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Strategy for Integrated Knowledge and Innovation Management in Venezuela Municipality

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Abstract

Context: In the municipality, postgraduate actions respond to the demands of society, with innovation focused on the territory. However, integrated knowledge and innovation management is insufficient locally.

Aim: To socialize the design process of an integrated knowledge and innovation management strategy proposed for the municipality of Venezuela, and the impacts made after two years of implementation.

Methods: Discussion groups of local actors in the government, the university center, and the productive sector, were formed. The instruments used were interviews to local actors, women, young people, and productive actors, which allowed for corroboration of the real state of the context.

Results: It is possible to address major challenges considering the potentialities and weaknesses of the context through integrated and coherent actions by local actors. **Conclusions:** The diagnostic demonstrated social, economic-productive, and environmental potentialities to promote local development. The theoretical-methodological rationale of integrated knowledge and innovation management evidenced the necessary relationship between knowledge management-local development - actors-strategic management. The strategy designed, and the results of implementation, demonstrated that the major challenges in the territory can be coped with the potentialities and weaknesses of the context, by means of integrated and coherent action of local actors.

Key words: Strategy, knowledge management, innovation.

Introduction

Integrated knowledge and innovation management for local development are becoming more preponderant today, as a multifactor phenomenon in which the work of all local actors must be integrated, and the university, represented by a municipal center takes a leading role as a dynamizing actor of social and economic development.

The role of universities in knowledge and innovation management has been dealt with by several authors (Núñez, Montalvo & Pérez, 2006), (Núñez Jover & Hernández, 2014, and Núñez, 2010). Moreover, local development topics found in the literature reviewed

have served as the background for research used by authors, such as (Arocena, 1995; Vázquez-Barquero, 2002; Gallicchio, 2004, and Rivero & Cabrera, 2009). The last one is an important referent in works tackling this process and the current challenges to Latin America.

Accordingly, the connection knowledge, innovation, and development is fundamental. This thesis relies on the sociology of science and technology, and theorizations on innovation systems (Cassiolato, Lastres & Soares, 2013), and on the set of actors that participate in the innovating process locally, paying special attention to interactive learning, training, and

tacit knowledge. (Núñez Jover, Alcázar & Proenza, 2017)

Considering the background analyzed in terms of knowledge and innovation management, the municipality of Venezuela has the following challenges:

- The transformation of an economy based on sugar production, into an economy relying on sustainable development of non-sugar cane based farming.
- The creation of job opportunities to prevent migration of labor into the municipal capital city.
- The proposal of new and varied forms of training to increase skilled labor qualification.

In view of these circumstances, local managers have stated the need to improve the local response to the challenges posed through an integrated knowledge and innovation management strategy of local development.

Hence, the aim of this article is to diffuse the strategy for integrated knowledge and technological innovation management in the municipality of Venezuela, and the results after two years of implementation.

Results and discussion

Strategy for integrated knowledge and innovation management in Venezuela municipality

The criteria from reputed authors in this topic (Castellanos, Llivina, & Fernández, 2003; Armas, Lorences & Perdomo 2003, González, 2005, Guzón *et al.*, 2011) were considered to conceptualize the strategy for integrated knowledge and innovation management for local development.

In this study, strategy is assumed as a “participatory process in which the main actors, summoned by the municipal government, organize and implement integrated and sustainable development of the territory, based on the identification of endogenous potentials, and set priorities. This means that the process will be different in every territory, reflecting a customized diversity. This development strategy is a working tool for municipal governments. (Guzón *et al.*, 2011 p.13)

Based on the opinions of the above-cited authors, the strategy can be effective if it responds to the interests of its users; if it is collectively and consciously assumed, becoming part of everyday management practice. It is highly coordinated and organized, in order to make efficient and effective use of all the available resources (including international cooperation), and particularly, it will require the reinforcement of existing structures in the municipality, integrated operation, and broadening of

horizontal relations. In addition to it, it will require systematic evaluation of the process and continuous adjustment.

