

Methodological design of a strategy for the productive and sustainable development of communities in Cauca

Diseño metodológico una estrategia para el desarrollo productivo y sostenible de comunidades en el Cauca

Desenho metodológico uma estratégia para o desenvolvimento produtivo e sustentável das comunidades do Cauca

Julián Andrés Mera Paz¹
Ramón Fernando Colmenaresquintero²

Received: May 15th, 2023

Accepted: July 25th, 2023

Available: September 15th, 2023

How to cite this article:

J.A. Mera Paz, R.F. Colmenaresquintero, "Methodological Design of A Strategy for The Productive and Sustainable Development of Communities in Cauca," *Revista Ingeniería Solidaria*, vol. 19, no. 3, 2023.
doi: <https://doi.org/10.16925/2357-6014.2023.03.06>

Research article. <https://doi.org/10.16925/2357-6014.2023.03.06>

¹ Doctorando en proyectos, línea de investigación TIC, Programa de contaduría pública, Programa de Ingeniería de sistemas, Grupo de investigación ESLINGA, Universidad cooperativa de Colombia.

Email: Julian.mera@crepic.org.co, julian.mera@campusucc.edu.co

ORCID: <https://orcid.org/0000-0003-4695-8022>

CVLAC: https://scienti.minciencias.gov.co/cvlac/visualizador/generarCurriculoCv.do?cod_rh=0000018983

² Doctor en sistemas energéticos y optimización 2: Grupo de investigación TERMOMECA, Universidad cooperativa de Colombia.

Email: ramon.colmenaresq@campusucc.edu.co

ORCID: <https://orcid.org/0000-0003-1166-1982>

CVLAC: https://scienti.minciencias.gov.co/cvlac/visualizador/generarCurriculoCv.do?cod_rh=0000192503



Abstract

Introduction: The productive and sustainable development in the department of Cauca depends to a large extent on the effective use of information and communication technologies (ICT). However, the institutional framework lacks mechanisms or methods to select investment projects with ICT resources. This situation has become an obstacle to economic growth and the improvement of social conditions in the region.

Methods: In this article, the construction of a methodological design, one that allows for the selection and evaluation of projects with ICT resources that contribute to the solidarity economy of Cauca communities, is consolidated. The investigative process used a mixed approach, carrying out a systematic review of academic and political-organizational information, after which proposals and selection criteria used in Cauca in the last 5 years were analyzed.

Results: With the information collected and analyzed, a route for the selection and evaluation of projects was compiled. Likewise, user stories were used to create a simulator that materializes the process of selecting and evaluating projects in a more efficient and effective way.

Conclusions: In conclusion, the creation of the methodological design, materialized in the simulator, represents a valuable tool for the department of Cauca, since it allows for a rigorous and coherent evaluation of investment projects with ICT resources

Originality: Promoting productive growth, the solidarity economy also contributes to sustainable development for the communities of Cauca.

Limitations: The sample was limited due to the geographical location of the municipalities.

Keywords: Information and communication technologies, productive development, investment projects, methodological design, sustainable development goals, solidarity economy, Cauca.

Resumen

Introducción: El desarrollo productivo y sostenible en el departamento del Cauca depende en gran medida de la utilización efectiva de las tecnologías de información y comunicación (TIC). Sin embargo, la institucionalidad carece de mecanismos o métodos para seleccionar proyectos de inversión con recursos TIC. Esta situación se ha convertido en un obstáculo para el crecimiento económico y la mejora de condiciones sociales en la región.

Métodos: En este artículo, se consolida la construcción de un diseño metodológico que permite seleccionar y evaluar proyectos con recursos TIC que aportan a la economía solidaria de comunidades del Cauca. El proceso investigativo se abordó desde un enfoque mixto, realizando una revisión sistemática de información académica y político-organizativa, después se analizaron propuestas y criterios de selección utilizados en el Cauca en los últimos 5 años.

Resultados: Con la información recolectada y analizada, se diseñó una ruta para la selección y valoración de proyectos. Así mismo se utilizaron historias de usuario para crear un simulador que materializa el proceso de seleccionar y evaluar los proyectos de forma más eficiente y efectiva.

Conclusiones: En conclusión, la creación del diseño metodológico, materializado en el simulador representa una herramienta valiosa para el departamento del Cauca, ya que permite una evaluación rigurosa y coherente de los proyectos de inversión con recursos TIC,

Originalidad: fomentando el crecimiento productivo, la economía solidaria al mismo tiempo se contribuye al desarrollo sostenible para comunidades del Cauca.

Limitaciones: Por la ubicación geográfica de los municipios se tuvo que limitar la muestra.

Palabras clave: Tecnologías de información y comunicación, desarrollo productivo, proyectos de inversión, diseño metodológico, objetivos de desarrollo sostenible, economía solidaria, Cauca.

Resumo

Introdução: O desenvolvimento produtivo e sustentável no departamento de Cauca depende em grande parte do uso efetivo das tecnologias de informação e comunicação (TIC). No entanto, o quadro institucional carece de mecanismos ou métodos para selecionar projetos de investimento com recursos de TIC. Esta situação tornou-se um obstáculo ao crescimento econômico e à melhoria das condições sociais na região.

Métodos: Neste artigo se consolida a construção de um desenho metodológico que permite selecionar e avaliar projetos com recursos TIC que contribuam para a economia solidária das comunidades do Cauca. O processo investigativo foi abordado a partir de uma abordagem mista, realizando uma revisão sistemática da informação acadêmica e político-organizacional, após o que foram analisadas as propostas e os critérios de seleção utilizados em Cauca nos últimos 5 anos.

Resultados: Com as informações coletadas e analisadas, foi elaborado um roteiro para a seleção e avaliação dos projetos. Da mesma forma, foram utilizadas histórias de usuários para criar um simulador que materializa o processo de seleção e avaliação de projetos de forma mais eficiente e eficaz.

Conclusões: Em conclusão, a criação do desenho metodológico, materializado no simulador, representa uma ferramenta valiosa para o departamento de Cauca, pois permite uma avaliação rigorosa e coerente de projetos de investimento com recursos TIC

Originalidade: promoção do crescimento produtivo, economia solidária ao mesmo tempo contribui para o desenvolvimento sustentável das comunidades do Cauca.

Limitações: Devido à localização geográfica dos municípios, a amostra teve que ser limitada.

Palavras-chave: Tecnologias de informação e comunicação, desenvolvimento produtivo, projetos de investimento, desenho metodológico, objetivos de desenvolvimento sustentável, economia solidária, Cauca.

1. INTRODUCTION

The structure and execution of online investment projects in information technologies are essential for strengthening productivity and sustainability [1]. Following a methodological design is necessary to ensure the sum of tools and techniques result in results that can be obtained in a structured and systematic manner [2]. The department of Cauca depends to a large extent on the proper use of investment projects [3], as it is a region in the south-west of Colombia, affected by various problems such as the absence of public services and connectivity in large areas, the presence of different illegal armed groups [4], adverse climatic conditions [5], among others. Currently, the institutional framework does not have a clear path of application methods or mechanisms to select and evaluate investment projects focused on ICT, which directly impact the organizational strengthening of communities towards a solidary and sustainable economy [6].

This article consolidates the construction of a methodological design that allows the selection and evaluation of investment projects with ICT resources that contribute to the productive development and the solidarity economy of the communities

of the department of Cauca. For the development of the investigative process, an approach was used mixed with a type of participatory action research, understood from the approach of “the life strategy that includes the creation of spaces for collaborative learning and the design, execution and evaluation of actions to achieve a better quality of life” [7], combining quantitative and qualitative elements, which were addressed in five phases based on the relationship of information and communication technologies, the communities of the department of Cauca, investment projects and their influence on productive development, the solidarity economy and the challenges of sustainable development. The design was structured in 5 phases related to the specific objectives of the research project with a series of activities to achieve them:

Phase 1: Understand the existing dynamics, models, and methodologies to select projects that will impact the productive and economic development and the sustainable development objectives of communities; a case study for the department of Cauca.

1. Search for information
2. Select the information
3. Define inclusion and exclusion criteria
4. Classify the information

Phase 2: Analyze the ICT-supported projects that have been selected to impact productive, economic development and sustainable development objectives in communities in the department of Cauca.

1. Identify the ICT-supported projects that have been selected and applied to communities in the department of Cauca.
2. Determine the selection process carried out in the identified projects.

Phase 3: Design a measurement and evaluation model in the prospective phase of ICT resources for productive and economic development projects and the sustainable development objectives of communities in the department of Cauca.

1. Determine the components and/or variables for the design of the measurement and assessment model for the selection of projects with ICT resources for communities in the department of Cauca.
2. Define the structure of the model to be implemented in software.

Phase 4: Simulate a methodological design in the prospective phase of ICT resources to evaluate the impact that is generated in the productive, economic development and the sustainable development objectives of communities in the department of Cauca.

1. Implement functional software in the prototype stage, applied to the model created.
2. Make initial tests of the operation according to the test cases.

