

Challenges faced by rural artisans communities: an eco-technological proposal for sustainable handicrafts

El desafío de las comunidades artesanales rurales

Una propuesta ecotecnológica para una artesanía sostenible*

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Abstract

An eco-technological model was used to determine aspects of artisan production in the rural communities of Galapa and Usiacurí, located in the Department of Atlántico, Colombia. The community of Galapa produces wooden masks, and that of Usiacurí handicrafts made with the Iraca palm. Both communities are facing the challenges of globalization and the capacity of their artisans has been affected by market economy dynamics, which demand high levels of production and excessive use of natural resources. This has led to a rupture between material cultural patrimony, technological memory, and ecological balance of natural resources used. The model presented here draws from qualitative data obtained through participatory instruments, which were then systematized in a structural analysis matrix to determine the impact and interdependency of the different aspects covered in the model. Based on the results obtained, a tool was designed for decision-making processes regarding the cultural, technological, and ecological productivity of handicraft production.

Key words: Ecology, environment, sustainability, handicrafts, models, participatory production, Colombia.

Resumen

Bajo el enfoque del Modelo Ecotecnológico observado en las comunidades artesanales de Galapa y Usiacurí del Departamento de Atlántico; Colombia, se presentan las dimensiones que caracterizan lo artesanal. En ambas comunidades se elaboran máscaras en madera y artesanías en palma de iraca, respectivamente, las cuales han persistido a retos de la globalización. Sin embargo, la capacidad de estos artesanos ha sido perturbada por la dinámica económica basada en el mercado, que les exige niveles de producción y utilización excesiva de recursos naturales, conduciéndolos a una ruptura entre el patrimonio cultural material, la memoria tecnológica y el balance ecológico de recursos naturales utilizados. El modelo se construye a partir de datos cualitativos

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obtenidos mediante instrumentos participativos sistematizados en una matriz de análisis estructural, para dar cuenta de las relaciones de incidencia y dependencia de las dimensiones del modelo. Los resultados se sintetizan en un instrumento que permite tomar decisiones sobre la productividad cultural, tecnológica y ecológica de la producción artesanal.

Palabras clave: Ecología, medio ambiente, sostenibilidad, artesanía, modelos, participativo, producción; Colombia.

Introduction

The sustainability of handicraft production necessitates entrance into the global market dynamics in a competitive and innovative manner, requiring from the artisans productive patterns that consider the following key elements: **artifacts** (handicrafts) that derive from a cultural memory; a **technology** represented in the accumulation of traditional knowledge applied to an object; and the **natural resources** that guarantee the permanence of a natural capital, an important factor for ensuring sustainability of the traditional handicrafts.

In this sense, it is assumed that the open market dynamic represents the prospect of commercial opportunities of interest to the artisans. According to the management report of Artesanías de Colombia (Colombian Artisans) (2008) in 2008 sales totaled more than US\$775,000 as a result of institutional strategies to widen national and international markets. But, what is the environmental impact represented by these figures? Which externalities arise with the creation of new markets for rural handicrafts, in terms of both natural capital, and cultural heritage? And finally, does the increase in institutional sales guarantee an increase in the quality of life for the rural artisan communities?

Currently, artisan production is in the game of the consumer market, as represented by the direct purchases in 2008 by Artesanías de Colombia from 537 artisan associations, totaling more than US\$435,000 (Artesanías de Colombia, 2008). In addition to providing income opportunities, a direct effect of a negotiation process with State companies unaligned to any concept of fair trade is the increase in risk of the artisan production process as a function of the environment. In other words, environmental resources are a vulnerable natural capital for handicraft production, and with increasing use of natural resources due to increasing market demands, the carrying capacity of the

ecosystems associated with the artisan production decreases. Additionally, the rural artisan needs to develop other survival strategies, as subsistence is not dependent only on the seasonal incomes from handicraft production. Furthermore, industrial hegemony and political exclusion of the artisans in local and regional development plans, despite handicrafts being a legitimate economic sub-sector, impacts on the community-based cultural elements. However, it cannot be denied that permanent access by artisans to commercial opportunities improves their income possibilities. Under this dynamic, we establish three scenarios for handicraft production: The first refers to artisan communities that tend to form small industries as a function of the market, so that the artisan community converts to a manufacturing industry with different productive nuclei; the second considers a fragile artisan community, having difficulty responding to the market quotas due to scarce (or no) capital, and the lack of natural resources, with consequent disappearance of the community artisan activities, or a change in the subsistence modes to other activities; and thirdly, a community with such force that it persists with the challenge, meeting requirements, and establishing itself as an autonomous social force with an adaptive capacity for production without losing the principles that identify it.

However, in the third scenario in order for the artisan community to become an autonomous social force, a strong relationship must be established between the different types of cultural technological and ecological productivity. Cultural productivity in rural handicraft is characterized by the traditional knowledge implicit in the production processes, the perception of the natural resources, the technical production skills, the forms of use of time and space in different activities, family division of work, and a particular organization system, such that: “the preservation of ethnic identity, and cultural autonomy contribute to the conservation and the development of the productive potential of their environment” (Leff, 2003). Technological productivity refers to the efficient manner in which the artisan achieves the process of transformation, making items with a high index of identity, as well as producing items to meet market quotas. The characteristic that promotes this productivity is the technological memory, which is derived from a particular relationship between human capital (Sen, 2004) and the social capital (Bebbington & Torres D, 2001) of the craftsman with his trade. Ecological productivity refers firstly to the productive organization as a function of key natural resources for the handicraft production, and secondly, to the control of the contaminating effects of the productive process. The primary ecological productivity of ecosystems (Leff,

2003) is based on the necessary sufficient and sustainable environmental planning for handicraft production.