Considering the theoretical and methodological rationale explained, a strategy for integrated knowledge and innovation management was designed in the municipality of Venezuela.

Diagnostic of the potential

From an initial list of 46 potentialities studied and weighted in the municipality by a team, the following were chosen:

1. Political will to promote development in the municipality, with stable leaders and cadres, enterprising, creative, motivated, optimistic, and confident people, with high working drive, organizing capacities, and good personal relations.
2. The existence of People’s Councils as a management structure, and delegates with knowledge who can perform community work.
3. The existence of a science and technology policy with sustainable development goals, strategic axes, and economic and social priorities, and strategic sectors.
4. The presence of a university center with well trained professionals to promote development.
5. Availability of large extensions of fertile well-drained soils, and abundant aquifers.
6. The existence of machinery for farming production in this mostly agricultural municipality.
7. Interrelation with research institutions (Bioplants Center, Center for Animal Biofeeds, National Institute of Agricultural Sciences, etc.).

Barriers

A number of 37 weaknesses were identified. The following were identified after weighting and integrating:

1. The absence of a multifactor approach in innovation that leads to poor use of the results of science and technology in the municipality.
2. Shortages of material and financial resources.
3. Unfavorable living conditions in the communities, most of them linked to the farming sector.
4. Insufficient utilization of agroecological alternatives for soil enhancement, depending on the type of exploitation, and poorly efficient irrigation systems.
5. Insufficient generation of research-development-innovation projects, and municipal initiatives to promote local development.

6. Insufficient creation of local development capacities.
7. Insufficient farm labor and little qualification of existing workers, in addition to the poor social recognition to educational workers in agriculture, and farmers.
8. Vertically centralized functionality with a sectoral approach, with no priority for local development, and loss of locally subordinated entities.

Context recognition

Five key variables were defined from an initial proposition of 15:

1. Farm sector
2. Situation of the Cuban economy and the local context
3. Climate change
4. Situation of skilled workers in different sectors of the economy, with emphasis on education and agriculture.
5. Scientific and technological development accomplished

In smaller groups, desired and undesired states, and trends were set per variable. This information was interpreted through different ways, by every member of the team, and through group analysis to compile collective opinion.

Vision

The group vision called for a highly qualified integrated group, evidenced in the solution of local problems, with elevated capacities to reach notorious development of endogenous resources, based on thorough institutional communication, adequate intersectoral relations, solidarity, enthusiasm, health, preparedness for the defense, commitment, patriotism, and decent behavior.

Allies

The allies acknowledged as a strategy, to conduct municipal development that demands strong collaboration relations with AZCUBA, MINAGRI, MINBAS, CITMA, MINVEC, UNIVERSITY, BIOPANTS, INCA, HYDRAULIC RESOURCES, CIBA, ACTAF AND EGAME.

Sources of funding

The main funding sources were,

- Local resources.
- National and/or provincial entities and bodies.
- International agencies and NGOs, such as WHO/PAHO, UNICEF, Alternatives (Canada), Endowment of the Canadian Embassy for local

initiatives, Cuban Council of Churches, and COSUDE (Sweden).

Strategic lines

Considering all the information compiled, five strategic lines were established for the municipality of Venezuela.

1. Food production
2. Production of construction materials.
3. Climate change and environmental problems.
4. Efficient and sufficient use of water and energy.
5. Professional education, training, formation and digitalization of Venezuela’s society.

Projects

To develop each line, R+D+I, or municipally fostered projects to promote development were identified.