Phase 5: Evaluate the effectiveness of the simulation of the methodological design in the prospective phase of ICT resources in the productive, economic development and the sustainable development objectives of communities in the department of Cauca.

1. Validate the functional software in the prototype stage with real data.
2. Generate a functional software behavior report.

The phases were progressed sequentially, with Phase 1 applying the technique of technological surveillance [8] of patents and papers in specialized databases. The following databases were consulted for patents: Google Patents, Patentscope, USPTO, Carrot2; and for articles: ProQuest, Springer, ScienceDirect, Scopus, Dialnet. The aim was to understand the relationship that may exist between productive development, economic and sustainable development objectives with projects supported by ICT, over the last 5 years. Thus establishing a systematic review of academic and political-organizational information to contextualize the situational analysis of the problem, followed by an analysis of the proposals and criteria established for the selection and evaluation of ICT projects carried out in the last 5 years by the department of Cauca. Discussion groups were also held with representatives of the associations, and semi-structured interviews with the people who make decisions in the selection and evaluation of the aforementioned projects. This qualitative cohort activity made it possible to understand the different perspectives of the key actors in the process, after which, with the information collected and analyzed, the methodological design was created for the prospective phase of ICT resources for the department of Cauca as a route for the selection and evaluation of the proposals with the purpose of improving the effectiveness and certainty in the decisions of the process. This input added to the documented user stories following an agile reference framework for software development called SCRUM [9], allowing for the development of a simulator that materializes

all the actions of the process in a clear and concise way. Subsequently, a validation process was carried out in which the representatives of the associations filled out a questionnaire regarding the level of satisfaction of the technological solution developed with a social and community purpose (Figure 1).

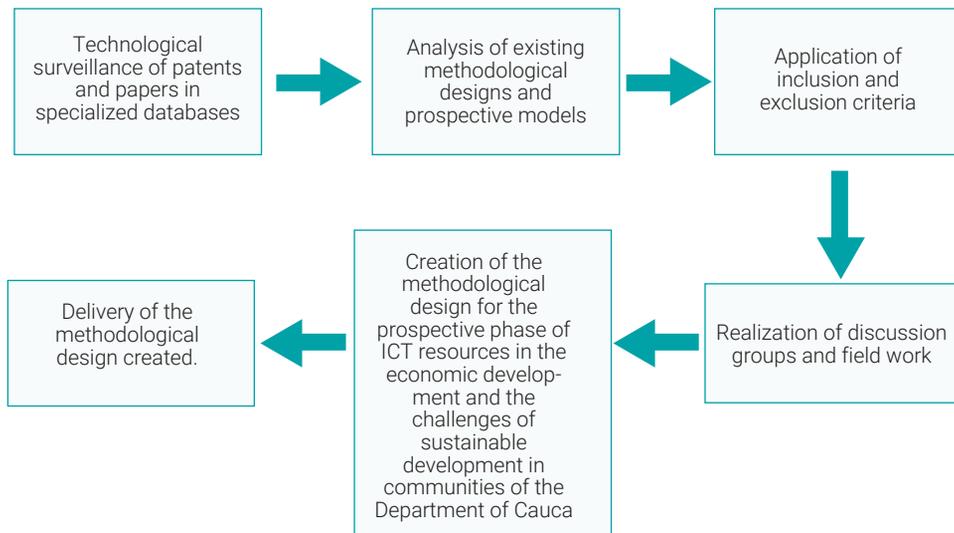


Figure 1. Route of the research process
Reference: Own work

Finally, it can be established that the construction of the methodological design materialized in the simulator represents a valuable tool for the institutional framework in the department of Cauca, strengthening the selection and evaluation procedure of investment projects with ICT resources and benefits associations as it promotes adequately the productive development, solidarity economy, contributing to the sustainable development of the communities.

1.1 Literature review or research background

The concept of sustainable development was born in the Brundtland report [10] as a general concept of social objective processes and the self-sustainability capacity of communities. From this, a phenomenon that breaks the paradigms is generated, when nations came together with the purpose of articulating guidelines to face common problems and framed, in September 2015 in the general assembly of the United Nations, an action plan with the intention of favoring people, the planet, minimizing risks and trying to guarantee prosperity [11]. The 2030 agenda is oriented towards

sustainable development and is framed within the 17 Sustainable Development Goals (SDGs), which were cataloged by more than 200 heads of state or government, highlighting the way to act as one world and the transformation of this through good living, prosperity, and tranquility for everyone in the world [12]. Likewise, the department of Cauca, in its departmental development plan called "42 reasons to move forward" emphasizes that peace is achieved with social innovation. Textually it focuses on that "Peace with social innovation is a dynamic process of integration between innovation, technology, detection and solution of social problems that seek to improve the quality of life of the inhabitants of the department of Cauca" [6]. Due to the various problems mentioned above, union, solidarity and resilient processes have been awakened in the Cauca community. It is appropriate to mention that socio-community and/or political participation is a very powerful tool that promotes the synergistic articulation of various dimensions of resilience at different levels, enabling a way out of different problems, by working together to address common challenges that strengthens the sense of belonging and mutual support, in turn reducing possible crises with a greater degree of well-being [13].

Going deeper into the research process, Phase 1 was carried out, establishing an information search protocol in which some guiding questions were raised that will facilitate the search process and meaning of the information that was intended to be obtained, defining the following:

What are the stages, processes, procedures, policies, and roles for the selection of projects with ICT resources that impact a community?

What technological tools exist in the market or in the academy for the selection of projects with ICT resources that have an impact on a community?

Following this, some keywords were established to make the search process efficient in metasearch engines, with the purpose of bringing the search closer to assertive results. The application of Boolean operators was used, combining elements of the keywords with AND, OR, NOT, using them to combine search terms for more accurate results. It is true that classical logic underlies search strategies, since Boolean operators are based on propositional logic and allow search terms to be combined in a logical and coherent manner, following the parameters of [14] who state that in a process search "It is necessary to analyze each case individually and use logical reasoning to determine the best search strategy to follow". With the intention of achieving a higher search index and obtaining quality information, the search was refined with inclusion and exclusion criteria as follows:

Inclusion Criteria:

- The document, article, patent, or other approaches the definition, description or content of interest in relation to the stages, processes, procedures, policies and roles for the selection of projects with ICT resources that have an impact on a community.
- The document, article, patent, or other approaches a solution, an experiment or a reference model to create a simulator that results in a selection of projects with ICT resources that have an impact on a community.
- The document, article, patent or other mentions good practices, an example already applied, or lessons learned when selecting projects with ICT resources that impact the community.

Exclusion Criteria:

- The document, article, patent or other is out of interest, does not report relevance for this research project.
- The document, article, patent or other is out of context or does not directly contemplate the purpose of the search based on the defined keywords.
- The document, article, patent, or others does not propose any approximation towards the solution defined in this research project.

It was possible to obtain results of international, regional, and national studies and events that point to the research topic:

[15] mentions that for Ibero-America the policies for the incorporation of Information and Communication Technologies (ICT) can offer many opportunities for the development of cultural communities that are usually excluded. These policies can help improve digital inclusion and human development through the exchange and construction of knowledge of individuals and strengthen the productive development of communities. [16] shows the progress in the development of the education postulate with emphasis on the social and solidarity economy at the Universidad Cooperativa de Colombia, which has a focus on promoting citizen participation and generating awareness and visibility around the solidarity economy. Its goal is to promote entrepreneurship and social innovation, with an impact on both internal and external communities. It recognizes the existence of an evident crisis in the social, economic, and environmental dimensions, which has led to the need for universities, governments, and civil society organizations, including those of the social and solidarity economy, to define strategies to improve the quality of life and promote sustainable development.

[17] mentions that public policies and development efforts, in relation to ICTs, focus on reducing digital divides and ensuring that marginalized people and communities have access and the ability to appropriate opportunities offered by ICT. This may include measures such as digital training programs, subsidies for the acquisition of Internet devices and services [18], and policies to respond to accessibility and the inclusion of people with disabilities, as well as the opportunity to strengthen projects for productive and economic development of the regions. The postulate of [19] states that the use and exploitation of ICT can be a key factor to improve public management and promote greater citizen participation in decision-making. Subnational governments have an important role in bringing citizens closer to the administration and streamlining processes through the use of ICTs. Collaboration between government and citizens, supported by technology, can help generate a culture of transparency and participation that benefits all of society. For its part, [20] made a reflection, in which it analyzes the productive chains as a great source of opportunities for entrepreneurs who live in rural areas, concluding on the importance of where the support of the public sector stands out, through favorable legal frameworks and business promotion programs, playing a crucial role in the support and growth of communities, facilitating access to resources, financing and advice, creating a favorable environment for the creation and consolidation of enterprises. The study carried out in [21] discusses an important initiative that provides a model for the debate on the role of engineering, science, technology, and innovation in marginalized regions of Latin America, and how community innovation can be an effective way to promote citizen participation and sustainable development in regions with limited resources and significant challenges. In addition, it can help change the way people think about development, fostering more inclusive and sustainable approaches, through projects with well-invested resources.