The inter-relationship of these productivities is based on the environmental approach termed eco-technology (Leff, 2003). This approach, serving as an example for other cases, arises from a historical analysis of the conformation of natural resources, and accounts for the formation processes and geographic distribution of material and energy, and biomass formation, as well as the effects of evolutionary processes in the transformation technical – cultural of the resources in terms of production. Artisan production is invited to participate in capitalist dynamics, without considering that the social nature of the artisan is founded as a pre-capitalist activity, as authentic as peasantry. Mayor Mora (1997) indicates that in the Spanish industrial modernization during the colonial epoch, the social values of the artisan guilds were altered, with them being considered vile trades of low social status. For this reason, in 1777, Spanish intellectuals proposed a general instruction for the guilds with the aim of normalizing and industrializing the pre-colonial artisan trades. However, the rural economy is based on a need for equilibrium between production and consumption to generate adequate incomes for the needs of each family unit. Similar characteristics are seen in handicraft production, where the family artisan economy produces handicrafts to obtain an income to satisfy the family's own needs, and its distribution depends on the necessities of each family member. To what point should handicraft production be integrated into capitalist processes based on market behaviors? What is the limit of their capacity for resistance as a productive activity? In this article we will try to answer these questions from an eco-technological focus.

The eco-technological rationality, as a strategy for eco-development, levels the ecological, technological and cultural productive forces of a community. Since the actual perspective of that tend towards a crisis of natural resources, and maximize the use of environmental services in the short term, the emergence of eco-technology is analyzed from the perspective of productive potential of a social organization in terms of its natural resources, such that the ecological and technological structures of an artisan community are factors consistent with a particular productive rationality, the result of social practices based on self-sufficiency, solidarity and local agreements; also in the ability to share information and resources with an external environment, without losing their autonomy as a rural economic social organization.

To this it is necessary to add that González (1993, 1999) confirms that culture is a system where the following key components interact permanently: **biophysical**, which is a natural evolutionary history builder; **technological** of transformation; **organizational**, related to production and reproduction processes of a society; **cognitive**, constructed culturally; and a **particular Cosmo vision** of the world. The result arising from the inter-relationships between these components form the group of social activities of man with his environment, in such a way so that, in craft, key cultural elements are observed that determine the cultural autonomy of this production as a social organization. Craftsmanship is understood as a cultural system, and is considered to act consistently with the model outlined by González (1993, 1999), since within it a knowledge system interacts that is represented by know-how and the significance that a social group gives to a craft. This is a symbolic system contained in the craft as a vestige of a traditional heritage, an organizational system related to the particular forms of production and reproduction; a biophysical system in as much as the craftsmanship is consistently linked to the use of the natural resources, and a technological system that allows the resolution of practical problems, and creates new forms of technical know-how.

Nonetheless, it should be noted that the craftsmanship is also a system that may be maintained independently, as it operates under its own logic, maintains its own identity, developing a capacity for self-correction, and, most importantly, it operates resourcefully with other systems. i.e. it possesses the features of a viable system (Beer, 1985). Thus, the rationality of artisan production can and should be analyzed from the perspective of the eco-technology, seen as a dynamic analysis of an appropriation of a knowledge system that allows the use of cultural resources and is expressed in diverse identifying materials. The eco-technology assumes the capacity of a rural community to apply its knowledge in dynamic technologies leading to the sustainable use of natural resources and the generation of productive traditional processes, as a potential means for local development.

The eco-technological model

Models are schemes that partially mimic reality, being vehicles that allow us to learn about complex phenomena in particular circumstances. A model takes into account the characteristics of a phenomenon, establishing relationships, and simulating the different effects that emerge from said relationships, in order to understand, to a certain point, the complexity of the original phenomenon. However, a model only represents part of the entirety of the original system, that is to say, a model represents a reasonable substitute (Swayer, 1991) of the reality and allows, in most cases, the theoretical prediction of what occurs in the system. Therefore it is important to establish a reality relationship between the system actually analyzed and the model constructed. According to Turner (1970) there exist three types of models: iconic, analogous, and symbolic. The first establish morphological properties (models) of the system reality; the second represent a system through formal conventions (maps); and the latter are abstractions of a real object using mathematical operations (geometry or statistics).

In social science, models have been frequently used since the Second World War: game theory, modeling agents and graph theory, amongst others have proposed correspondence between theoretical relationships, empirical data and mathematical reasoning. It is important in this study to evidence that the proposed model is a formal scheme that represents a particular social system, allowing analysis and understanding of the interactions between the different dimensions that characterize the artisan under an eco-technological conceptual framework.

For this reason, the Eco-technological Model for artisan production (Gómez & Pacheco, 2007) departs from the following point: the demand for natural resources to sustain artisan activity in Colombia is based on the cultural cognitive apparatus associated with the use of vegetation cover, forests and soil extraction, that is to say, on the dynamic of culturization of the landscape (Vink, 1975) based on human interventions in an ecosystem for spiritual and material satisfaction of a social group. These processes of natural resource use, associated with the cultural context of an artisan community is aimed at transforming said resource in an symbolic-functional material expression named handicraft, in order to strengthen the characterization of the principal material identity; so that the handicraft is a techno-cultural structure joining productive and cultural processes as a function of the use of natural resources. This cohesiveness is injured by global market dynamics.

