This study provides scientific evidence for policies and decision makers to explain Costa Rica's stagnation in the innovation field, taking as an example and conducting a study on the barriers of living labs in Costa Rica encounter at a technological, organizational, and contextual level in the implementing or creating process.

These studies employ a questionnaire based on the Delphi Model or procedure is a popular consensus method that, unlike others, does not require face-to-face communication while still steering group opinion. It allows a larger group to participate than other forms of consensus. The Delphi method is unique in that it involves "specialists," and it uses a sequence of questions followed by controlled feedback to gather information about group discussions (Trevelyan, 2015). Considering the problem statement and the study's research goals, the following research question has been created:

RQ1: What are the technological, organizational and context barriers that Costa Rica has faced when implementing the Living Labs?

1.5 Research Structure

Overall, the composition of this thesis consists of five chapters. The problem, the research question, and the study's research plan are all described in the first chapter called Introduction. The second chapter offers a review of earlier studies that investigate the concepts, benefits, issues, characteristics, and various forms of living labs around the world. The third chapter gives a research approach as well as the framework and hypothesis. The results of a data analysis carried out by the TOE Model to assess the connections between the variables we found through the literature review and to examine the study hypotheses are covered in the

fourth chapter. The conclusion, which concludes the chapter, examines the study's findings, limits, recommendations for legislation, restrictions, and future research.

1.6 Novelty

According to the gaps in the literature, it has been mentioned that the barriers have not been analyzed in-depth, and therefore, this research will analyze this topic based on the experience of Costa Rica using the Delphi method.

In this study, we will concentrate on an innovation-related solution because, in accordance with the National Development Plan, the Government of Costa Rica must develop new initiatives to boost national productivity, competitiveness, and new knowledge as well as to create formal employment across the entire nation, particularly in less developed regions.

Chapter 2. Literature Review

2.1 Challenges vs. Living Labs

Making a brief comparison between the difficulties facing Costa Rica and the Living Labs was the first stage of the literature review. Table 1 shows that there is no direct correlation between the difficulties and

living labs in the literature since each challenge's related issue is addressed differently by each author and because the primary goals of living labs are innovation and the creation of new knowledge. Subsequently proceeded to analyze the “National Development Plan of the Government of Costa Rica”. Consequently, we discovered that it included a proposal to foster creativity across the entire nation.

Table 1: Country Challenges comparison with literature

Challenge	Literature
<p>I.- Poverty and of closing gaps</p>	<p>Two methods are suggested by the literature study to analyse poverty:</p> <ol style="list-style-type: none"> <li data-bbox="686 1062 1146 1371">1. Absolute poverty, which is defined as a population's ability to live below the poverty line while maintaining socially acceptable standards of living. <li data-bbox="686 1429 1146 1603">2. Relative poverty: This compares a population's lower and upper divisions based on income.

	<p>According to the literature, the main difference between these occurs whenever the population's well-being declines (Tim Callan, 1991).</p>
<p>II.- Formation of human capital</p>	<p>According to the literature assessment, both the creation of new information and human capital are regarded as factors of production in different countries. The accumulation of human capital is a key factor in the relationship between economic growth and its spread, which leads to global economic growth (Mincer, 2002).</p>
<p>III.- Creating opportunities and jobs</p>	<p>The readings state that as they are necessary to provide its population with new sources of revenue and employment prospects, terms like jobs, careers, and new knowledge</p>

	<p>have taken on significant importance in governments.</p> <p>Governments exist to develop fresh concepts for reshaping occupations and careers to make them more fruitful, pleasurable, and educational (DOUGLAS TIM, 2010).</p>
<p>IV.- Improving competitiveness</p>	<p>The analysis of the literature revealed a connection between competitiveness and free trade. The intellectual underpinnings of the system of international trade have also been based on this viewpoint (Mulatu, 2015).</p>
<p>V.- Consensus to establish enduring national policies</p>	<p>According with literature, government policies are thought to be actions done by the government's reaction to society's many demands can be understood as a deliberate allocation of resources to address</p>

	<p>crucial issues both at home and overseas (Domingo Ruíz, 2021).</p>
<p>VI.- Modernization of the state and its institutions</p>	<p>One example of the modernisation of the state and its institutions was the only one we could locate in the literature we evaluated. This illustration was given in reference to the impact of new European law and national administrative traditions (Knill, 1998).</p>
<p>VII.- Environmentally friendly development</p>	<p>Nations are concentrating their efforts in response to this challenge on achieving the “Sustainable Development Goals”. Since protecting the environment and building sustainable communities is one of these objectives (UNDP, 2021).</p>

Why Living Labs?

According to the literature, living laboratories—which provide real-world evaluation and experimentation conditions for the development of information and communication technologies (ICT) —began to be used by commercial firms around the year 2000. Living Labs are widely recognized as "innovation ecosystems," where specialists and laypeople can collaborate to create new goods, data, and services. They have also been used as a governmental instrument to support open innovation in towns, communities, and regions in response to local demand. For this reason, researchers, decision-makers, and practitioners are beginning to pay more attention to living labs (Krassimira Paskaleva, 2021).

Previous authors base their view on living labs, based on earlier literature reviews on the ideas, theoretical underpinnings, and potential outcomes of various experiments (Lars Fuglsang, 2021). Although they place a strong emphasis on consumers' capacity to develop and share innovations through customizing products and services rather than producers, the living labs are regarded as a significant source of inspiration (Ballon, 2015).

At the market level, several platforms promote innovation, such as the provisioning of software services, which can serve as bridges between groups of services (Kim, 2020). In addition, new innovations

frequently employ several model components and techniques to produce new services (Gibreel, 2018). Therefore, these concepts form the foundation of innovations created through service platforms, and it is crucial to understand the structure of value creation and how value is distributed in various contexts (Haile, 2016).

The primary goal of Living Labs is to directly include end users in the creation of new apps and services by offering bilateral access, on the one hand for consumers to new and emerging services, and on the other for developing businesses to feedback from consumers. This involves consumers in the process of developing innovations, which may assure accurate market assessment and significantly lower technological and commercial risks (Kviselius, 2009).