For its part, the government of Cauca has in its organization chart the planning advisory office, which has the following functions:

1. Advise and coordinate the design, preparation, presentation, and execution of the departmental development plan.
2. Coordinate the preparation of the annual action plans that the different dependencies must formulate to execute the departmental development plan.
3. Coordinate the harmonization, monitoring and evaluation of departmental and municipal development plans.
4. Monitor the investments made by the national government in the department.

5. Prepare the annual operating investment plan -POAI- in coordination with the finance ministry.
6. Advise the other dependencies of the departmental administration in the formulation of programs and projects for the management and investment of departmental resources, the nation, the private sector, and national and international cooperation organizations.

It is in this office where projects for productive and economic development and application to the challenges of sustainable development are led, advised, and selected [6].

Currently in the office there is a registry of 100 associations or cooperatives legally attached to the government of Cauca, that is, they meet the requirements of existence and legal representation, have RUT or NIT, legal representatives in the chamber of commerce, email, certificate of Constitution. In addition to this, there is important information reported by the previous administration of the Government of Cauca [22], where among others in the OCAD¹ of science, technology and innovation, which administers 10% of the resources of the general system of royalties at the national level -SGR, the department of Cauca has obtained the approval of 20 projects for a value close to \$123 billion pesos, which shows the progress in the region. It is then evident that there is an application of projects, the resources arrive, but there is no evidence of a methodology in the prospective phase focused on some characteristics and technical conditions, nor a process for measurement and evaluation that allows ICT resources to have a destination and be more productive.

2. MATERIALS AND METHODS

A systematic review of information was the key method to establish the methodological design in this research process, for which 7 steps mentioned in [23] were followed, which are described as follows:

1. Prepare the computer resources: for this, the team determined the use of metasearch engines for the review of existing papers and patents, in relation to the research process.

1 OCAD: Collegiate administration and decision-making body, entity responsible for making viable, prioritizing and approving investment projects financed with royalty resources.

2. Design the PICO question: Where the research question or questions were established with an objective, they were focused on the search-oriented process.
3. Choose the variables of the structure that are intended to be studied.
4. Use the keywords, operators and do the bibliographic search
5. Initial selection of the results, order the articles
6. Apply inclusion and exclusion criteria, defining the final selection of results.
7. Apply the results to the writing of a research report.

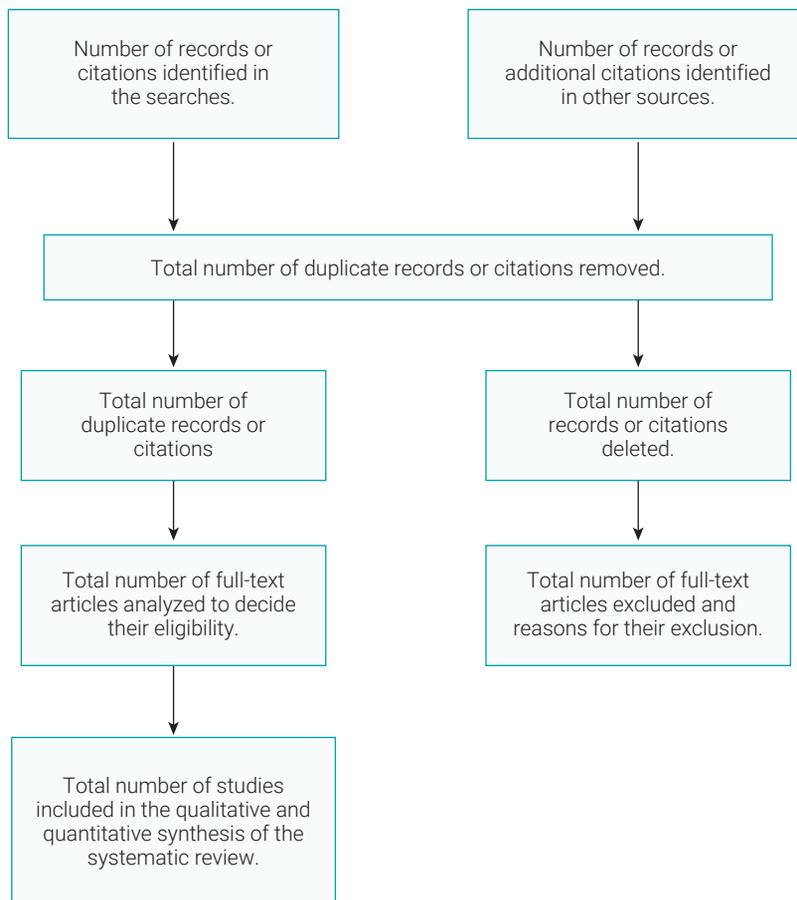


Figure 2. Information obtained with the application of the systematic review of information [24].

From the results of the systematic review of information (Figure 2) and background, the information was classified as the final activity of Phase 1, obtaining the following tables:

Table 1. Patent search results

| Database | Quantity |
|----------------|----------|
| Google Patents | 1 |
| Patentscope | 2 |
| USPTO | 1 |
| Carrot2 | 3 |

Reference: Own work

Table 2. Database search results

| Database | Quantity |
|---------------|----------|
| ProQuest | 4 |
| Springer | 3 |
| ScienceDirect | 5 |
| Scopus | 0 |
| Dialnet | 3 |

Reference: Own work

With the results of Tables 1 and 2, it was observed that there is a notable scarcity of information in the academic and industrial environment regarding the research process. Therefore, an undeniable opportunity was evidenced, to materialize the study with a real case to be applied and building the route to consolidate the methodological design and its materialization in the software-type simulator.

Following the information search process, an analysis was carried out on the existing methodological designs and prospective models. A finding is Law 2056 of 2020 that applies to the DNP (National Planning Directorate) in which a guide is established for the participatory planning of investments with royalty resources [25]. There is also a document created in November 2004 by the DNP called Methodology for monitoring investment programs and projects. In the Ministry of Information Technology and Communications MINTIC there is an ICT promotion guide called Objective Selection Process. Based on the analysis and findings of these documents, the proposal is strengthened and structured to create a simulator that has robust characteristics. In the results chapter, the information of this is detailed in depth. After that, two discussion groups were held [26] with people who were part of the research sample; these as a vehicle of expression from ideologies and social worldviews, taking into account the observation of the behavior of the attendees in verbal and non-verbal communication, exploring elements of difficult access. Likewise, two interviews were

conducted to selected people who are characterized as being experts in planning and assigning projects in the Government of Cauca. With the classified and consolidated information, the methodological design was created along with a simulator to control, review, apply metrics, evaluate, and generate results of the applications represented in proposals of the associations of the department of Cauca.

Population and Sample

The team took into account the statistics of the DANE² of 2018 where it is established that the inhabitants of the department of Cauca number 1,404,313. This is the population directly or indirectly affected by the investment projects with ICT resources presented by the associations. However, the planning office of the department of Cauca has 100 associations that are linked and have their processes in accordance with Colombian laws to be representative; Therefore, the number 100 is taken as the population in this project.

In order to define the sample, a probabilistic sampling formula is applied.

$$n = \frac{Z^2 * (P * Q)}{e^2 + (Z^2 * (P * Q))/N}$$

Where: n= Sample size, Z= Desired confidence level (95%), therefore Z=1.96; P= Proportion of the population with the desired characteristic (success) (0.95), Q= Proportion of the population with the desired characteristic (failure) (0.05), N= Size of the population (100), E= Sampling error level (0.05)

Replacing the data:

$$n = \frac{(1,96)^2 * (0,95 * 0,05)}{(0,05)^2 + ((1,96)^2 * (0,95 * 0,05))/100}$$

$$n = \frac{0,15}{0,004} \quad n = 37,5$$

A sample of 37 of the associations linked to the municipal planning office with their respective representation is taken.

2 DANE: National administrative department of statistics in Colombia, in charge of conducting the national census.

Considering the criteria of the applied research methodology and that there is a codependency of the relationship with participatory action research, qualitative and quantitative variables are established (Figure 3) under the relationship of impact or benefit with the community.

