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University for development agencies and innovation UNACH proposal to the problems of the agricultural sector in Chiapas

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Abstract

The Modelo de Agencia Universitaria para el Desarrollo (AUDES) created by Universidad Autónoma de Chiapas is formed by a group of teachers with a vast experience in technological development and innovation with a vision of relation with the agriculture. That manages to integrate the different actors of agricultural development as a supporting pillar, consultants and technological proposal generators and as a strategic partnership that contribute to the development of the agricultural sector and social enterprise and sustainable vision. The creation and implementation of the UNACH AUDES allowed having mechanisms to link all the potential of the university and the productive environment, creating bonds of cooperation and dialogue, as well as strategies and accurate dynamic response to the real problems presented by the agricultural sector, which has earned the recognition in the state and international, in areas of social and economic importance to the state, such as the cacao tree and organic milk production, this allow positioning the model of UNACH AUDES as an innovative example of effective impact of the university to the society, getting involved in its development.

Key words: Innovation – Transfer – Agricultural development

Introduction

Today humanity faces serious problems related to poverty, marginalization and social exclusion of large sectors of the population, especially those living in rural areas. We also found environmental problems such as global warming, water pollution, soil erosion and increasing destruction of natural resources.

The state of Chiapas, is not immune to these problems, despite the great natural wealth, there are serious social, environmental and productive problems. It is considered that the state's economy based primarily on agriculture. However, the productivity of many crops and livestock systems is low; it is also noticeable how little modernization and receiving a small technical assistance to producers.

At present there are 20 product systems in Chiapas, 14 related to agriculture and six related to livestock farming. Of these, they stand

out for their environmental impact and economic and social importance, the cocoa product system, the product system and the system bovine milk cattle meat product.

For Mexico, cocoa rather than a food product represents tradition, a rich cultural heritage to preserve, a great source of natural wealth, generating jobs and economic livelihood for more than 50 principal thousand families cocoa production in Mexico is concentrated mainly in the states of Tabasco and Chiapas. The area devoted to this crop and annual production has been declining (Ramirez, 2008). The cocoa sector in Mexico has serious difficulties; in 2002 were reported 83.174 ha. of cocoa with a production of 46.194 tons of dry cocoa, in 2008, there were only 27.549 ton. and reported an area of 61.092 ha. According to estimates by the United Nations Food and Agriculture Organization (FAO) Mexican cocoa production decreases at an average rate of 0.5% per year, this may increase in the coming years. The average yield per hectare is estimated at 300 kg. This progressive decreasing in production has generated a crisis, directly affecting over 50,000 families, thereby increasing poverty in these communities, in itself already depressed. The migration of its people has generated further environmental degradation by the demolition of the plantations, and the shortage of Mexican chocolate industry, which has to import cocoa beans from other countries.

Livestock production is considered the second most important economic activity in the state. Approximately 2.8 million hectares are devoted to this activity and 87% is occupied by cattle, beef cattle inventory in the state is 2.3 million head, which generate 253.000 calves at weaning and 300 million liters of milk annually.

In the area of organic production, Chiapas ranks first nationally in the production of organic food, where producers 67.000 220 organizations engaged in this activity over 100,000 hectares. They grow 23 different products, highlighting the coffee, honey, cocoa and milk. The organic farming occupies about 3,000 ha., are operated more than 3,500 heads and produce about 2 million liters of milk annually. The municipalities of Tecpatán and Mezcalapa are among the most important at both the state and national levels in organic milk production. From the standpoint of social, economic and environmental, is becoming increasingly important in organic livestock Chiapas (Ruiz-Rojas, 2008).

In the case of Chiapas Ruiz-Rojas (2010) notes that in entity engaged around 2,300 hectares to cattle organic dual purpose. In the municipalities of Tecpatán and Mezcalapa are 80 ranches with 2300 ha. and 3,500 head of cattle, of which about 1,000 are milking cows that pro-

duce a total volume between 4 and 5,000 liters of milk. In 2010, with the support and advice of the UNACH, the Group Organic Milk Producers "The Pomarroza", from the Ejido Emiliano Zapata, was certified organic. Earlier this year the Group Organic Milk Producers "Malpaso" was also certified organic, becoming, in the main groups of organic milk producers in Mexico.