2.2 Definition of Living Labs

Previous researchers see living labs as a system for innovation, where setting with users and embedded technologies, increasing or implementing user and public participation, as a project for developing goods, systems and services, and as an instrument for managing innovation (Leminen, 2015).

Public, private, and people associations (4Ps) of diverse sectors, including public organizations, universities, clients, and investors, are

formed by interested parties in living laboratories. Together, these parties develop, prototype, test, and assess new technologies, systems, goods, and services in actual environments (Leminen, 2015). Additionally, a framework is used to analyze the architecture (Bastiaan Baccarne, 2014).

The Living Labs is an open innovation-promotion strategy that brings advantage of the chances offered by citizen, business, and social society collaboration to create emerging technologies. Environments like living labs can support transparent, open innovation processes (Gascó, Mila, 2017).

2.3 Living Labs Types

Through the literature, four types of Living Labs were detected, which are detailed below:

Developer or creator: The first consideration relates to the process utilized to create inventions (design, data, behavioral economics, hybrid, and others). Developing solutions to specific problems. Create specific innovations; Introduce new technologies into government administration (Criado, 2021).

Enabler: Consider the industry for which the laboratory is being designed. Bringing community members, non-profits, and businesses together to develop fresh concepts. Create new ways for citizens to

participate and use fresh communication strategies in government (Criado, 2021).

Transformer: The third Living Lab, in terms of the phases of innovation, is the point at which the innovation process is focused on problem awareness, idea production, idea implementation, and scalability. Government procedures, capabilities, and culture are changing. Modernize the methods used in government and encourage a creative work atmosphere (Criado, 2021).

Architect: The goals of the fourth type of living lab include: encouraging involvement, supporting innovative projects, developing new ideas, and training public servants, and implementing more comprehensive policy and system changes (Criado, 2021).

2.4 Characteristics of Living Labs

2.4.1 Participation of users

A living lab is built around user interaction and co-creation. Innumerable factors must be considered when evaluating user involvement. Including users in the service design process, educating them on more efficient technology tools and platforms, and accounting for users' cultural variations are just a few examples (Gascó, Mila, 2017).

2.4.2 Creating a service

It deals with the procedure of coming up with fresh concepts and testing them in a real-world setting. To facilitate collaboration amongst all parties concerned, this variable takes into account the co-creation process, the idea-generating process, market strategies, and supporting technologies (Gascó, Mila, 2017).

2.4.3 Governance

This characteristic examines how the living lab is set up generally and how its participants interact (Gascó, Mila, 2017).

2.4.4 Results of innovation

Knowledge, novel commodities or services, or intellectual property rights can all be obtained through the living lab (Gascó, Mila, 2017).

2.4.5 Orientation for users

Living labs have this crucial component, but it's an intangible benefit that doesn't support the lab's own financial viability. The foundation of viable business models is the end-to-end delivery of value to consumers who are willing and able to pay for it (Katzy, 2012).

2.4.6 "Needs" of consumers

This characteristic is related to identifying the customer needs and

promoting the convergence of a specific product or service. Since the living labs may be able to help bring consumer needs together, users must be involved in this process (Dutilleul, 2010).

2.4.7 Aiming

By merging research and innovation processes, living labs aim to teach and explore. Innovation encompasses both the creation of novel items (facility, technology, product, techniques, or system) and the identification of fresh approaches to persistent problems. The generation and exchange of information between people are related to both learning and experimentation. As a result, the objective is to recreate the idea elsewhere, in real life, inspire future creativity, and learn from the lab experiences. Living Labs are distinguished from other policy experiments and innovation niches by concentrating on systematic knowledge generation or lessons that are formalized and shared (Steen, 2017).

2.5 Living Labs Gaps

Several gaps that the authors of earlier research have identified during the literature review process have been found. Below is a list of these gaps:

2.5.1 Public-private alliances

Considering innovation in the public sector is a significant issue on the national agendas of politicians and academia, the authors mention in the literature that they want to incorporate public-private collaborations in their future research. The environment in which Living Labs are built, in their opinion, can benefit public processes of open innovation, intermediation, and its main challenges (Gascó, Mila, 2017).

2.5.2 Living Labs Evaluation Processes

The authors of earlier studies emphasized the crucial observation that the evaluation of Living Labs should be approached with extreme caution. This is because there aren't many studies that look at how well living laboratories work as institutions that can generate information that's useful for society or the economy (Krassimira Paskaleva, 2021).

2.5.3 Quantifying the benefits of living labs

The authors suggest that in order to continue funding living labs, it is important to gather data for a study that will clearly and quantitatively demonstrate how useful they are. This is because, according to the authors, comparative studies to determine the methods and effectiveness of living labs were lacking in many earlier research investigations. The authors believe that even if past academic studies have shown the advantages, characteristics, and true value of living labs, they are still not

well understood (Mokter Hossain, 2018).

2.5.4 Business Models

However, the authors believe that in order to increase interest from organizations looking to establish and run a Living Lab, it is crucial for future studies to build viable financial models for the production of goods and services through Living Labs (Mokter Hossain, 2018).

2.5.5 Change of perspective inside the public sector

In addition, the authors advise that viewpoints should be studied in future research. Understanding all of Living Labs' components, particularly their project ambitions, is crucial because many academics are interested in using them as a form of open innovation (Mokter Hossain, 2018).

2.5.6 Types of open innovation activities

The analysis of the different open innovation activities that occur within Living Labs in accordance with their initiatives is another crucial topic in the literature and one that will be carried out in future research investigations. To improve the relationship between the organizations and the customers, which is vital for linking and researching future creative management practices and governmental initiatives (Mokter Hossain, 2018).

2.5.7 The suitability of Living Labs

Finally, it is suggested that a thorough review of Living Labs' suitability for techniques, goods, services, and expenses be done in preparation for future research. To better identify when and when Living Labs might benefit different stakeholders, the living lab community can do the following. (Mokter Hossain, 2018).