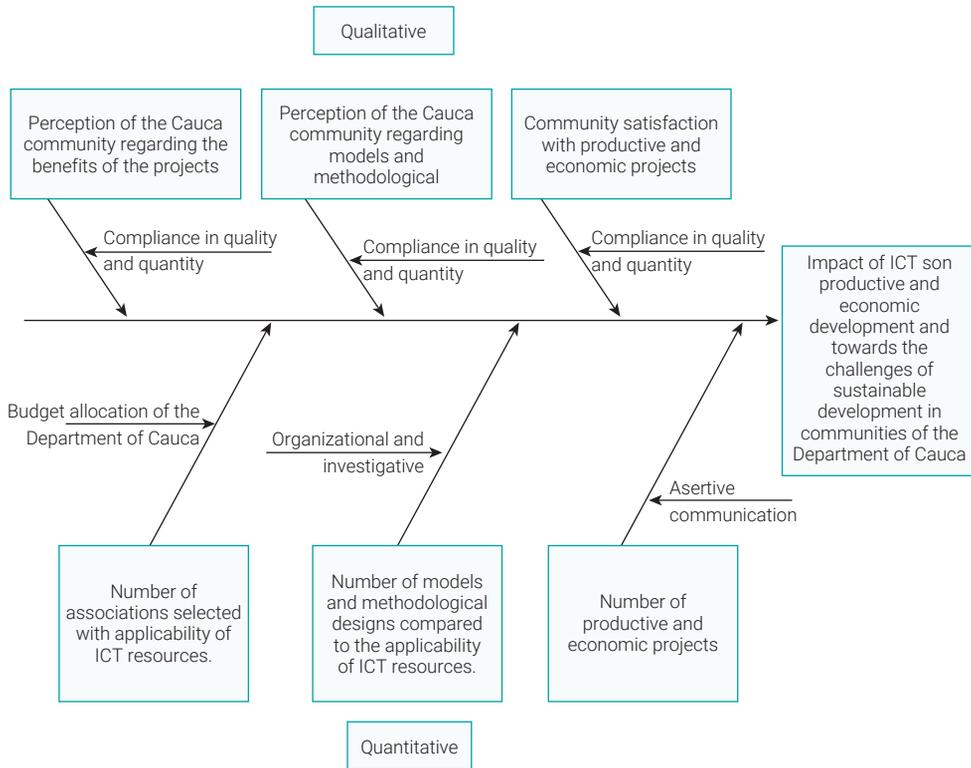


Figure 3. Quantitative and qualitative variables
Reference: Own work

The diagnostic instruments are from their own source. They were adopted to the conditions found in the project. The structure and discourse for the discussion groups were organized, in addition to the development of two semi-structured interviews with experts in planning from the department of Cauca and therefore relevant in the decision-making process.

It was possible to establish participation in 4 discussion groups with the assistance of 9 people representing the associations (Figure 4), the medium used for the realization was the Gessell camera [27]. This is due to the fact that it is an adequate space for the collection of information. For the purposes of observation, preparation had to be made before the events and to establish a time, the selected one was exactly at 6:00 p.m.; this due to the ease of attendance by the summoned.



Figure 4. Discussion groups with the associations attached to the government of Cauca.
Reference: Own work

For the development of the discussion groups, a guide was prepared with some dimensions to be addressed:

1. Dimension of the formation of the cooperative or association
2. Dimension of the organizational process towards a solidarity and sustainable economy
3. Dimension of projects that have been favored.
4. Dimension of benefits of assigned projects
5. Dimension from what the government of Cauca is expected to do for the assignment of projects.

Focusing on the 5 dimensions, and under the moderation of one of the own work of this document, dialogues were held with the participants to explore and understand their perception and adoption of the dimensions raised in the discussion groups. Through this interaction, the different outcomes were reflected upon and both the verbal and non-verbal responses of the participants were observed.

On the other hand, two officials from the planning office of the Government of Cauca, experts involved in the project selection and evaluation process, were asked to respond to a semi-structured interview consisting of 10 questions as follows:

1. From your job position, do you consider that the Government of Cauca has criteria and metrics to select projects with defined and adequately oriented ICT resources?
2. Do you consider it appropriate and pertinent that the projects that the department of Cauca commits to be supported by a methodological design?

3. How do projects with ICT resources impact productive and economic development and the challenges of sustainable development for the department of Cauca?
4. What parameters should be the most important to take into account when formulating an ICT resource project for the department of Cauca?
5. In your opinion, how are projects associated with ICT resources to benefit the communities of Cauca?
6. Based on your experience, do associations and/or cooperatives have clear routes to formulate projects with ICT resources?
7. According to your participation in project formulation, what would be the results for a community that is selected with the approval of an ICT project?
8. To what extent can it be considered that there is a relationship between the prospective phase of ICT resources and the benefits for communities in the department of Cauca?
9. What do you consider to be the importance for a community that the government of the department of Cauca approves a project with ICT resources?
10. Do you consider that, through a research process, a technological instrument can be consolidated that facilitates the process of selecting and assigning projects with ICT resources for the communities of Cauca.

With the application of research instruments and/or diagnostic tools, it was possible to make visible the speeches and narratives of those involved and experts, allowing an analysis that led to responding to the problem statement, addressing the answers to the questions, research and checking the relevance of the proposed hypothesis.

Data analysis

A qualitative analysis was carried out from a microanalysis of the information according to what was stated in the grounded theory [28]. The initial procedure was carried out through open coding, segmenting the data with axial codes, performing textual and contextual analysis of the discourse, examining similarities and differences. At the end of the process, it was possible to classify knowledge, coherence and proceedings in three categories, the discussion groups were recorded with the verbal authorization of the participants. From this, the analysis was carried out using the Atlas.ti software. Defining the initial categories, the information was condensed into subcategories. For the category "knowledge" (Figure 5) it was split into the

subcategories of basic knowledge and in-depth knowledge of the subject. Regarding “coherence”, it was divided into subcategories: relationship between projects with ICT resources and benefits, and the connection between the association or cooperative with projects with ICT resources; for its part, the category “proceedings” is divided into subcategories: processes used to apply a project with ICT resources and results obtained with experiences of projects with assigned or approved ICT resources. From the subcategories, the properties, actions and interactions of the discourse were observed, later an explanatory diagram was created.

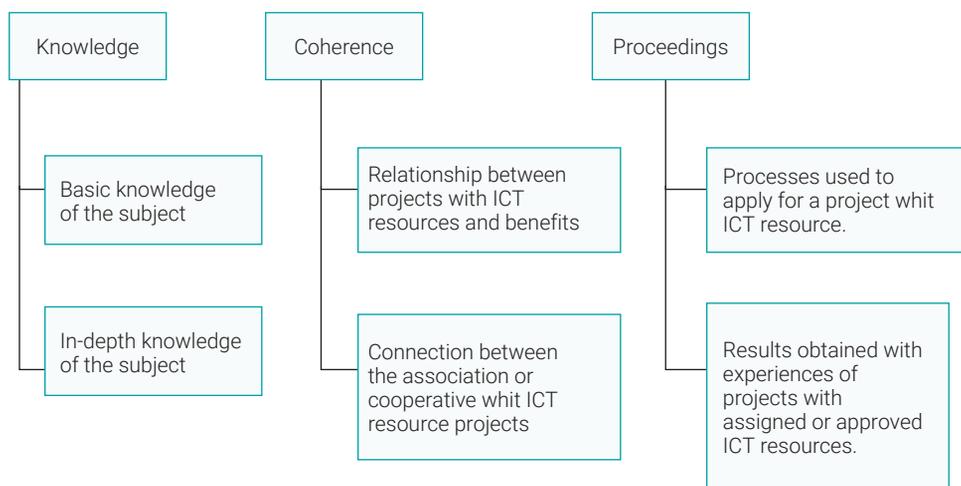


Figure 5. Categories y subcategories

Reference: Own work

On the other hand, the interviews were carried out in a semi-structured format based on theoretical components [29]. Through open coding, the segmentation of the discursive categories or theoretical saturation proposed by [30] will be carried out, and finally the interpretation of the qualitative results. For the results of the interviews in questionnaire format, it was decided to carry out a qualitative analysis using the ATLAS.ti software.

3. RESULTS

With the analysis of the data obtained, in the process of classification and analysis of the documentation, discussion groups and interviews, it was possible to obtain some relevant categories for the measurement and assessment of the proposals or

projects presented by the associations (Communities). For this, a step by step or path of the methodological design is established, made up of the following steps:

1. The roles involved in the project for filing, review and evaluation, and administration or control.
2. Consistency between the title of the proposal, the association, the national plan, the departmental plan, and the municipality where the proposal will be implemented.
3. Relationship of the proposal with the objectives of sustainable development and its mandatory nature
4. Articulation of a problem tree (having a central problem, description and magnitude, direct and indirect causes, direct and indirect consequences)
5. Characterization and articulation to the objectives (number of people affected by the problem and age by category, project execution time, ethnic groups, general and specific objective, activities, direct and indirect effects)
6. Analysis of the risks of the proposals
7. Budget broken down by items (human talent, transportation, materials and supplies, computer equipment, licenses and software, training, events, etc.)
8. Define a scoring scale and some limits and maximums for evaluation purposes by the reviewer(s).
9. Store the data and be able to generate reports.

With the steps and the information, the user stories are established, to create a division of modules in the construction of the simulator, classifying the modules in strips (Table 3), giving order to the presentation of simulator interfaces.