While the model is a simulated reproduction of some of the emergent properties of the complexity of the traditional production system, in order to discover, represent, study and predict their relationships, the eco-technological rationality on which it is based refers to the potentialities of ecosystems, assumed to be natural capital, in order to promote the transformation of natural resources into artisan products with a certain recognized environmental logic at the local scale. Thus, it is proposed that a productivity principle, where a traditional productive system governed by spatial characteristics (ecosystem), is interrelated with the material wealth of a community, and with the dynamic of use of the natural environment in order to achieve its cultural manifestation through an artifact named handicrafts.

In the present study we define variables linking socio-productive elements with ecological elements in the communities studied. Cultural, technological and ecological dimensions of the artisan communities are analyzed and relationships between these identified, in order to establish a pattern of artisan productivity based on environmental and cultural sustainability. Equally, elements of the social organization of production are related to the technological structure of the artisan community, and the local appreciation of the ecosystem services, in order to identify the character of artisan productivity through the lens of environmental rationality, identifying empirical knowledge, technological structure and management of natural resources.

Finally, a model is developed of the relationship, consisting of categories, variables and dimensions that allow the eco-technological characterization of aspects of productivity in artisan communities. Thus, the variables of each category relate the cultural with the technological and ecological aspects, thus allowing three study variables to be defined for each category: the analysis of each category considers 27 dimensions and a considerable number of relationships (Figure 1).

Each dimension is analyzed from the relationship established with the category, for example. The dimension **a** (ecological order) is defined by two levels of analysis: level 1 related to the cultural category, and level 2 referred to as the technological variable. In other word, the dimension **a** is related to two components of analysis, one cultural and the other technological. In turn, the dimension **b** is also defined by two levels: level 1 being the technological category, and level 2 the ecological variable. In this respect, the dimension **b** is related to the analysis components of technology and ecology. So, the

following questions arise: how can the eco-technological level of an artisan community be analyzed and characterized with a conceptual model?; and how can an artisan community be approximated and its partial reality be interpreted? Although there are no answers, rather more questions, on concluding this study it was possible to approach a validation of the Eco-technological model from the following methodological mechanisms: (1) with the tools of participatory methods; (2) with the tools of structural analysis; and (3) with a dynamic modeling of different scenarios. The explanation and results of the first two methods are presented in the present study.

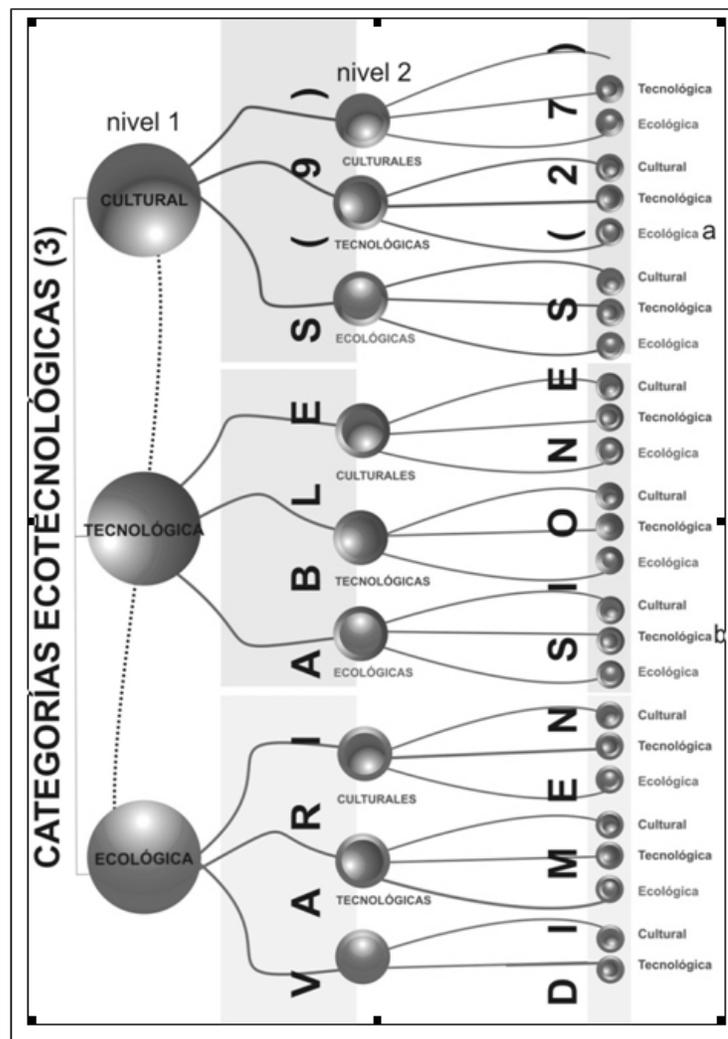


Figure 1. Quantitative relationship of the Structure of the Eco-technological model.
Source: Final Project Report: Validation of the Eco-technological Model for artisan production Design Department. Pontificia Universidad Javeriana. [Pacheco, Gómez & Barrero, 2008].