2.6 Costa Rica Living Labs' Effort

Costa Rica has started using living laboratories and has been working in creating a pilot program to improve living labs structure in three areas:

- i. Active investigation module: The standards required to design and establish the research criteria are established (Mata, 2021).
- ii. Innovation module: The intellectual underpinnings and resources required to identify various resolution possibilities are defined (Mata, 2021).
- iii. Entrepreneurship module: Through the appraisal of company potential, students' entrepreneurial profiles are strengthened. (Mata, 2021)

Nevertheless, it is crucial to note that Costa Rica has previously made initiatives to promote innovation, such as with the establishment of Law

N° 5048 in 1972, which created the National Council for Scientific and Technological Research, and Law N° 7169 in 1990, which promotes scientific and technological development and is still in effect today. However, even though these regulations were created to foster innovation, there is a lack of a plan for utilizing and promoting Living Labs in Costa Rica.

2.7 Living Labs in Costa Rica Cases

2.7.1 Helice

The University of Costa Rica's (UCR) entrepreneurial spirit and the productive sector are joined in the project called Helice. Beginning in 2019, this will be based on the bilateral ties between the republics of Costa Rica and Korea (KOICA and Korea University). To contribute to national economic growth and well-being through the activation of productive enterprises with social responsibility, Helice seeks to accelerate the formation of research, development, and innovation alliances with the manufacturing sector. This is done by putting the quintet Helice innovation model into practice (UCR, 2022).

Helice goals are to improve Costa Rica's capacity for innovation, integrate an open innovation ecosystem, and foster the use of pertinent information in problem-solving, decision-making, and the creation of practical applications that influence social transformation and productive

processes (UCR, 2019).

2.7.2 Civic Innovation Lab

With the assistance of the Costa Rican government and Earth University, the Civic Innovation Project at the Iberoamerican General Secretariat organized the Civic Innovation Lab as a temporary Living Lab. Ten initiatives with a good influence on society and the environment will be built in Liberia, in the state of Guanacaste (Costa Rica). LABICs are international, public, cooperative settings for the development of novel ideas, where citizens play a central role. Civic Innovation Lab established programs to develop various projects relating to, among other things, platforms that allow for the exposure of how climate change is affecting communities in Latin American nations to foster greater awareness and action for the environment, solutions to achieve water purification in areas with limited access to drinking water, new product development for sustainable uses, and others (Iberoamericana, 2019).

Chapter 3. Research Methodology

3.1 TOE Research Model

According to previous literature, the technology-organization-environment (TOE) model is commonly used to evaluate these three aspects inside the living labs (Gascó, Mila, 2017). This model is also

used to specify the factors that affect and forecast technological acceptance. The adoption and implementation of technological advances by a company are described by the TOE, which is affected by the technological, organizational, and environmental context. The technical framework contains internal and external mechanisms pertinent to the company. Both mechanisms and procedures can be referred to as technologies. Refers to the companies or organizations' characteristics and resources, including its size, management engagement, human capital, supplies, and employee connections, in the case of the organizational setting. The industry's size and structure, the rivalry faced by the business, the macroeconomic climate, and the regulatory framework are all part of the environmental backdrop. These three factors both impede and enable technological progress, accordingly. Therefore, these three variables affect how businesses view the need for, seek out, and apply new technology (Tornatzky, 1990).

Finalizing the literature review process, the following barriers were found:

3.1.1 Scalability of results

The examined literature indicates that because of the Living Labs' limited resource availability, the prototypes that are developed there do not become scalable. Additionally, it seems that outsourcing can help

ideas and prototypes grow in significance and size (Gascó, Mila, 2017).

3.1.2 Infrastructure

The infrastructure barrier is based on the services and technologies necessary for a good function of the Living Labs, since through them it is possible to measure and analyze the data collected, use tools and statistical results for end users and decision makers (Gascó, Mila, 2017).

3.1.3 Human Resources

According to the examined literature, there is evidence that the teams in charge of networks and relationship formation are very small. Additionally, it appears that there are a number of issues with the employees needed to carry out the various programs designed within the Living Labs, which restricts the range of activities and initiatives that can be planned (Gascó, Mila, 2017).

3.1.4 Sustainability

In the different investigations previously carried out, it is indicated that the issue related to sustainability is linked to the inconvenience of obtaining the necessary resources to start the implementation and development of the Living Labs (Gascó, Mila, 2017).

3.1.5 Visibility

In previous research, a lack of visibility barrier was defined as the

drawbacks faced by Living Labs in relation to the little knowledge that citizens have about the space for the co-creation of new products and services due to the little dissemination work that has some Living Labs that have already been implemented (Gascó, Mila, 2017).

3.1.6 Management

According to the literature, problems related to the co-administration of Living Labs are defined as a management barrier, given that these are useful public spaces for the community whose purpose is to generate innovation within the city, and there have been examples where Living Labs that are managed by the public sector are facing a paradigm shift for which they are not prepared (Gascó, Mila, 2017).

3.1.7 Communication

Refers to obstacles that affect communication (communicating with persons with different backgrounds). A problem that precedes any collaboration is that Living Lab organizations' very existence and the potential for collaboration both offer powerful mechanisms for drawing in business. However, organizing or even simply facilitating effective communication with regional networks is an issue that is present nowadays (Dutilleul, 2010).

3.1.8 Regulation / Policies

The second chance is for government agencies to collaborate with individuals and groups to test out new rules and instruments of governance (Gascó, Mila, 2017). The laws that support and promote stakeholder input are primarily restricted to notifying the public about upcoming and ongoing projects. One key barrier to co-creation activities, however, is the failure to develop new legal or policy frameworks that encourage the many participants to continue their commitment over a lengthy period. This is brought on by a lack of regulatory and policy structures that would enable it. To offer a secure environment for participants to discuss their creative ideas, a strong and benevolent legal framework is required (Sarabi, 2021).

3.1.9 Cognitive barriers

The cognitive barrier is defined in the literature as the drawbacks of interaction between groups with different cognitive backgrounds, such as those with a scientific discipline vs those with a practical background. Since the fact that individuals who come from a scientific discipline are unable to co-dependency claims of those with a practical background, specialization and division of knowledge lead to dependency among the participants in the innovation process (Dutilleul, 2010).