Table 1. Projects approved and implemented in Venezuela municipality

PIMDL	Strategic line favored
Diversification of Industrial production of Jucaro Marina Fishing fleet Branch.	Food production
Intensive swine raising at Nestor Bonachea Cooperative (CCS)	Food production
Micro industry for crop and green vegetable preservation at El Vaquerito Cooperative (CCSF)	Food production
R+D+I project	Implementation
Optimization of environmental education at different levels in the local University	Professional education, training, formation and digitalization.
My area in the history of the municipal university	Professional education, training, formation and digitalization.
Local Agricultural Innovation System at the university	Food production

Table 2. Ongoing local business, which are IMDL projects under approval review

Local businesses	Location	Strategic line favored
Title: Producing cooking oil from decentralized production of sesame.	Venezuela company branch	Food production
Efficient Tilapia rearing	CCSF El Vaquerito	Food production
Increase of capacities for the production of flooring and wall elements in the program of sales of Construction Materials in Venezuela municipality.	Company branch No1 Venezuela.	Production of construction materials
Refurbishing of Simon Reyes mechanical workshop	Company branch transportation	Transportation
Reduction of greenhouse gases by handling swine stools, at CCS El Vaquerito, Venezuela People's Council.	CCS El Vaquerito	Climate change
Ovine-caprine fattening at CCSF El Vaquerito	CCSF El Vaquerito	Production of construction materials
Cattle fattening	CPA Héctor Díaz.	Food production

Evaluation of the strategy

The strategy is evaluated and adjusted periodically by the Group of Local Development, with the Administration Council, and the Municipal Assembly of the People's Power, based on a continuous flow of information. A system of indicators, whose main source is the vision as a preset goal, and the process evolution map, where all projects implemented at different stages, are recorded.

The indicators designed respond to the vision part of the strategy or "common dream". The design includes the indicators defined by experts at GUCID Networks (Ministry of Higher Education, 2017), as follows:

- a) Formation of students in degrees that respond to the essential guidelines of social and economic

development of, and attendance to on-the-job practices.

- b) Spaces for consensus created in the territory to promote local development.
- c) Creation of capacities.
- d) R+D+I projects of local development and local businesses.
- e) Indicators of visibility of science, technology, and innovation in the territory.

The most significant contributions to integrated knowledge management in the municipality of Venezuela are in terms of social practice. A high level of satisfaction has been achieved by the Municipal government in relation to the advising role of the local university in strategic projection. The actions suggested by the Local Development Group are controlled, evaluated, and redesigned by the permanent members of the group (University, Labor and Social Security; Economy and Physical Planning, Finances and Prices, Statistics Office, National Association of Economist of Cuba, CITMA, Ministry of Agriculture, BANDEC, and Hygiene and Epidemiology). Together with the Municipal Administrative Council, the group assesses propositions, and makes decisions related to the strategy of development and the advances of every indicators. The main impacts are listed below, depending on the set indicators.

- a) Formation of students in degrees that respond to the essential guidelines of social and economic development, and attendance to on-the-job practices. The ground level state entities and bodies show adequate level of satisfaction with the impact of on-the-job training. Student engagement in local actions with social impact. The work of the Municipal Council of University Extension is stable and systematic, though the low level of enrollment of students in pedagogical and agricultural degrees is a still unsatisfied demand that becomes a weakness.

Advances in this direction are discreet, and linked to actions oriented to vocational formation at different educational levels, in pedagogical and agricultural degrees, as well as in student groups of interest in Agronomy, Mechanization, and Agroecology. Additionally, eight students graduated from the Pedagogical College this year, and other seven will study pedagogical degrees in the specialties of Biology, Chemistry, and Mathematic.

Technical training of labor in agriculture is poor. Currently, 52 university graduates are working in the sector, of which fourteen are agronomy engineers, three are mechanization engineers, and two are veterinarians. However, actions have started to address this challenge. A number of 31 workers from the Agricultural Company Cubasoy are now enrolled

in the course for workers, at the University of Ciego de Avila, studying Agronomy.