Brief general characterization of the case-study populations

The study shows that the general conditions of the populations of Galapa and Usiacurí are different. Galapa, a municipality located 13 km from Barranquilla, is characterized by a wide offer of services and commercial activities, is a urbanized population with spontaneous growth without urban regulation. This spontaneous growth is causing problems of environmental degradation, mainly due to inadequate soil use. According to the Municipal Council (Alcaldía de Galapa, 2008), the municipality is a product of the paradigm of industrialization based on energy consumption, mass production on assembly lines, and the generation of large human concentrations, a prerequisite for economies of scale and mass consumption. According to the FODA (Analysis of strengths, opportunities, weaknesses and threats) carried out by this institution, amongst the strengths related to the cultural sector a highlight is that the municipality possesses a Cultural Center, which facilitates the development of cultural projects. Additionally, it has the opportunity to be one of the most important pillars for the Carnival of Barranquilla. This is, in part, due to the persistence of handicraft activities, such as the production of masks and headdresses, and making carnival costumes in paper mache. In contrast, and contradictory, the weaknesses indicate that folkloric groups (including artisans) do not have entrepreneurial mentality, and there is a scarcity of economic support from local and departmental government. Finally, a threat is detected related to the loss of cultural identity, and the poor state recognition of the cultural values of the municipality.

In the dimension of economic development, which, for the purpose of this proposal, includes the technological dimension, one of the greatest strengths is the large land area, and the presence of peasant organizations. The opportunities lie in strengthening agriculture as a national policy, and the main threat is the lack of agricultural technification, and the climatic effects from the production of greenhouse gases. On the other hand, the analysis of ecological development highlights the existence of environmental promoters, members of the public trained by the Regional Corporation of Atlántico in conservation of ecosystems and environmental impact evaluation in rural zones. On the other hand, an important threat is deforestation, a consequence of urban growth and agricultural activities. It is evident that artisan logging activity does not negatively influence the processes of forest degradation, although, it is currently affected by this anthropogenic dynamic.

In Usiacurí documental evidence shows other important characteristics. According to a proposal of the current local government (Usiacurí Town Council, 2008), the potential economic base is focused on the subsoil richness, and thus on agricultural activities related to artisan production and tourism. These factors form the foundation for a program of recuperation of the natural environments impacted by an inefficient waste water system and by erosion, principally the result of deforestation in the river and creek watersheds. Proposals also include the recuperation of medicinal water bodies, and associated ecosystems. A further fundamental point is the program for agro-industrial development of the iraca palm, a key resource for the elaboration of handicrafts in the region. It is pertinent that, in contrast with Galapa, in Usiacurí the only artisan activity is that of the iraca palm weaving, an activity on which a large proportion of the community depends – mostly the women. It is evident that the three pillars of the program are directly related with the artisan activity, showing its importance in the local economy of the community.

Participation, a key element for the construction and validation of the eco-technological model

Stakeholder participation is a key element on the process of model validation. The participatory workshops were based on the instruments of participatory development (Geilfus, 1997) and were fed by the life stories, the experiences and the popular knowledge of the artisans and by information supplied by key representatives of both non-governmental organizations and departmental organizations. These inputs were essential to identify the factors that characterize the eco-technological level and to validate the existence of the dimensions. Taking into account the fact that diverse eco-technological dimensions of the artisan production were explored, and additionally that their relationships were validated, the community participation became a mechanism for the social groups to analyze their own reality, in such a way that the participative research contains instruments that permit the collection of data based on three concepts: people, power and practice (Finn, 1994).

The triangulation and the convergence between the information regarding the diversity of individuals, field observations, conceptual support documentation and the

previous experiences with the community related to the participatory workshops, formed the base on which to establish the characterization and the validation proposal.

Results

The main objective of the validation was to identify the eco-technological characterization that is manifest in the artisan production of Galapa in the activity of woodwork of 'Ceiba roja' (*Bombacopsis quinata*), and in Usiacurí in the weaving of the iraca palm (*Carludovica palmata*). Thus, it was necessary to identify the eco-technological characterization using participatory instruments that involved the general community, the artisan workshops, the local institutions that support the artisan activity, and the governmental, municipal, departmental and state institutions, in interpreting this characterization in a qualitative analysis. Similarly, it was necessary to verify the convergence of analysis categories established in the Strategic Model (SM) through the identification of the cultural, technological and ecological dimensions that are manifest in the artisan activity in both communities. In the SM, dimensions were defined from the participatory work, however, it was not certain if the proposed model fulfilled the simulation of reality of the studied system, and for this reason, it was essential to perform a validation based on the same participatory instruments, in order to check the existence of the different dimensions and so corroborate the relationship between them, and to confirm the instrumental character of the Strategic Model for the effective planning of local artisan initiatives within an environmental framework.

The initial vacuum that needed resolving was in two senses. (1). Related to the verification of the concept eco-technological in rural artisan communities. Leff (2003) indicates that one of the fields in which a productive rationality based on an ecological potential could be applied is in communities where the primary productivity of the ecosystems is high and vulnerable, where there are also found capitalistic rationality, and capital-intensive technological models; the cases of Galapa and Usiacurí fulfill these criteria; and (2) contrast the validation with other similar models. In this case the Andean Project for Rural Technologies of the University of Cochabamba in Peru (1990) was found, and the study carried out by CEPAL (1983) regarding rural survival in high altitude ecosystems. No information was found on the subject of eco-technology in rural artisan communities, and thus it was considered opportune demonstrate that a model based on an eco-technological focus and applied to artisan communities supports the idea that

handicrafts are a system of social organization that interacts with the environment and is integrated with a specialization, as well as being part of a territory that provides environmental services and allows socio-cultural and socio-productive connections in a rural community. Both the spatial organization and the territoriality of artisan production is circumscribed to a particular culture, giving the artisan production and products a relationship with the region to which it is associated. Furthermore, the project results validate the existence of some of the interrelationships proposed in the conceptual model and, by using a structural analysis (Godet et al., 2000) it was established that both influencing and depending relationships characterize the eco-technological level in the artisan community, and, further, the analysis allowed a simulation of behavior of the artisan system as a socio-ecological system, and observations of the behavior of the way that changes were promoted in both the dependent and influencing relationships.