Table 3. Distribution in modules or strips of the simulator

| Strip 1 | Strip 2 | Strip 3 | Strip 4 | Strip 5 | Strip 6 |
|--------------------|--|----------------------------|--|---------------------|------------------------|
| Authenticate roles | General data | Description of the problem | Characterization | Risk analysis | Budget |
| Administrator | Title of the proposal | Core problem | Number of people affected by the problem | Description of risk | Human talent |
| Reviewer | Association and identification number | Description | Proposal execution time | Probability | Displacement or travel |
| Consultant | Articulation to the SDGs, national, departmental, and municipal plan | Magnitude | Age by categories | Impact | Licensing/ Software |

(continúa)

(viene)

| Strip 1 | Strip 2 | Strip 3 | Strip 4 | Strip 5 | Strip 6 |
|---------|--------------------------|-----------------------|---------------------|---------------------|----------------------------------|
| | Municipalities benefited | Direct causes | Ethnic groups | Impact effects | Materials and supplies |
| | | Indirect causes | General objective | Mitigation measures | Technological equipment |
| | | Direct consequences | Specific objectives | | Trainings |
| | | Indirect consequences | Activities | | Events |
| | | | Direct effects | | Contracting of external services |
| | | | Indirect effects | | Project monitoring |
| | | | | | Infrastructure |
| | | | | | Administrative expenses |
| | | | | | Stationery and office supplies |
| | | | | | Others |
| | | | | | Total |

Reference: Own work

With the clarity that the project proposals presented by the associations cannot be approved in their entirety, due to the limitation of financial resources for investment in ICT projects by the government of Cauca, limitations and conditions were taken into account, abstracted from the discussion groups and interviews that allowed to parameterize elements in the simulator. This allowed the reviewer role assigned by the government to follow a rating scale according to the content and its thematic expertise. With this, it was possible to measure efficiently and effectively, evaluating the relevance of the proposals regarding productive development, solidarity economy and sustainable development challenges.

The rating was established by assigning values to each range, from 1 to 20, with 1 being the minimum value and 20 the maximum. The values were left in a drop-down list to avoid typing errors in such an important assessment process. Once the reviewer selects the rating for each range, the simulator will be adding the accumulated ratings, so the reviewer will be able to observe and save their measurement or assessment process. There are two conditions that stood out in the collection of information in the discussion groups and interviews, and therefore it was necessary that they materialize in the simulator:

Condition 1: Those proposals that have a score of less than 10 points in each of the items mentioned in the problem, characterization, and budget items, must go to the list of ineligible proposals for resource allocation.

Condition 2: For a proposal to be eligible for allocation of resources, it must have obtained a score equal to or greater than 70 points and, in addition, its score must be equal to or greater than 10 points in the problem, characterization, and budget items.

With the design parameters and clarity in the evaluation process, the following action was carried out:

Simulate a methodological design in the prospective phase of ICT resources to evaluate the impact that is generated in the productive, economic development and the objectives of sustainable development of communities in the Department of Cauca.

According to the methodological processes carried out and that technically the development was carried out with the Laravel framework [31], Mysql is used as a tool for managing databases, with which non-relational tables are established in the first instance (Figure 6), necessary for the authentication process or login to the simulator [32]. This process takes into account that the roles (Administrator, reviewer and consultant) must be managed. For this, a Laravel function called laravel-permission [33] is used. With this functionality, the coding process was facilitated for the access permissions from the roles to the information that is allowed or restricted within the simulator. With this defined, the tables for the roles and the permissions model are generated for the database (Figure 6), with the respective relationships between the tables.

| | |
|---|--|
| simulador password_resets email : varchar(255) token : varchar(255) created_at : timestamp | simulador personal_access_tokens id : bigint(20) unsigned tokenable_type : varchar(255) tokenable_id : bigint(20) unsigned name : varchar(255) token : varchar(64) abilities : text last_used_at : timestamp created_at : timestamp updated_at : timestamp |
| simulador migrations id : int(10) unsigned migration : varchar(255) batch : int(11) | |
| simulador failed_jobs id : bigint(20) unsigned uuid : varchar(255) connection : text queue : text payload : longtext exception : longtext failed_at : timestamp | |
| | simulador sessions id : varchar(255) user_id : bigint(20) unsigned ip_address : varchar(45) user_agent : text payload : text last_activity : int(11) |

Figure 6. non-relational tables for the database

Reference: Own work

Consistent with the development process following the SCRUM reference framework [9], it is essential to take into account the importance of the quality testing process in the development of software products, since this contributes to improving their quality and reliability throughout the entire project life cycle [34]. The implementation of a software quality testing process allows a review and control of defects, faults and errors detected, which facilitates the generation of higher quality solutions. In this way, software quality tests become an essential tool to guarantee that the final product meets the established requirements and works properly, thus minimizing the risks of failures and increasing customer satisfaction [35]. In summary, investing in a software quality testing process is essential to achieve higher quality and more reliable software products. For this reason, tests were carried out alternately through white box and black box techniques, and work was done on the implementation of a test review matrix (MRP).

At the same time that the user stories were established, the test cases were created, following the V-Model (Figure 7) [34].

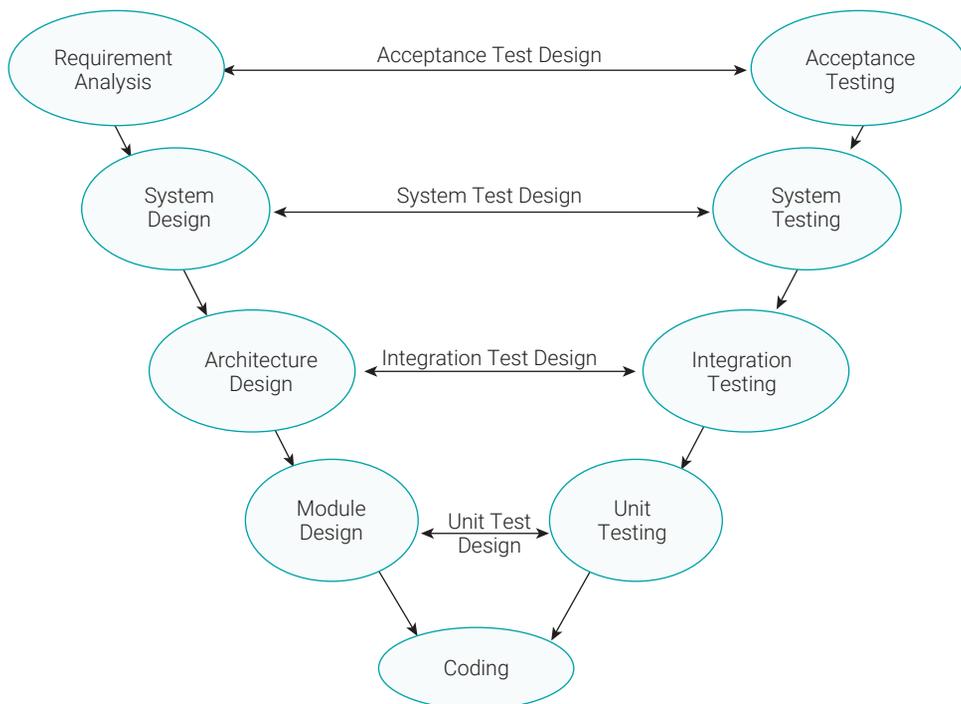


Figure 7. V-shaped model
Reference: Own work

App functionality

For the authentication in the simulator, the registration was through email and password (Figure 8), and its corresponding role (administrator, reviewer or consultant); the simulator will allow viewing the parameterized information for each role.

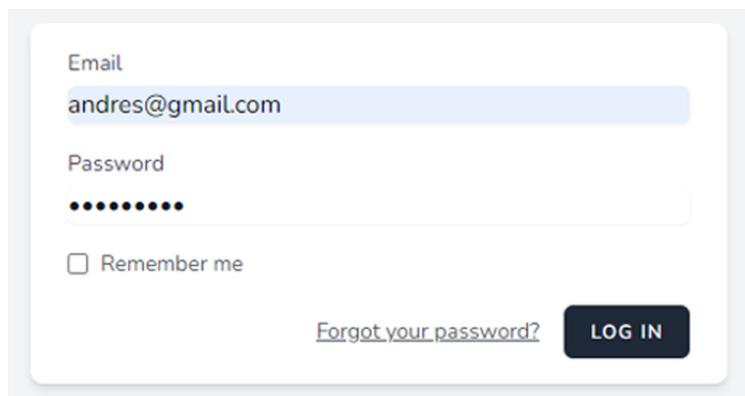


Figure 8. Simulator authentication interface

Reference: Own work

Once you have entered the profile, you will be able to interact with the simulator options according to the methodological design and the route established in the user story. For example, in the case of the reviewer, the qualification of the range is established in the range of 1 to 20. Once finished evaluating the five bands that make up a submitted proposal, the reviewer must save this qualification by clicking on the qualify button (Figure 9).