3.1.10 Cultural

According to the literature, the cultural barrier is demonstrated by the unpleasant experiences the participants had while being in the Living Labs. The adoption of the Living Labs is constrained by a significant fear of failure that can result from these negative experiences, even while everyone engaged is motivated to work together to complete the task at hand (Sarabi, 2021).

Based on the recommendation of the previous research, we used this model to classify all the barriers that we found through the literature review and are resumed in Figure 2.

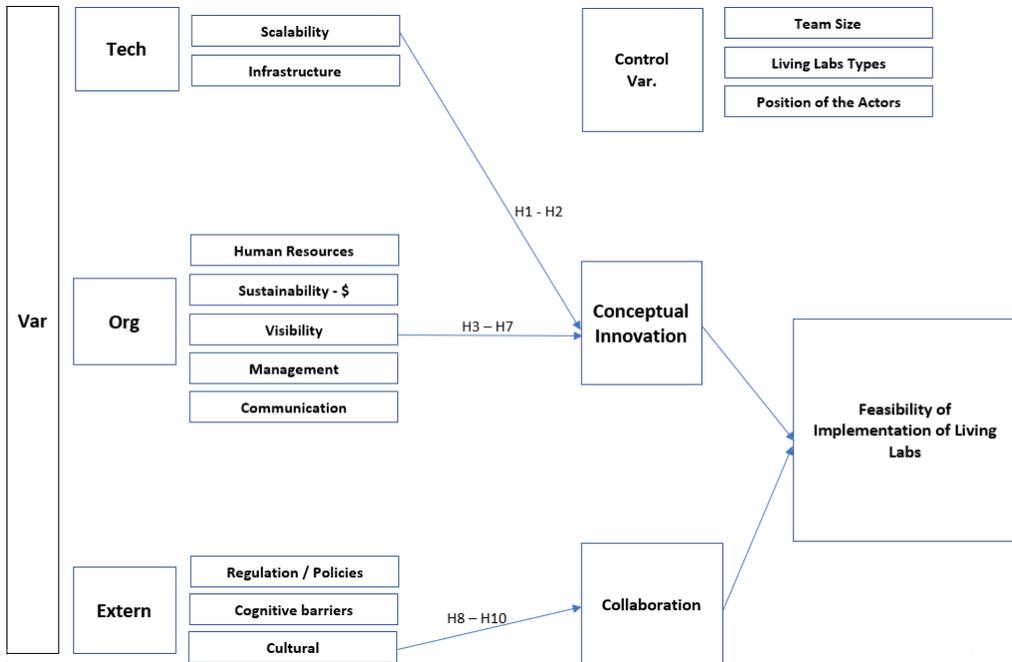


Figure 2: TOE Research Model

3.2 Hypotheses

According to the characteristics, gaps, and barriers identified through the literature, the following hypotheses were developed:

H1. The more ideas and prototypes the Living Labs develop, the more the Living Labs can externalize and become bigger.

Due to the generally limited resources available, the prototypes are not scalable. When ideas and prototypes are externalized and scaled up, they can become significant (Gascó, Mila, 2017)

H2. The greater the infrastructure that is developed in the Living Labs, the greater will be their capacity to carry out measurements and data analysis to solve problems or user needs.

Concerned about the tools and services needed for measurement results and data analysis, including networks, servers, statistical software, and end-user applications (Gascó, Mila, 2017)

H3. The greater the lack of people, the greater the impact of developing innovation, new services, or products within the Living Labs.

Some studies revealed that the groups in charge of the Living Lab network are quite small. Additionally, there are problems with a shortage of individuals in charge of each program within the numerous

organizations, or the required staff limits the number of events and initiatives that may be planned (Gascó, Mila, 2017).

H4. The lower the economic investment within the Living Labs, the greater the impact on the results of innovation and human resources.

Previously, the Living Labs required an initial financial investment. Consequently, despite ambitions to grow the network, it might be challenging to find the necessary resources. Furthermore, it is obvious that this kind of initiative requires the support of the political system (Gascó, Mila, 2017).

H5. The greater the promotion or dissemination of the Living Labs, the greater the development of the innovation and the greater the interaction of the actors involved.

Citizens, their primary target group, are unfamiliar with co-creation spaces. Due to the scarce human resources that Living Labs have, which causes a low possibility of working on their diffusion (Gascó, Mila, 2017).

H6. The more public administration and management the Living Labs receive, the Living Labs generate more interactions among the different actors (Control and distribution)

Living labs are community centers that facilitate innovation in urban settings. Usually, the public administration is not prepared to assume the changes in paradigms (Gascó, Mila, 2017).

H7. The greater the communication barrier within the Living Labs, the greater the possibility of generating collaborations that allow attracting business, organizing, or simply facilitating effective communication within and between the networks.

It refers to communication barriers between people from different backgrounds.

Communication barriers are referred to as (communicating with persons with different backgrounds). The mere existence of Living Lab organizations, as well as the potential for collaboration, both provide strong mechanisms for attracting businesses, organizing, or simply facilitating effective communication within and between regional networks (Dutilleul, 2010).

H8. The higher the regulations that support Living Labs, the higher the innovation development within Living Labs.

Previous studies have found the impediment of a lack of regulations, such as the incapacity of legal frameworks to give advantages for different stakeholders to continue taking part in long-term co-creation

activities. In order to create a safe atmosphere for stakeholders inside Living Labs to express their innovative ideas, a strong and supportive legal framework is also necessary (Sarabi, 2021).

H9. The greater the experience, scientific discipline, or practical background, the greater the specialization and division of knowledge among the participants or actors that are within the Living Labs.

The participants in the innovation process are unable to assess the expert claims of the latter for themselves due to specialization and division of knowledge, they become dependent on one another. They express when persons with different cognitive backgrounds, such as expertise, scientific discipline, or practical backgrounds. They not only make communication more difficult, but they also create knowledge asymmetries that make some participants in the innovation process reliant on others because the former is unable to properly evaluate the expert claims made by somebody else (Dutilleul, 2010).