This discussion is based on the knowledge that the Strategic Model provides evidence of the complexity of the socio-ecological system that requires attention by programs for strengthening and promotion activities from the environmental perspective. With the validation the presence of some of the established dimensions from the conceptual model was shown, and the inter-relationship between these and the eco-technological characterization was also shown. The greatest importance of the SM is in the possibility that the artisan communities take control of the instrument and use it in the analysis for planning their own development projects, taking into account that the conceptual model was constructed by those same artisans, which is the principal indicator of applicability of the model (Box 1).

Box 1. Component Matrix of the Eco-technological Model.

Category	Variables	Dimensions
Cultural Productivity	Productive social organization	1 Trans-generational and inter-generational dynamics
		2 Organizational pattern
		3 Productive social structure around the RR.HH.
	Socio-economic structure of artisan production	4 Productive community
		5 Unit of artisan economy
		6 Market dynamics for RR.HH.
	Cultural perception of the RR.HH.	7 Entrepreneurialism
		8 Technical valuation of the RR.HH.
		9 Cultural management of the RR.HH.
Technological productivity	Technological memory	10 Technological Identity
		11 Technical innovation processes
		12 Use dynamics of RR.HH.
	Technological pole	13 Technological organization
		14 Technological resources
		15 Local technological structure. Use of primary materials.
	Sustainable technological processes	16 Environmentally responsible technology
		17 Competitive ability
		18 Identification of factors for sustainable management of RR.HH.
Ecological Productivity	Ecological organization of production	19 Integrated management of crops associated with production
		20 Alternative agricultural activities
		21 Ecological Interchange
	Environmental impacts	22 Ecological degradation aspects
		23 Cleaner production
		24 Impacts on resources
	Ecosystem analysis	25 Potential for sustainable ecology
		26 Ecosystem carrying capacity
		27 Geophysical location of the RR.HH.

Source: Final Project Report: Validation of the Eco-technological model for handicraft production del Design Department. Pontificia Universidad Javeriana. (Pacheco, Gómez & Barrero, 2008).

Study variable of the Strategic Model

Productive Social Organization. This variable is based in the family. For example, in Galapa, the older men are the leaders or maestro artisans; the wives are key people in the administrative process of the workshop, although they also participate in productive processes. In most cases, the older sons and daughters take responsibility for the continuation of the artisan training combined with studies that support both the creative-productive process and also the administrative process, while younger children are at school until they are interested in participating in the process. In contrast, in Usiacurí, the mother is the leader or maestro artisan, and the person in charge of the productive

process. A few cases have shown a productive family structure where other relations have participated, or where the father was the maestro artisan.

In both cases, exchange occur between master and apprentice, and between maestro and operator in the workshop during the productive process, The interest of the maestro is derived from the permanence of the activity, the generational change and the increase in productive capacity of the workshop. The interest of the apprentice is initially for the income, but then is united with the interest in the cultural permanence of the activity. In contrast, the operator is only interested in the income, and, in very few cases, in the cultural process.

Socioeconomic structure of artisan production. The artisan socioeconomic structure is based on the technical knowledge of the activity, the capacity for commercialization of the products, the ability to form groups and participate in networks, the capacity to form promotional and strengthening projects, the labor opportunities offered to interested youngsters interested in being employed or in continuing cultural artisan processes, their self-instruction and self-responsibility in order to guarantee the permanence of the artisan activity.

The cultural perception of the natural resources. In both artisan communities, the cultural perception revolves around the usefulness of the natural resources, and there is no evidence that indicates the rituals or myths exist relating to the ceiba tree in Galapa or the iraca palm in Usiacurí. However, at the point of extraction there are certain criteria for selection, for example in Galapa, the artisan chooses the most mature ceiba, and the harvest is made in such a way as to ensure that there is sufficient tissue left for new growth.

Technological memory. The technical identity consists of the unique components of each workshop, and is based on the identifying technical and artistic style of each artisan maestro. The processes of innovation are centered on the initiative of the maestro, who continually experiments with new productive techniques, technological adaptations and new forms of artistic expression, while the dynamic of use of the natural resources depends directly on the market dynamics.

Technological pole. The technological organization is centered on temporary sets of projects, however, each workshop develops its own technological organization that

depends of the initiatives of creation and diversification of products. In Galapa, the technological advance is more rapid than in Usiacurí, and this depends on the activities that are undertaken in each community. Thus, while in Galapa the advance is due to the adoption of new technologies, in Usiacurí the weaving activities depend only on basic tools such as a needle, or a wire frame. This shows that the technological dynamic in wood-carving is centered on the interaction between creativity or the artisan and the manual ability to develop the idea. From a different perspective, the technological resources of one part are acquired through the submission of project proposals to NGOs and governmental institutions, and through the acquisition of their own resources.