Actions within the agreement between polytechnic school-production companies are being strengthened, in order to provide more students to companies in different years of their degrees; six classrooms are expected to be created in the company. Professionals with skills in tutorships are being identified, and local students of the provincial university are being followed up. Although, this indicator is far from being accomplished, according to the opinion of Núñez Jover & Hernández (2014), it is a “key piece of the strategy” (p.6). The actions are conceived are oriented to better results.

b) Local areas of coordination In this indicator, advances are observed in the following aspects:

- The director is a permanent member of the Municipal Administrative Council.
- The director and the group of science and technology at the local university are part of the group of local development in the territory.
- Advisory is offered to the municipal specialist of FORUM.
- The work of the Commission for Cadre Preparation is tutored.
- Advisory to the municipal group of materials for constructions.
- Creation of the advisory group to calculate economic feasibility of IMDL projects.
- Creation of the Municipal Coordinating Team for the system of agricultural innovation.
- Operation of the Municipal Group of Care and Prevention of AIDS.

In that sense, there is an adequate articulation with the local government, with participation in all the spaces, joint meetings, group training, and permanent redesign of actions in the strategy of local development. The main problems have been identified, and efforts are being made to address them in the short, mid, and long-term. The post-graduate course strategy is designed according to the demands and priorities, so the evaluation of this indicator is satisfactory, though better methods and ways to achieve coherent and systematic engagement of all the factors in favor of local development.

c) Creation of capacities for local development A post-graduate course plan is designed according to the real demands of the municipality, which includes actions that have an impact on local development. Capacities are created in the agro-industrial, energy,

environmental, and the sociocultural sectors, including the local actors.

The post-graduate activities agreed with local entities and bodies contribute to professional development of human resources, by encouraging workers to take vacant jobs; training workers to hold several jobs, and broad job profile; training to achieve formal qualification depending on job suitability; providing higher training of workers within their posts; ensuring professional skill training of technicians, higher technicians, and university professionals, which conferred prestige and social recognition to the work of the local university, in terms of developing activities planned with the required technical and material support, in addition to having well-trained professionals.

Table 3. People trained by years

2016	2017	2018		2019	
404	1 231	2 376 SS	487 NSS	1 224 SS	141 NSS

Legend:

SS: state sector

NSS: non-state sector

The main impacts of this activity are,

High level of municipal government satisfaction, since skilled personnel have contributed to higher productivity in the municipality, including increased quality, reduction of costs, strengthening of technological discipline, reduction of accidents, and operating errors, and improvements in the organization of the process.

Integration with all the entities and bodies of the territory, including the non-state sector in terms of postgraduate courses.

Diversification of professional training of local human resources, satisfying 100% of requested needs from 2017 on.

Implementation of a system to determine training needs, and training of the main local entities and bodies so postgraduate plans according to the needs of the territory can be achieved.

- The projected actions of upgrading and training respond to the real needs of local human resources, thus increasing the level of satisfaction.
- The necessary tools are given in sufficient quantities to solve local problems through research + development + innovation projects, and municipal projects.

- Advisory and support to the government in the projection and implementation of the local development strategy.
- Close and systematic ties of CUM, CAM, and CITMA to lay down strategies and programs for integrated development in the municipality.
- A well-equipped classroom is available for entity training and upgrading.

d) R+D+I projects local development and local businesses

Before 2017, when the strategy was first implemented in the municipality, there were no I+D+I or IMDL projects. The main actions that led to the approval of these projects are linked to post-graduate resources designed and delivered to address complex local problems, with the engagement of different local and institutional actors.

According to Núñez Jover & Hernández (2014), these problems are frequently complex, and demand multi or inter disciplinary approaches. Problems like food production, housing, heal care, family violence, and others in the territory, which require the integration of several disciplines in the search of responses. In many cases, the solutions are part of a smart combination of existing knowledge (p.6)

One of the most important local projects in the municipality is the System of Local Agricultural Innovation. It was started in 2017, in the province, with the delivery of a Diploma course that trained four facilitators in the municipality of Venezuela, who were able to grasp the necessary tools to strengthen food production. A program for local agricultural development in three production units was created and implemented (CCSf El Vaquerito, CPA Ramón Domínguez de la Peña, and UBPC 3 de Octubre), the municipal coordination team was approved, and now holds meetings twice a month to ensure the actions suggested. The work of the municipal team was consolidated, with the participation in a high number of national workshops, starting in 2018 , including The National Workshop of Melliponiculture associated to PIAL, in Cienfuegos, National Workshop on Climate Change, National Workshop on Agricultural Productive Poles, in Guantanamo, and Gender and Youth workshops.