H10. The greater the cultural barrier, the greater the difficulty of LL implementation.

Previous research has found that negative stakeholder experiences can create a significant fear of failure, limiting the adoption of Living Labs even when internal staff is highly motivated to engage citizens.

These prior experiences might have played a major role in the

negative opinion of the co-creation method in Living Labs (Sarabi, 2021).

3.3 Data collection

For this section, we made a data collection from the Living Labs based on the survey questionnaire method via expert reviews, based on the Delphi method.

With the advent of Web-based technologies, the usage of questionnaires, as a survey approach widely mentioned by researchers, has become more frequent. In terms of time and research techniques, questionnaires are currently one of the least expensive administrative tools while still offering enough value to be published in prestigious information systems journals. However, not all questionnaires are created equal. Frequently asked questions about the study population, response rate, and data analysis help determine the quality of these studies. Researchers spend a lot of time and effort ensuring they have a sufficiently large and diverse group of participants to meet the criterion. It is advantageous to have a basic understanding of conventional thought and practice in sampling and analysis, given the time and effort devoted by systems researchers since this defines the norm (Lund, 2021).

The Delphi procedure is a frequently used consensus method that, unlike other consensus methods, does not require face-to-face

communication while nevertheless steering group opinion. It allows a larger group to participate than other consensus techniques. The Delphi method is distinguished by the involvement of specialists and the use of a sequence of questions with controlled and organized feedback to gather data on a set of opinions. When there is a lack of agreement, insufficient knowledge, uncertainty, or evidence, it is an appropriate methodology. This strategy isn't meant to be a challenge to statistics or model-based techniques; rather, it's meant to be used in instances where statistical models aren't feasible or practicable. Anonymity between members, iteration with controlled feedback of set of opinions, statistical aggregation of group answers, and specialists' input are the four fundamental aspects of the Delphi technique. Anonymity allows individuals to express and modify their opinions in secret. Iteration with regulated feedback allows members to 'communicate' and share perceptions while also allowing them to modify their minds. Data can be analyzed and interpreted via statistical aggregation of group responses (Trevelyan, 2015).

For this research, the questionnaire was divided into two types of questions: The first are closed questions, which consist of response possibilities from which the respondent must choose, and the second are open questions, which inquire about the challenges that Living Labs face

or have experienced in Costa Rica. In the case of the close questions, we employed the five-point 'Likert scale' which has a measurement range of 1 to 5, this is a popular scale for many different types of study. Whereby 1 is the same as (=) strongly disagree; 2 is the same as (=) disagree; 3 is the same as (=) neutral; 4 is the same as (=) agree, and 5 is the same as (=) strongly agree.

In the segment of open questions for this study, we ask the Living Labs experts in Costa Rica, based on their experience, about the barriers that have been faced, all based on the literature review.

The survey was conducted online using Google Forms, and the Web address and a brief introduction to the survey were sent to 40 experts through email and their mobile phone numbers via WhatsApp, which was a popular platform in Costa Rica in May 2022. Only 10 responses were received after the data collection period was already over, accounting for 25% of the total response rate. This study's analysis was based on 10 replies after data filtering. The constructs and measurements utilized in this investigation are shown in Table 2.

Table 2: Definition of Variables

		Construct	Indicator	Sources
Tech	<i>Conceptual innovation</i>	Scalability of results	Scalable prototypes.	(Gascó, Mila, 2017)
			Ideas and prototypes.	
Outcomes importance.				
		Infrastructure	Services, technologies.	(Gascó, Mila, 2017)
Org	<i>Conceptual innovation</i>	Human resources	Size of the Team.	(Gascó, Mila, 2017)
			Lack of people.	
		Sustainability - \$	Initial economic investment.	(Gascó, Mila, 2017)
			Resources.	
		Visibility	Promotion or Publicity.	(Gascó, Mila, 2017)
			Human resources.	
			Networking of people and organizations.	
		Management	Community	(Gascó, Mila, 2017)
			Support innovation processes	
			Public administration and governance	
Communication	Communication between people of different backgrounds	(Dutilleul, 2010)		
Exter / Contxt	<i>Collaboration</i>	Regulation / Policies	Regulations and development of innovation	(Sarabi, 2021)
		Cognitive barriers	Different cognitive backgrounds	(Dutilleul, 2010)
			Specialization and division of knowledge and innovation process	(Dutilleul, 2010)
		Cultural	Cultural	(Sarabi, 2021)

Chapter 4. Analysis Results

The poll was done via email from May 20th to June 15th, 2022, with a total of 40 individuals who are experts and work in Living Labs as respondents. However, just ten responses were received from the participants. The public and private sectors of living laboratories provided participants.

In the first step, we focused on obtaining the information of the LL in Costa Rica, and we could recollect data from 8 Living Labs related to the kind of living lab, contact, their experience, and the population they are focusing their services on.

For the second step, we developed the questionnaire to evaluate the hypothesis by using 1 to 5 values for each choice, the averaged answer was 3.4806, and the standard deviation was 1.0532. It can be interpreted quite positively that most participants agree with previous research, and they had faced these barriers.

4.1 Costa Rica Living Labs barriers analysis

For this section, the information was divided into two parts: the first part consists in the present the basic information and statistics collected, which are related to general aspects of Living Labs in Costa Rica.

In the second section, we did a Descriptive Statistics analysis of the data collected on the barriers that Living Labs face or have faced.

5.1.1 General information analysis of the Living Labs in Costa Rica

The general information analysis explains the experts Living Lab type they are involved, the number of people that make up, the approximate number of people served by the Living Labs, and the type of collaboration in the Living Labs. The highest response rate was obtained from the experts of the Developer Living Labs, which represented 50% of the responses, and the lowest response rate was from the experts related to the Transformer Living Labs, which represented 10% of the responses.

In addition, as an important point of this analysis, 90% of the responses are from experts who are part of Living Labs that are under the structure of collaboration between the public-private sector, as shown in Table 3.