Sustainable Technological processes. In this variable, data were not generated, as the dimensions relating to environmental responsible technology, competitive ability, and the identification of sustainability in the management of natural resources are not present in the study cases.

Production organization for the use of natural resources. This organization is promoted according to the supply and demand in the market. Resource management plans do not exist in the communities studied, nor rates of ecological or economic return on the use of natural resources, apart from the prices that are decided by the farm owners for the harvesting of ceiba trees in the case of Galapa, and the prices set by the intermediary for the iraca palm in Usiacurí.

Environmental impact. The impacts occur according to the production dynamic. No evidence was seen of work with clean technologies or of ecological impact, despite the fact that the Caribbean region suffers from a severe environmental crisis.

Ecosystem analysis. The technical knowledge that a community has regarding the environmental services of the region is low, despite empirical knowledge regarding the natural resources associated with artisan production being important. However, the ecological potential of the region is vulnerable. On one hand, the environmental offer of the zone is limited and its carrying capacity is critical, and on the other hand, cattle ranching has increased, having a direct effect on artisan activity, with the cattle ranchers clearing the forest landscape to cultivate grass, in the case of Galapa. In Usiacurí, although the palm grows in uncontrolled conditions, there is no sustainable management,

so that the providers of this resource impact directly on the ecosystems of the region of Montes de Maria in the Department of Bolivar.

Systemization

The systemization that characterizes the eco-technological level, obtained using the structural analysis (Godet et al. Roubelat, 2000), uses the following values and indicators of influence and dependence:

Value		Indicators
0	No influence	No dependence
1	Weak indirect incidence	Weak dependence
2	Strong indirect incidence	Strong indirect dependence
3	Weak direct incidence	Weak direct dependence
4	Strong direct incidence	Strong direct dependence

Based on the values assigned to each of the 27 dimensions of the Strategic Model, the following results are presented:

In Galapa the dimensions that present the greatest dependence value are the technological resources (14), environmentally responsible technologies (16) and the competitive ability (17). The dimensions that have the greatest influence are the use dynamic of the natural resources (12), the alternative agricultural activities (2)), and the environmentally responsible technologies (16). The dimensions that have the least dependence on the relationships for eco-technological productivity are the cultural management of the natural resources (9), the technological identity (10) and the identification of factors for sustainable management of the natural resources (18), while those that present least influence are the technological resources (14) the ecological potential (25) and the artisan economic unit (5).

in the artisan community of Usiacurí the dimensions that present the greatest value of dependence are the technological resources (14), the organization pattern (2) and the ecological potential (25). Those with the least dependence are the biophysical location of the natural resources 927), the carrying capacity of the ecosystem (25) and the use dynamics of the natural resources. The dimensions the present the greatest value of influence are the cultural management of the natural resources (9), the factors of use of the natural resources (18), and the technical valuation of the natural resources (8). Those

that present the lowest values of influence are the entrepreneurialism (7), the biophysical location of the natural resources and the carrying capacity of the ecosystem (Figures 2 to 5).

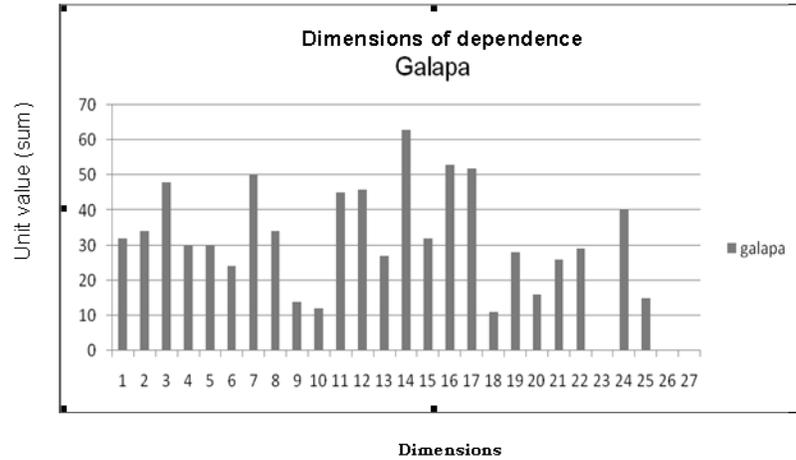
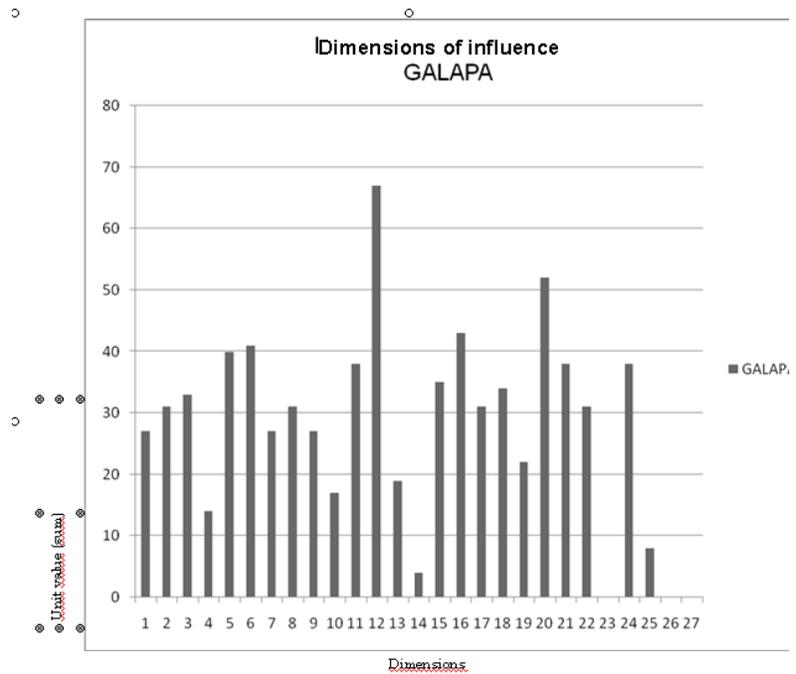
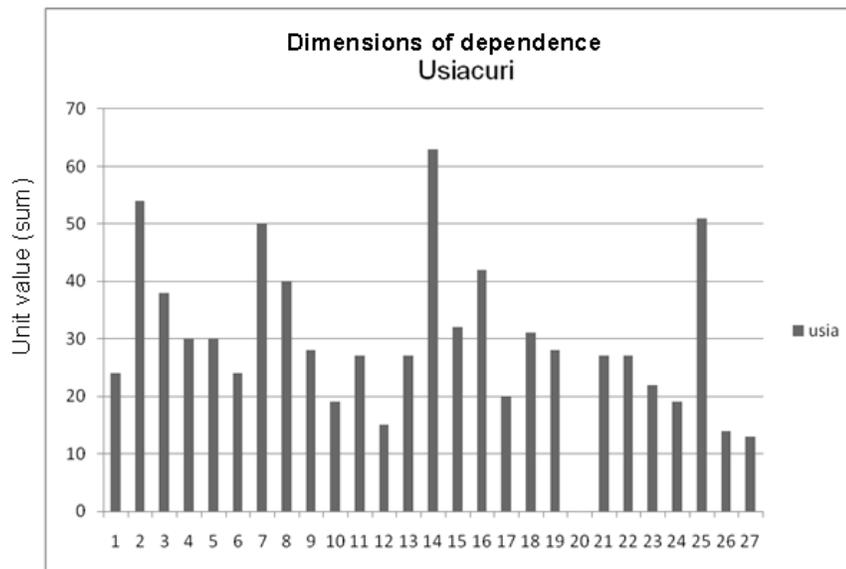