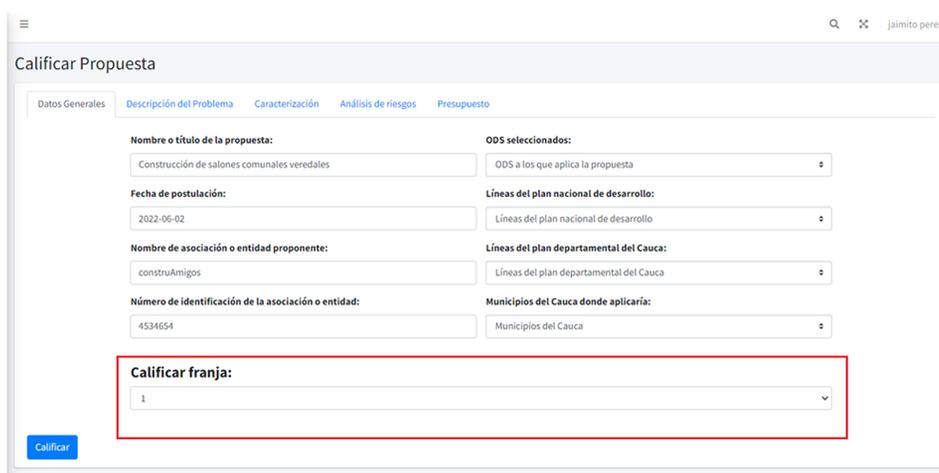


Figure 9. Qualification from the reviewer role
The language of the software is Spanish.

Reference: Own work

According to the established parameters, it is possible to observe if a proposal is “Eligible” or “Ineligible” (Figure 10), observing the proposals and the observations of the condition of the proposal. This facilitates the preparation of effective reports and also provides clear information to the associations of the status of the proposals. For the planning office, it becomes a control, monitoring and storage tool of the proposals, enabling decision-making with a lower margin of error and with an assertive process following the guidelines and parameters of the methodological design established for its development.

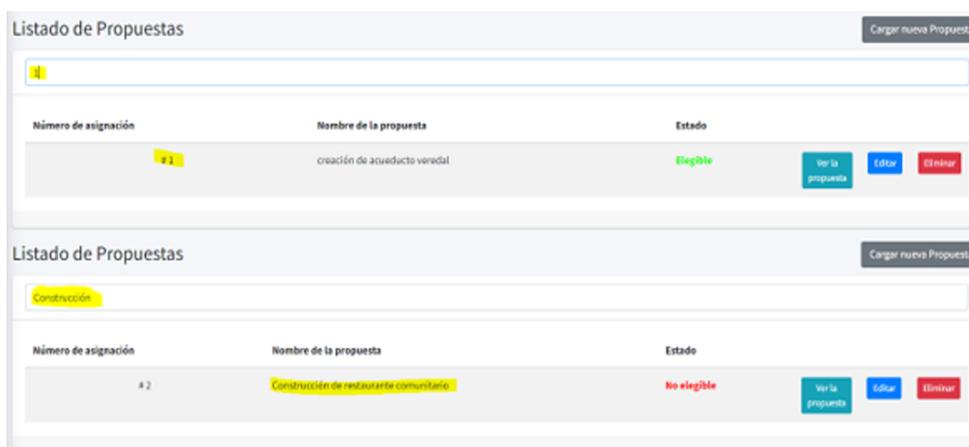


Figure 10. Simulator display
The language of the software is Spanish.
Reference: Own work

As a consolidation process, the simulator was launched, taking into account the presentation of a proposal from each of the 37 associations that were the object of the study sample, who had an awareness and training plan regarding the inclusion of the proposals in the simulator. Likewise, the inspectors of the government of Cauca were trained for the administration and review of the simulator. A questionnaire of satisfaction of the simulator was carried out also.

4. DISCUSSIONS AND CONCLUSIONS

This component addresses the most outstanding and relevant aspects that emerged from the investigation. The results obtained since its construction are exposed, contrasting it with the results of the application of the satisfaction level questionnaire.

Likewise, conclusions of the research process are presented, establishing a connection between the research questions and the general objective of the project.

The results of the satisfaction questionnaire are the following:

In your experience with the simulator, how did your association with the way of using it go?

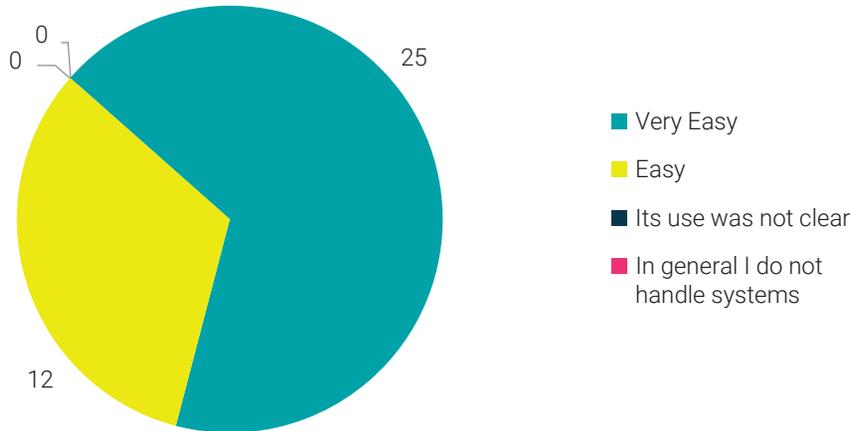


Figure 11. Question 1

Reference: Own work

Figure 11 shows that 68%, that is, 25 of the associations, stated that it is very easy to use the simulator, and 32%, that is, 12 associations, indicated that it was easy to interact with the simulator. This allowed us to validate that it is a technological tool that can be used in an understandable way for the inclusion of the proposals.

Do you think that the simulator provided you with a clear guide to present your proposal ?

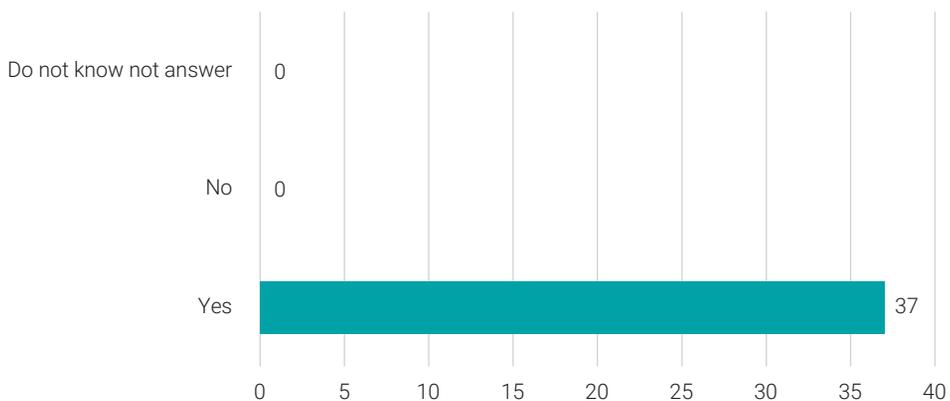


Figure 12. Question 2

Reference: Own work

In the result of the answers to Question 2 (Figure 12) it is evident that 97.2% of the associations, that is, 36 of the respondents considered that the simulator has a clear guide to be able to present their proposals, for their part 1 of the associations stated that when asked the question they did not know or did not decide to answer.

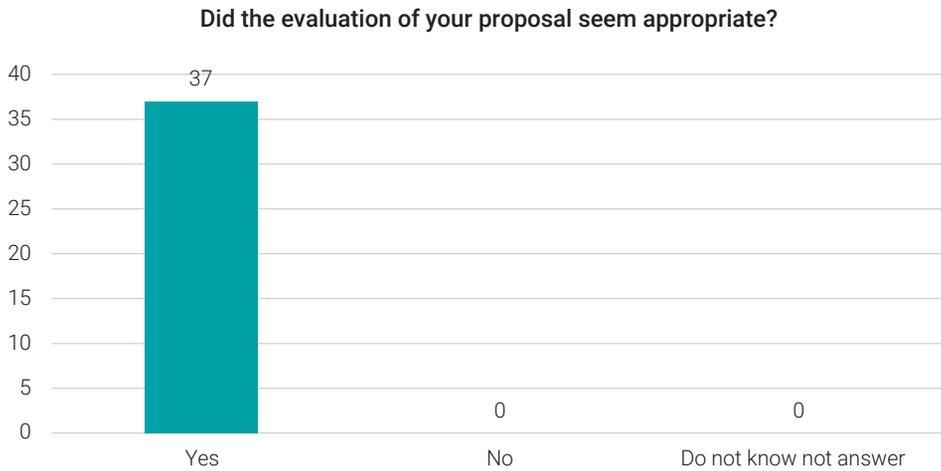


Figure 13. Question 3
Reference: Own work

In the answers to Question 13 (Figure 13) it is established that all the associations presented acceptance for the way in which their proposals were evaluated, stating that they had an adequate perception of the procedure.