Table 3: General information of the experts

Evaluated Measures	Evaluated Variables	Count	%
Living Lab's Types	Developer or creator	5	50 %
	Enabler	2	20%
	Transformer	1	10%
	Architect	2	20%
Number of people that make up the Living Lab's.	1 a 5	2	20%
	6 – 10	5	50%
	11 – 50	1	10%
	51 – 100	-	-
	101 - 200	-	-
	201 - 250	-	-
	251 - 300	-	-
	More than 301	2	20%
Approximate number of people served by the Living Lab's.	1 to 10	3	30%
	11 to 20	1	10%
	21 to 50	2	20%
	51 to 100	1	10%
	101 - 200	-	-
	201 - 250	1	10%
	251 - 300	-	-
	More than 301	2	20%
Type of collaboration has the Living Lab's.	Only collaboration of the Public Sector	-	-
	Only collaboration of the Private Sector	1	10%
	Collaboration of the Public Sector and the Private Sector	9	90%

5.1.2 Descriptive Statistics

In the second part of the survey, the experts were asked, based on their experience, to evaluate 20 barriers identified through the literature. It is important to mention that the experts evaluated these barriers by using a scale of a number between 1 and 5; the results, as well as the standard deviation of each response, are presented in Table 4.

Table 4. Descriptive Statistics

Barriers	Aver.	St. Dev.
1. Social inventions are considered as prototypes that are developed in LLs, but despite having available resources, they present inconveniences to implement scalable solutions (startup) that adjust to social needs. Therefore, and based on your experience, do you consider that this barrier is a determining factor when implementing an LL, as well as developing innovation within the country (T1 - H1)."	4.0000	1.1547
2. Generation of prototypes that are developed within the LL within our country, have many inconveniences to be promoted outside of their environment (T1 - H1)."	3.9000	0.9944
3. The results generated within the LLs are important for the development of innovation in Costa Rica. (T1 - H1)"	4.3000	0.9487
4. LLs in our country have infrastructure limitations to develop new services, technologies, products, and innovations (T2 - H2)"	3.9000	0.8756
5. The size of the work teams found in smart laboratories is a limitation for the development of innovation within LL (O1 - H3)	3.2000	1.1353
6. The greater the lack of participants within the LL, the greater the impact will be to develop innovation, new services or products within the LL (O1 - H3)	3.5000	1.2693
7. The initial economic investment is a great limitation for the implementation of the LL, as well as the development of innovation (O2 - H4)	3.9000	1.1972

8. In our country it is easy to obtain the necessary resources for the implementation of the LL in our country (O2 - H4)	1.5000	0.5270
9. The benefits generated within the LLs that have been implemented in our country are known by the citizens (O3 - H5)	1.9000	0.9944
10. The LL within our country have a low diffusion or promotion, this is due to the fact that they do not have the necessary number of human resources. (O3 - H5)	4.1000	0.8756
11. Our country, need to increase contacts between people and organizations, in order develop more innovative services and products (O4 - H5)	3.9000	1.1005
12. The administrative support and public management within the LLs in our country, the greater the development of innovation generated by the LLs. (O5 - H6)	3.9000	1.1972
13. The LL within in our country have the necessary support to increase the development of innovation in Costa Rica. (O5 - H6)	2.4000	1.0750
14. The public administration is not prepared to assume the changes in administrative paradigms generated by the LL, this in relation to the collaboration between the public and private sectors. (O5 - H6)	3.8000	0.9189
15. The communication barrier within the LLs, the lower the possibility of generating collaborations that allow generating or simply facilitating effective communication within and between outside the LLs. (O6 - H7)	3.7000	1.0593
16. The Government to have a policy or a new regulation that supports LL, in order increase the innovation process, as well as the collaboration processes between the public sector and the private sector. (C7 - H8)	4.1111	1.2693
17. LL within our country have extensive experience, scientific discipline, or specialized training. (O8 - H9)"	2.9000	0.9944
18. LL in our country, they have great cultural barriers that may represent inconveniences within the LL (C10 - H10).	3.4000	1.1738
19. Cultural barriers have some influence on the development of ideas to provide solutions to social problems. (C10 - H10)	3.7000	1.3375
20. Consider that cultural barriers have some influence on the development of innovation.	3.6000	0.9661
Total	3.4806	1.0532

In general, numbers #3, #16, #10, and #1 obtained the highest score, with a low standard deviation. The experts seemed to agree that innovation is highly necessary to increase the country's development; likewise, the experts consider that policies should be generated to promote and support Living Labs, to increase innovation and generate scalable products and services.

In addition, they rated #17, #13, #9, and #8 as having lower scores. This point is important, given that based on the analysis of the data, the experts view these four barriers negatively. Therefore, it could be considered that these barriers can become or are problems that they are facing. Therefore, more follow-ups should be given to promote the necessary policies to eliminate these barriers in the moment of implementation and growth of Living Labs and their innovation. The Top 10 outcomes with the highest value are displayed in Table 5 below, which should be noted. Since 3.8 is the midpoint between "neutral" and "strongly agree," these outcomes had an average score higher than this value. One can say that a score of more than or equal to 3.8 is sufficient to cross the midpoint.

Table 5. Results of the Survey (Top 10)

Rank	Barriers	Aver.	St. Dev.
1	3. The results generated within the LLs are important for the development of innovation in Costa Rica. (T1 - H1)"	4.3000	0.9487
2	16. The Government to have a policy or a new regulation that supports LL, in order increase the innovation process, as well as the collaboration processes between the public sector and the private sector. (C7 - H8)	4.1111	1.2693
3	10. The LL within our country have a low diffusion or promotion, this is due to the fact that they do not have the necessary number of human resources. (O3 - H5)	4.1000	0.8756
4	1. Social inventions are considered as prototypes that are developed in LLs, but despite having available resources, they present inconveniences to implement scalable solutions (startup) that adjust to social needs. Therefore, and based on your experience, do you consider that this barrier is a determining factor when implementing an LL, as well as developing innovation within the country (T1 - H1)."	4.0000	1.1547
5	2. Generation of prototypes that are developed within the LL within our country, have many inconveniences to be promoted outside of their environment (T1 - H1)."	3.9000	0.9944
6	4. LLs in our country have infrastructure limitations to develop new services, technologies, products, and innovations (T2 - H2)"	3.9000	0.8756
7	7. The initial economic investment is a great limitation for the implementation of the LL, as well as the development of innovation (O2 - H4)	3.9000	1.1972
8	11. Our country, need to increase contacts between people and organizations, in order develop more innovative services and products (O4 - H5)	3.9000	1.1005
9	12. The administrative support and public management within the LLs in our country, the greater the development of innovation generated by the LLs. (O5 - H6)	3.9000	1.1972
10	14. The public administration is not prepared to assume the changes in administrative paradigms generated by the LL, this in relation to the collaboration between the public and private sectors. (O5 - H6)	3.8000	0.9189