Figure 2. Dependence of dimensions in the community of Galapa, Atlántico Department, Colombia.
Source: Final Project Report: Validation of the Eco-technological Model for Handicraft Production. Design Department, Pontificia Universidad Javeriana. (Pacheco, Gómez & Barrero, 2008).
 (The meaning of the dimensions is given in Box 1).



Departamento de Diseño, Pontificia Universidad Javeriana. (Pacheco, Gómez y Barrero, 2008)
Figure 3. Influence of dimensions in the community of Galapa, Atlántico Department, Colombia.
Source: Final Project Report: Validation of the Eco-technological Model for Handicraft Production. Design Department, Pontificia Universidad Javeriana. (Pacheco, Gómez & Barrero, 2008).
 (The meaning of the dimensions is given in Box 1).



Dimensions

Figure 4. Dimensions of dependence in the community of Usiacuri, Atlántico Department, Colombia.
Source: Final Project Report: Validation of the Eco-technological Model for Handicraft Production. Design Department. Pontificia Universidad Javeriana. [Pacheco, Gómez & Barrero, 2008].
 (The meaning of the dimensions is given in Box 1).

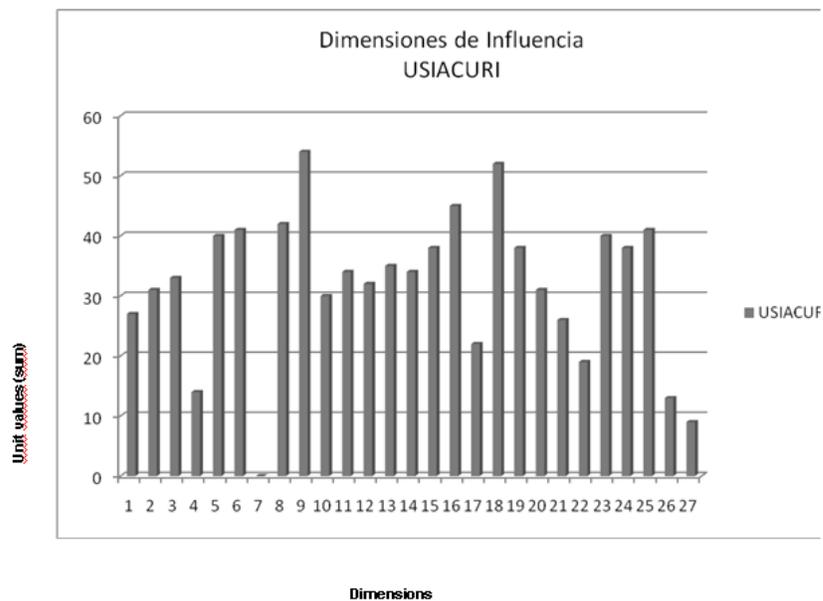


Figure 5. Influence of dimensions in the community of Usiacuri, Atlántico Department, Colombia.
Source: Final Project Report: Validation of the Eco-technological Model for Handicraft Production. Design Department. Pontificia Universidad Javeriana. [Pacheco, Gómez & Barrero, 2008].
 (The meaning of the dimensions is given in Box 1).