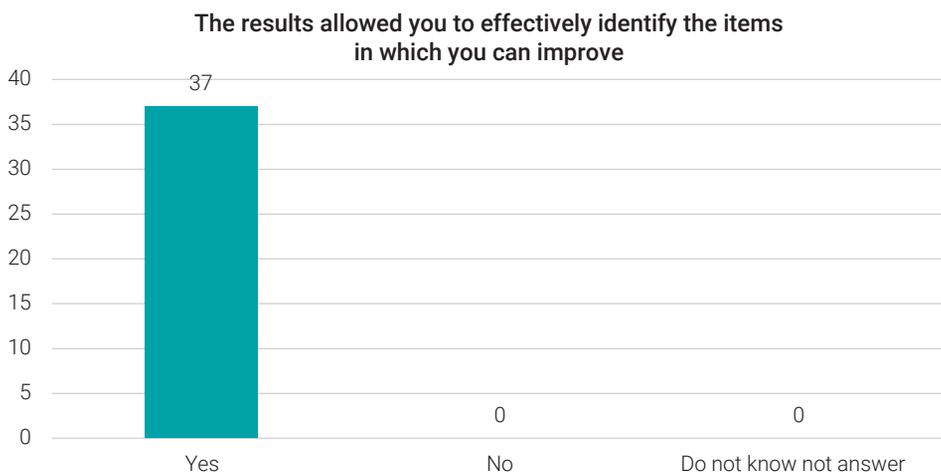


Figure 14. Question 4
Reference: Own work

In the results of Question 4 (Figure 14) the 37 associations addressed the results, clearly identifying the elements to improve. This result is important because they will have a clear picture in future moments of application.

Did the simulator help you understand how selection and resource allocation decisions are made by the planning office?

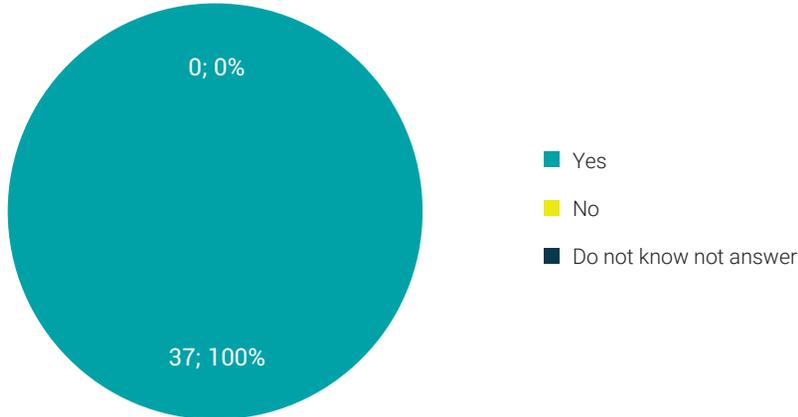


Figure 15. Question 5

Reference: Own work

In the result of the answers to Question 5 (Figure 15), all the associations understood the procedure for the selection and assignment of projects with ICT resources, which will be carried out by the planning office of the government of Cauca.

Do you think that the simulator offered you a realistic and relevant experience that provides you with opportunities for the productive and sustainable development of your community?

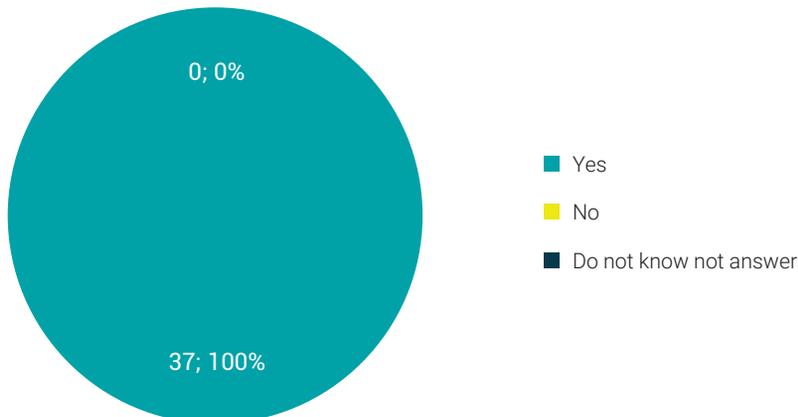


Figure 16. Question 6

Reference: Own work

The result of the answers to Question 6 (Figure 16), it was evidenced that 100% of the associations considered that the simulator allows them to have a real panorama to be able to offer opportunities to their community, especially for productive and sustainable development.

For a productive and sustainable development, the solidarity economy is potentiated with the project proposals. It is here that the methodological design became an adequate strategy to channel the processes carried out in the planning office of the government of Cauca. The construction of the simulator became a challenge when coordinating different perspectives regarding the same product, however, the result of the satisfaction questionnaire demonstrates a favorable result, making the technological tool a potential element for significant improvement in the selection process and evaluation of project proposals, providing a more objective and efficient methodology. It is essential to highlight that a simulator helps contemplate complex elements through parameterized and controlled scenarios, as mentioned in [36] "The contribution of the simulator as an innovation is highlighted, having an impact on having a more plausible and explicit judgment to analyze and evaluate the importance of simulation for the understanding of complexity". The simulator can help identify those proposals that have the greatest potential to promote development sustainable and generate a positive impact in the communities of Cauca. There are some empathic technology processes since the simulator is a software system that integrates multiple activities, which become procedural routines that facilitate the understanding of daily actions that were carried out over a longer period and a high level of complexity. Therefore, as future work, the architecture can be adjusted for operation in various applications and systems, for example, planning a video game that allows understanding through a teaching-learning strategy of the concepts [37], so that future generations appropriate the functional knowledge of the procedural. The methodological design provides a procedural standardization, which through the simulator helps reviewers to have a clear and objective methodology, thereby avoiding biases and favoritism in the selection and evaluation process, thereby guaranteeing greater equity, justice and efficiency in the allocation of resources, impacting on the community by having a productive, sustainable development and spaces for a social and solidarity economy [38]. This strengthens the confidence of the associations and the community of Cauca, because it encourages the active participation and commitment of the interested parties, who were linked from the initial design of the project, going from being a "research object to being protagonists of research". This methodological application resulted in a joint and horizontal construction, which served as a bridge for a social fabric and exchange

of knowledge to analyze and improve the reality itself in the face of a process that involves the productive and sustainable development of the community [39].

In conclusion, the development of the methodological design is a strategy that offers the planning office an organization, control and monitoring of the proposals. Likewise, it benefits the associations and the community of the department of Cauca as it becomes a valuable strategy for development of a productive, supportive, and sustainable economy, including a more objective and transparent evaluation, with special consideration of social, economic, and environmental factors, the promotion of innovation and continuous improvement. For the development of the research, it was essential that the interested parties were involved in the different phases, through participatory action research, thus achieving an adequate understanding of the requirements through the user stories; the test cases were projected to guarantee the quality levels of the software and in turn the satisfaction of the simulator users, that is, the associations and experts of the planning office of the government of Cauca.

REFERENCES

- [1] J.D. Solís, et. al., Aproximación al estado del arte de la competitividad en las empresas pymes. p.8-12, 2023. [Online]. Available: <https://repositorio.uan.edu.co/handle/123456789/7616>
- [2] V. Betancur-Chicué, A. Muñoz-Repiso, García-Valcárcel, "Características del Diseño de Estrategias de micro aprendizaje en escenarios educativos: revisión sistemática," *RIED. Revista Iberoamericana de Educación a Distancia*, vol. 26, no. 1, p. 201-222, 2023. <https://www.redalyc.org/journal/3314/331473090011/331473090011.pdf>
- [3] F.J. Mejía González, "Modelo de articulación de los lineamientos de la formulación de proyectos del departamento nacional de planeación con las necesidades de las organizaciones indígenas en el departamento del Cauca, Colombia," *Economía Solidaria*, pp. 400 - 415 2020. [Online]. Available: https://www.researchgate.net/profile/Jorge-Suarez-0/publication/361655492_El_rezago_en_el_estudio_de_la_contabilidad_estragica_en_Colombia/links/62c1bed4bd55e01e75f7e502/El-rezago-en-el-estudio-de-la-contabilidad-estragica-en-Colombia.pdf#page=400-
- [4] C. Rojas-Granada, R. Cuesta-Borja, Los estudios sobre el conflicto --armado y la construcción de paz en Colombia desde una perspectiva territorial: abordajes y desafíos. CS, no. 33, pp. 205-235, 2021. doi: <https://doi.org/10.18046/recs.i33.3995>
- [5] A. Machado, El problema de la tierra: conflicto y desarrollo en Colombia. Taurus, p. 18-25, 2017.