Chapter 5. Conclusion

5.1 Discussion

This research work sought to expand previous studies on the characteristics, implementation and barriers of Living Labs. The objective of the study is to explain to decision-makers in Costa Rica the stagnation of innovation through the study of the barriers faced by Living Labs in our country. It is important to point out that, to achieve this objective, an analysis of previous literature was carried out.

Consequently, several barriers were identified to be analyzed quantitatively. Additionally, the TOE framework (Tornatzky, 1990) was used to divide the barriers and analyze the technological, organizational and contextual barriers to see the impact they have on Living Labs and the innovation they develop.

This study reveals that, at a contextual level, more support is required from the issuer of policies and regulations (Government), as well as from the support of decision-makers and internal resources, which are extremely important factors for adequate implementation and continuity of Living Labs in Costa Rica, to increase the development of new products and services.

At the technological level, both the development and selection of technology are affected by the limitations of infrastructure and financial resources, which affects the potential of Living Labs and the growth of innovation within them.

At the organizational level, the inadequate management of human and financial resources, as well as the communication between the parties involved in the Living Labs, have a negative impact on them.

In addition, the authors of previous research, as well as the experts who participated in this study, widely consider that the lack of understanding and knowledge about Living Labs is a negative factor since they are not serving the population for which they were created and not all citizens benefit from them.

6.1.1 Technological context

In the technological context, hypotheses #1 and #2 were tested. The results of the study show that the experts agree that in the case of hypothesis #1, although Living Labs may have available resources, they have problems implementing and outsourcing scalable solutions (startup) that fit social needs. Likewise, the experts also consider that these scalable solutions generated within the Living Labs are important for the development of innovation in Costa Rica (Scalability of results, (Gascó,

Mila, 2017)). The results of hypothesis #2 confirm the infrastructure limitations to developing new services, technologies, products and innovation (Infrastructure, (Gascó, Mila, 2017)).

6.1.2 Organizational context

In the case of the organizational context, hypotheses # 3, # 4, # 5, # 6 and # 7 were tested. In the case of hypothesis # 3, the experts agree that the people who make up or participate in the Living Labs are important for the development of ideas; therefore, if the Living Labs have a reduced number of people, they will have a high effect on the development of innovation, services or products within the Living Labs (Human Resources, (Gascó, Mila, 2017)).

Regarding hypotheses # 4, # 5, and # 6, the experts consider that these points are the most negative factors, economic investment (Economic Sustainability,(Gascó, Mila, 2017)), promotion or diffusion (Visibility, (Gascó, Mila, 2017)) and administration and interactions between the different actors within the Living Labs (Management, (Gascó, Mila, 2017)) are the biggest barriers faced by Living Labs in Costa Rica.

The result of hypothesis # 7 indicates that most experts agree with the fact that the barrier related to poor communication inside and outside the Living Labs has an impact on the generation of collaborations that

allow attracting businesses that bring benefits to the Living Labs (Communication, (Dutilleul, 2010)).

6.1.3 Environmental context

The external / contextual context level, the result of hypothesis # 8 indicates that experts consider that the generation of a policy or new regulations that support the development of Living Labs is highly necessary to increase the innovation process, as well as the collaboration processes between the public sector and the private sector (Regulation / Policies, (Sarabi, 2021)).

Regarding hypothesis # 9, experts agree that Living Labs in our country lack extensive experience, scientific discipline, or specialized training because they are in the process of learning and sharing knowledge through strategic alliances, for example, is the case of Helice Living Lab, which was founded in 2019 by the University of Costa Rica in partnership with the Government of Korea (Cognitive Barriers, (Dutilleul, 2010)). It is important to note that Helice seeks to accelerate the realization of research, development, and innovation alliances with the productive sector, as well as the creation of intensive companies derived from knowledge to contribute to economic growth and national welfare through the activation of productive linkages with social responsibility, through the implementation of the quintuple helix

innovation model (UCR, 2022).

Finally, we have the results of hypothesis # 10, which indicate that Living Labs in our country have great cultural barriers that may represent disadvantages. Likewise, the experts consider that cultural barriers have a certain influence on the development of ideas to provide solutions to social problems (Culture, (Sarabi, 2021)).

5.2 Implications

This investigation supports the existing literature by analyzing and validating through the TOE model and, with the collaboration of experts, the existence of barriers faced by Living Labs, which were extracted from previous research. Additionally, the present study, based on the criteria provided by the experts, identifies the barriers that have the greatest impact on Living Labs in Costa Rica. These barriers are economic sustainability, visibility, management and cognitive barriers, which have a strong influence on the development of innovation and the generation of new opportunities.

It is hoped that this study will be an example to initiate an analysis of the main challenges and benefits of Living Labs in the Latin American Region, given that there are very few previous and specific studies where Living Labs are analyzed at the regional level since this concept is

relatively new in our countries. It is also expected that this study will be a guide for decision makers and policymakers, to establish and policymakers, to establish policies and strategies to help in the implementation and continuity of Living Labs as the principal tools to increase the development of innovation and thus generate a greater impact on the country's economy.

As part of the research, information was taken from the websites of the Living Labs identified in Costa Rica; in these sites, it was possible to identify the sources of investment, as well as the public-private partnerships. However, it was not possible to determine under which policies they were developed (projects of law). Additionally, the information available mentions the projects and activities being developed, although the final results are not shown.