Discussion

In agreement with the valorization of the dimensions of the matrix of structural analysis (Godet et al., 2000) it was found that in Galapa there is a higher level of dependence on dimensions related to the category of technological production, while in Usiacurí the greatest value of dependence was related with the ecological category.

In terms of influence, in this same municipality, it was found that the greatest value for the dimensions was given to the category of technological productivity, while in Usiacurí two belong to the cultural productivity and another to the category of technological productivity.

The lowest values were as follows: in Galapa the dimensions of lowest dependence value the first is related to the category of cultural productivity and the other two with the category of technological productivity. In the same way, in Usiacurí it was found that the first two belong to the cultural productivity category. In relation to the valorization of influence in Galapa, the lowest values corresponded to a dimension for each category (technological, ecological and cultural productivity, respectively), while in Usiacurí the first dimension corresponds to the category of cultural productivity and the last two to the category of ecological productivity.

These findings allow us to infer that the eco-technological characterization of the artisan community of Galapa is centered on the dependence and influence of technological variables. Which is coherent with the evidence observed in the field work where the appropriation and the processes of technological transfer have allowed the artisans to respond to the challenges of the market. However, there is a variation in the values related with the ecological and cultural productivity, which presents a valuation disequilibrium that must be analyzed from the eco-technological perspective of the artisan production.

In the community of Usiacurí it is observed that a better balance exists in the eco-technological characterization, presenting cultural, ecological and technological productivity variables, although in different proportions. This characterization is related to the awareness processes regarding the rural environment, and the use of natural

resources by the local authorities and the regional corporation, an institution that trained more than ten people in environmental issues, who have subsequently divulged the information to the artisans in the iraca palm. In Usiacurí a strong cultural tradition has existed related to the artisan products, which explains why the cultural and ecological variables are prominent.

Conclusions

From the results of this study it is possible to conclude the following:

- Artisan production consists of an eco-technological complexity that has not been considered in state and institutional organizations. It is seen that handicrafts construct adaptive relationships and capacities for response to disturbances that impact the social, economic and ecological structures. However, these responses appear in a disjointed manner and are focused only on the production with respect to the market, risking key constitutive components of the handicraft production such as cultural and ecological dimensions.
- If the artisan communities continue in the construction of their identity, maintaining their technological memory, and sustainably using the environmental services of the region, under an eco-technological balance, they may confront the challenges of the market in the focus of the Strategic Model.
- This latter consists of a practical tool for analysis which integrates variables of artisan production in order to support strategies essential for planning under the focus of a socio-environmental rationality, which should be verified in a future study comparing diverse artisan communities.

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References

- Alcaldía de Galapa. January 2008. <http://www.galapa-atlantico.gov.co>: <http://www.galapa-atlantico.gov.co/planeacion.shtml?apc=p-11--&x=10326>.
- Alcaldía de Usiacurí. 2008. El nuevo modelo de autogestión. Usiacurí. No editorial.
- Armatte, M. 2006. La noción de modelo en las ciencias sociales. *Empiria. rev. Metodologías en las ciencias sociales* . p. 33-70.
- Artesanías de Colombia. January 2008. www.artesantiasdecolombia.com.co/informegestion2008.
- Bebbington, A. & Torres, D. V. 2001. Capital social en las Andes. Quito: Ediciones Abya- Yala.
- Beer, S. 1985. Diagnosing the system for organizations. Oxford. John Wiley & Sons.
- Finn, J. 1994. The Promise of participatory research. *Rev. Servicios Sociales Progresivos*, 5(2):25-42.
- Geilfus, F. 1997. Ochenta herramientas para el desarrollo participativo: Diagnóstico, planificación, monitoreo, evaluación. San Salvador. IICA-GTZ. 3ed. Ed. p. 3-100
- Godet, M.; Monti, R. ; Meunier, F. & Roubelat, F. 2000. Caja de herramientas de la prospectiva estratégica. Paris. Gerpa con la colaboración de Electricité de France, Mission Prospective. Cuarta Edición. Pag. 75-79. Prospektiker —Instituto Europeo de Prospectiva y Estrategia
- Gómez Vásquez, G. & Pacheco Contreras, J. C. 2007. El modelo ecotecnológico, una alternativa para la sostenibilidad de las comunidades artesanales de Galapa y Usiacurí en el Departamento del Atlántico. *Cuadernos de Desarrollo Rural* 229:118-148
- González L de G, F. 1999. Reflexiones acerca de la relación entre los conceptos: ecosistema, cultura y desarrollo. Serie ensayos de ambiente y desarrollo. Bogotá. Editorial Javeriana.
- Keen, R. E. & Spain, J. D. 1992. Computer simulation in biology. New York. Wiley-Liss.
- Leff, E. 2003. Ecología y capital. Racionalidad ambiental, democracia participativa y desarrollo sustentable. Buenos Aires. Siglo XXI. p. 140-258.
- Mayor Mora, A. 1997. Cabezas duras y dedos inteligentes. Bogotá. Colcultura. p. 20-68
- Sen, A. 2004. Capital humano y capacidad humana. *Cuadernos de Economía. Foro de Economía política*. p. 1-4.
- Swoyer, C. 1991. Structural representation and surrogate reasoning. *Synthese* 87:449-508.
- Turner, J. 1994. Matemática moderna aplicada. Probabilidades, estadística e investigación operativa. Madrid: Alianza Editorial.
- Vink, A. 1975 . Land use in advancing agriculture. New York. Springer- Verlag.