- [6] Gobernación del Cauca, 42 motivos para avanzar: Plan de Desarrollo Departamental 2020 p. 11-18 2023. Autor. [Online]. Available: <https://www.cauca.gov.co/Dependencias/OficinaAsesoradePlaneacion/Documents/Capitulo-independiente-inversiones-SGR.pdf>
- [7] E.E. Espinoza Freire, “Reflexiones sobre las estrategias de investigación acción participativa,” *Conrado*, vol. 16, no. 76, pp.342-349 2020. [Online]. Available: <https://scielo.sld.cu/pdf/rc/v16n76/1990-8644-rc-16-76-342.pdf>
- [8] M. Guagliano, M. Villanueva, N. Perez, A.S. Rico, “Nuevas herramientas para la toma de decisiones: Vigilancia Tecnológica e Inteligencia Estratégica,” *Revista Abierta de Informática Aplicada*, vol. 3 no. 2, pp. 16 - 22. [Online]. Available: <https://portalreviscienc.uai.edu.ar/ojs/index.php/RAIA/article/view/17>.
- [9] K. Schwaber, J. Sutherland, La guía definitiva de Scrum: las reglas del juego. pp. 3–16. [Online]. Available: <https://repositorio.uvm.edu.ve/handle/123456789/59>
- [10] C.A.D. Tibacuy, et al., “Desde la sostenibilidad hasta el desarrollo sustentable: Una radiografía de la evolución del concepto,” *LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades*, vol. 3, no. 2, pp. 1536-1550. doi: <https://doi.org/10.56712/latam.v3i2.200>
- [11] M. Vergara Vargas, L.A. Núñez, *Los Objetivos de Desarrollo Sostenible: hoja de ruta en la educación del siglo xxi: Innovación docente en la formación de profesionales*. Ediciones Octaedro, 2021.
- [12] R.P. Martell, C. Caja, edit. Los Objetivos de Desarrollo Sostenible. 1st ed., J.M p. 17–26 Bosch. *JSTOR*. doi: <https://doi.org/10.2307/j.ctv14t4706>.
- [13] A. Serrano Pascual, M.P. Martín Martín, C.D. Castro Pericacho, “Sociologizando la resiliencia. El papel de la participación socio-comunitaria y política en las estrategias de afrontamiento de la crisis,” vol. 2 no. 28, pp. 227-247. doi: <https://doi.org/10.22325/fes/res.2018.75>.
- [14] A.C. Picalho, L.E.R. de Oliveira, I.S. Amorim, Lógica booleana aplicada na construção de expressões de busca. *AtoZ: novas práticas em informação e conhecimento*, no. 11, pp. 1-12. 2022. [Online]. Available: <https://revistas.ufpr.br/atoz/article/view/81838>
- [15] J. Salinas, B. de Benito, “Competencia digital y apropiación de las TIC: claves para la inclusión digital,” *Campus Virtuales*, vol. 2, no. 9, pp. 99-111, 2020. [Online]. Available: <https://uajournals.com/ojs/index.php/campusvirtuales/article/view/741>.
- [16] C. Perez Munoz, M.E. Gomez, I. Hernandez Arteaga, S. Garcia Porras, “Educación superior y economía solidaria hacia un enfoque territorial,” *Sophia*, vol.15, no.1, pp.16-30. 2023. doi: <https://doi.org/10.18634/sophiaj.15v.1i.902>

- [17] G. Sunkel, H. Ullmann, "Las tecnologías de la información y las comunicaciones (TIC): una clave para la inclusión de las personas mayores en América Latina," *Revista de la CEPAL*, vol. 127, pp. 1-15 2019. [Online]. Available: <https://www.cepal.org/es/notas/tecnologias-la-informacion-comunicaciones-tic-clave-la-inclusion-personas-mayores-america>.
- [18] A. L. Fagua Fagua, J. C. Najjar Pacheco, "Internet of things, reality of a connected world", *Vis. Electron.*, vol. 14, no. 2, pp. 264–270, 2020. <https://doi.org/10.14483/22484728.16783>
- [19] J. Franciskovic, A. Hamann, F. Miralles, "Las TIC, una oportunidad de participación ciudadana en los gobiernos subnacionales," *Revista republicana*, 2020, no. 29, pp. 21-46. doi: <https://doi.org/10.21017/rev.repub.2020.v29.a85>
- [20] E. Campero, "Las cadenas productivas como fuente de oportunidades para emprendedores en el medio rural," *Revista Ingeniería Solidaria*, vol. 11, no. 18, pp. 75-85. doi: <https://dx.doi.org/10.16925/in.v11i18.993>
- [21] J.D. Reina-Rozo, "Ingeniería, innovación y construcción de paz: caso en el pacífico colombiano," *Anales do I Encontro Latino-americano de engenharia e sociedade*, p.11. 2019. [Online]. Available: <https://doity.com.br/media/doity/submissoes/artigo-09ceccce7e29af7b66be38a-f6ebfb63169e07dfc-arquivo.pdf>
- [22] Gobernación del Cauca, Oficina de planeación 2016-2020. p. 1. [Online]. Available: <http://anterior.cauca.gov.co/secretaria-planeacion>
- [23] J.L. Pardal-Refoyo, B. Pardal-Peláez, "Anotaciones para estructurar una revisión sistemática," *Revista ORL*, vol. 11, no. 2, pp. 155-160. doi: <https://doi.org/10.14201/orl.22882>
- [24] D. Moher, et al., "Reprint—preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement," *Physical therapy*, vol. 89, no. 9, pp. 873-880. doi: <https://doi.org/10.1093/ptj/89.9.873>
- [25] M. Ayure, R. Triana, "Participatory science communication for transformation in Colombia," *Journal of Science Communication*, vol. 21, no. 2, p. Y03. doi: <https://doi.org/10.22323/2.21020403>
- [26] F.D.R. Pacheco, V.G.P. Salazar, "Grupos focales: marco de referencia para su implementación," *INNOVA Research Journal*, vol. 5, no. 3, pp. 182-195. doi: <https://doi.org/10.33890/innova.v5.n3.2020.1401>
- [27] R.M. Linero Racines, Guía de laboratorio de cámara de gesell. p.21 2022. [Online]. Available: <https://repositorio.cuc.edu.co/handle/11323/9022>

- [28] J.D. Sánchez, C.M. López Jaramillo; R. A. Cano Londoño, La teoría fundamentada como marco metodológico situado en una investigación cualitativa sobre la evaluación escolar en matemáticas. En *Libro de Actas del 2.º Congreso Caribeño de Investigación Educativa: Nuevos paradigmas y experiencias emergentes*. Instituto Superior de Formación Docente Salomé Ureña (ISFODOSU), 2022, pp. 423-428.
- [29] N.D. Piza Burgos, F.A. Amaiquema Marquez, G.E. Beltran Baquerizo, “Métodos y técnicas en la investigación cualitativa. Algunas precisiones necesarias,” *Conrado*. vol.15, no.70, pp.455-459 2019. [Online]. Available: https://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1990-86442019000500455&lng=es&nrm=iso. Epub 02-Dic-2019. ISSN 2519-7320.
- [30] M.M. Contreras Cuentas, D. Páramo Morales, Y.N. Rojano Alvarado, “La teoría fundamentada como metodología de construcción teórica,” *Pensamiento & Gestión*, no. 47, p. 283-306. 2019. doi: <https://doi.org/10.14482/pege.47.9147>
- [31] S. Rajput, What are the reasons to choose Laravel MVC for web development. p. 1, 2020. doi: <https://doi.org/10.31219/osf.io/fgq3z>
- [32] C. Villegas Castañeda, Rudecindo. Análisis Comparativo de Sistemas Gestores De Base de Datos Relacional y No Relacional en el Contexto del Manejo de Información de Grupos de Rescate Internacional en Desastres. pp. 16-45. 2022. [Online]. Available: <https://repositorio.uss.edu.pe/handle/20.500.12802/10642>
- [33] (n.d.), Spatie/laravel-permission: Associate Users with Roles and Permissions. p.1. 2020. [Online]. Available: <https://github.com/spatie/laravel-permission>
- [34] J.A. Mera Paz, “Software quality testing process analysis,” *Revista Ingeniería Solidaria*, vol. 12, no. 20, pp. 163–176. doi: <https://doi.org/10.16925/in.v12i20.1482>
- [35] J.A. Mera Paz, “Diagnóstico tecnológico de la pertinencia al implementar un laboratorio de testing de software. Caso: Universidad Cooperativa de Colombia, campus Popayán,” *Tecnura*, vol. 23, no. 59, pp. 68-79. doi: <https://doi.org/10.14483/22487638.13334>.
- [36] R.F. Cisneros Rosales, I.P. López, M. Ramírez, “Hacia la Creación de un Simulador como Innovación para Abordar la Complejidad,” *Revista Ciencias de la Complejidad*, vol. 2, no. Edición Especial, pp. 61-66. doi: <https://doi.org/10.48168/ccee012021-007>
- [37] J.M. Medina Cabrera, I.I. Medina Sánchez, B.A. Muñoz Céspedes, “The inclusion engineer with STEAM in the educational institution,” *Revista Ingeniería Solidaria*, vol. 18, no. 3, pp. 1-23. doi: <https://doi.org/10.16925/2357-6014.2022.03.10>

- [38] M. Urrutia, C. Robles Báez, “Mercado y gasto social: la agenda pendiente para la equidad en Colombia,” *Revista Desarrollo y Sociedad*, no 82, pp. 73-101. doi: <https://doi.org/10.13043/dys.82.3>
- [39] E.J. Gutiérrez Díez, “Otra investigación educativa posible: investigación-acción participativa dialógica e inclusiva,” *Márgenes: Revista de Educación de la Universidad de Málaga*, vol. 1, no 1, pp. 115-128. doi: <https://dx.doi.org/10.24310/mgnmar.v1i1.7154>