Finally, this document evaluates each one of the barriers provided by previous research; additionally, through the survey, it was detected which types of Living Labs had been implemented in Costa Rica. According to the number of responses, 50% of the experts who participated in the survey belong to the developer or created Living Labs, 20% belong to Enabler type Living Labs, and the other 20% correspond to architecture Living Labs and 10% to transformer type Living Labs. It is also important to point out that 90% of the Living Labs have a public/private

sector collaboration and 10% correspond to the private sector, as shown in Table 3.

It is important to indicate that, according to the literature, it is important to have an analysis of the barriers faced by Living Labs since having them identified contributes to the formulation of strategies and policies to reduce the limitations that are significantly impacting the adoption of Living Labs (Sarabi, 2021).

5.3 Policy suggestion

This study is intended to be a useful guide for future researchers who will specialize in Living Labs and for decision-makers inside and outside Living Labs implemented and implemented in Costa Rica.

The main purpose of this study was to investigate and identify the main barriers to Living Labs, and for this purpose, an evaluation of the barriers found in the literature was carried out using the TOE model. This was done to try to show which are the barriers with the greatest impact on the Living Labs adoption process within the contexts of technology, organization and external or environmental contexts.

In terms of policy and decision-makers, it is very important that they consider two aspects; the first one is to acquire knowledge about the multiple benefits that Living Labs have generated in European countries

and especially in Asian countries and how they have generated an important impact on their economies, as well as on the growth of innovation. The second aspect to consider is to learn about the barriers that impede the growth of Living Labs, to create the necessary strategies and policies to mitigate these limitations, as well as possible risks and solutions when implementing them. Additionally, it is important to consider the creation of a robust innovation ecosystem, which allows not only to develop ideas but also to protect it; in this case, it is recommended that when generating policies and regulations related to Living Labs, these are accompanied by an adequate intellectual property process, as well as performance indicators that evaluate each stage related to the generation of innovation.

5.4 Limitations and Future Research

The present research has the following limitations:

1. The survey has a limited number of responses due to two factors; the first factor is the number of Living Labs that have been implemented. The second factor is the feeling of cyber distrust, as a consequence of the difficult moment that the country is going through; this is due to the fact that Costa Rica has been involved in several blockades such as the Ministry of Education and the “Caja Costarricense del Seguro Social”, which is the main

institution in charge of providing healthcare services nationwide. For this reason, the Costa Rica government has issued directives regarding this issue, which has affected the number of responses obtained.

2. This study was carried out during the period of change of government, as well as the incorporation of the country to the OECD, which implies that the National Development Plan has variations or changes in the priority of the topic of increasing innovation and its positive impact on the Costa Rican economy has since these possible variations have not been contemplated when this study was developed and finalized.

It is considered necessary for future research to carry out comparative research work on Living Labs, showing broader statistics, to expand research on the socio-economic and technological impact at the time of adopting policies for the adoption of Living Labs.

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Appendix.1

Costa Rica Living Labs Barriers Questionnaire	
Control	1. Of the types of living labs mentioned above, can you tell us which type of LL is working?
	2. What is the number of people that make up the LL to which they belong.
	3. Could you tell us the approximate number of people served by the LL to which you belong?
	4. Could you tell us what type of collaboration the LL in which you work has.
	5. Do you consider that the LL within our country have extensive experience, scientific discipline or specialized training. (O8 - H9)
Tech	6. According to previous studies, social inventions are considered as prototypes that are developed in LLs, but despite having available resources, they present

	inconveniences to implement scalable solutions (startup) that adjust to social needs. Therefore, and based on your experience, do you consider that this barrier is a determining factor when implementing an LL, as well as developing innovation within the country (T1 - H1).
	7. Do you consider that the ideas and the generation of prototypes that are developed within the LL within our country, have many inconveniences to be promoted outside of their environment (T1 - H1).
	8. Do you consider that LLs in our country have infrastructure limitations to develop new services, technologies, products and innovations? (T2 - H2)
	9. Do you consider that the results generated within the LL are important for the development of innovation in Costa Rica? (T1 - H1)
Org	10. Do you consider that the size of the work teams found in smart laboratories is a limitation for the development of innovation within LL? (O1 - H3)
	11. Do you consider that the greater the lack of participants within the LL, the greater the impact will be to develop innovation, new services or products within the LL? (O1 - H3)
	12. Do you consider that the initial economic investment is a great limitation for the implementation of the LL, as well as the development of innovation? (O2 - H4)
	13. Do you consider that within our country it is easy to obtain the necessary resources for the implementation of LL in our country (O2 - H4)
	14. Do you consider that the benefits generated within the LLs that have been implemented in our country are known by the citizens (O3 - H5)
	15. Do you consider that the LL within our country have a low diffusion or promotion, this is due to the fact that they do not have the necessary number of human resources. (O3 - H5)
	16. Considers that the LL implemented within our country, need to increase contacts between people and organizations, this in order to develop more innovative services and products (O4 - H5)
	17. Do you consider that the greater the administrative support and public management within the LLs in our

	country, the greater the development of innovation generated by the LLs. (O5 - H6)
	18. Do you consider that the LL within our country have the necessary support to increase the development of innovation in Costa Rica. (O5 - H6)
	19. Do you consider that the public administration is not prepared to assume the changes in administrative paradigms generated by the LL, this in relation to the collaboration between the public and private sectors. (O5 - H6)
	20. Consider that the greater the communication barrier within the LLs, the lower the possibility of generating collaborations that allow generating or simply facilitating effective communication within and between outside the LLs. (O6 - H7)
Ext	21. Do you consider that it would be very helpful to have a policy or a new regulation that supports LL, this in order to increase the innovation process, as well as the collaboration processes between the public sector and the private sector. (C7 - H8)
	22. Do you consider that within the LL in our country, they have great cultural barriers that may represent inconveniences within the LL (C10 - H10).
	23. Consider that cultural barriers have some influence on the development of ideas to provide solutions to social problems. (C10 - H10)
	24. Consider that cultural barriers have some influence on the development of innovation.