Additionally, five local innovation groups in agriculture related to seed production, have been created. Areas like ovine-caprine and rabbit raising; melipona, bovines, and pineapple. The groups provide solutions and manage the main production problems in the municipality.

Good practices are promoted, and tools and methodologies are used to enhance different dimensions of local development (social, economic, and ecological), such as the utilization of organic

fertilizers, substitution of chemical pesticides by biological means, minimum tilling, wind breakers, local production of farming and botanical seeds, utilization of popular education and learning in the action, and presentation of three microscholarship proposals associated to increased seed diversity at Cubasoy Agricultural company, sustainable management of pineapple (main crop of Ciego de Avila), and production of hydro forages, implementation of productive chains to achieve stock sustainability in the municipality.

Two maize varieties donated by INCA, a variety of sorghum, and five new varieties of sweet potato from INIVIT have been introduced. Farmers and professionals participate in joint cooperative meetings, the municipal, provincial, and national ANAP forum, and several scientific conferences, with their results. A number of forty technologies have been transferred, of which 23 associated to stock production, and crop farming, particularly pineapple. Three television programs have included the participation of leader farmers, and three human resources from the territory in the Second Edition of the Diploma Course Local Agricultural Innovation System.

e) **Visibility indicators** Five main indicators are included: **Relevance, pertinence, science, technology, and impact**, suggested in the Methodological Documents for Science, Technology, and Innovation Organization. Ministry of Higher Education (2017, p.81). In this stage, two sub-indicators of the **Pertinence** strategy are encouraged: Equivalent project index by professor, and percent of professors associated to projects. Two sub-indicators of science: percent of doctors in the institution, and science publication rate by the human resources, and a sub-indicator of **Technology**: patent and registration index.

Only these indicators and sub-indicators are encouraged in this stage, since this municipality had no developments in science, which according to Núñez Jover & Hernández (2014) "... it requires knowledge, technologies, and innovation". (p.1). Although participation has always been part of the university during different activities related to science.

Table 4. Municipal visibility indicators

Indicator	2017	2018	June 2019
Equivalent project rate by professor	1/12	1/12	3/12
Percent of professors associated to projects	8.3%	8.3%	100%
Science publication	–	6	3

index by human resource			
Patent and registration index	–	3	Not evaluated
Percent of doctors in the institution	8.3%	8.3%	8.3%

As shown in Table 4, for the first time in history of the University Center, the number of books, papers, and registrations meet the recommendations of the Methodological Documents of Science, Technology, and Innovation. Ministry of Higher Education (2017, p. 81). Three books were published in group II, two papers were published in group II, and five papers were published in journals of group III.

Although these results are still far from high levels of development in the municipality of Venezuela, they do show clear and simple evidence that firm step are being taken to favor local development, which has possible thanks to the establishment of alliances with different local actors.

Conclusions

- The diagnostic of integrated knowledge and innovation management in the municipality of Venezuela, Ciego de Avila, Cuba, shows the social, economic-productive, and environmental potential to encourage local development.
- The theoretical-methodological rationale of integrated knowledge and innovation management in the municipality of Venezuela evidenced the necessary relationship between knowledge management-local development - actors-strategic management.
- The strategy of integrated knowledge and innovation management, and the results of implementation, demonstrated that the major challenges in the territory can be coped with the potentialities and weaknesses of the context, by means of integrated and coherent action of local actors.

Author contribution

Zaray Losada López: research planning, data collection, analysis and interpretation of results, redaction of the manuscript, and final review.

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Lourdes Margarita Santamaría Moreno: research planning, data collection, analysis and interpretation of results, redaction of the manuscript, and final review.

Conflicts of interest

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