In response to these productive and substantial problems compliance with its functions, the Universidad Autónoma de Chiapas has been generating actions to the various problems that arise, so that the current administration headed by Rector Mtro. Jaime Vals Esponda mainly focuses its actions towards the Generation and Innovation Management (Academic Project from 2010 to 2014), the benefit of the Chiapanecos inhabitants.

Considering the leadership in research, innovation and generation capacity implement technology transfer programs by a group of teachers from the UNACH, the University, through the Dirección General de Investigación y Posgrado and the Consorcio de Ciencias Agropecuarias, promoted a series of activities to organize and promote collegial work for integration and structuring of the proposal for the formulation of Agencia Universitaria para el Desarrollo e Innovación Chain-Chocolate Cocoa "Cocoa-Chocolate AUDES", based on the "Institutional Program Agricultural Productivity Growth in Chiapas 2007-2018", drafted the first proposal of the Agency.

After this, there were two workshops for analysis, discussion and enrichment of the proposal, attended by directors of the Comité Estatal del Sistema Producto Cacao, representatives of producer organizations in the state of Chiapas, officials Fundación Produce Chiapas, and officials and researchers from the Universidad Autónoma de Chiapas. So officially in June 2010 establishing an Agency for the Development of University-Chocolate Cacao a structure that is aimed at strengthening the competitiveness and sustainable development of the cocoa-chocolate food chain in the state of Chiapas, through innovation technology.

With the same basis, in June 2011 establishing an Agency for Development University for the Production of Organic Milk, as an initiative of the Universidad Autónoma de Chiapas, which is considered a strategic priority area for sustainable development of the State of Chiapas and is an entity of research, technological development, innovation, training, production and services, acting as the legal and structural framework of the University, whose corporate purpose is

contemplated Scientific and Technological Development, oriented to the domain, the generation, the dissemination and the use of knowledge, the innovative technologies and the products, in order to contribute to improving the competitiveness of the supply chain quality milk in the state of Chiapas.

The model of the University Agency for Development and Innovation UNACH

Methodology for the Formulation of AUDES

For the formulation of the proposed Agencia Universitaria para el Desarrollo e Innovación de la Cadena Cacao-Chocolate, "AUDES Cocoa-Chocolate", the Universidad Autónoma de Chiapas through the Dirección General de Investigación y Posgrado and the Consorcio de Ciencias Agropecuarias promoted a series of activities to organize and promote collegial work for integration and structuring of the proposal. On December 4, 2009, the UNACH hosted a working meeting attended by cabinet members university, the Dean of the University and representatives of the Comité Estatal del Sistema Producto Cacao del Estado de Chiapas, as a result of this meeting signed a letter of intent, which was the basis for formalizing collaborative work to develop research, technological innovation, technology transfer and training in cocoa-chocolate chain in the state of Chiapas.

From this first stage was made the first proposal for the agency. Then there were two workshops for analysis, discussion and enrichment of the proposal, attended by directors of the State Committee of Cocoa Production System, representatives of producer organizations in the state of Chiapas, officials Fundación Produce Chiapas, and officials and researchers from the Universidad Autónoma de Chiapas.

The approaches of Cacao-Chocolate AUDES are aimed at strengthening the competitiveness and sustainable development of the cocoa-chocolate food chain in the state of Chiapas through technological innovation.

Organization

The Agencia Universitaria para el Desarrollo e Innovación (AUDES) is a research, technological development, innovation, training, production and services, acting as the legal and structural framework of the University, whose corporate purpose is contemplated the scientific and technological development, oriented domain, generation, dissemination and use of knowledge, innovative technologies and products in order to contribute to improving the competitiveness of the agrifood chains in the state of Chiapas.

The AUDES is a business-minded organization, staffed by professionals with technical and scientific profiles, women and men, with multidisciplinary training, disciplinary experience in primary production, industry and enterprise development.

Objectives

General: Contribute to integrated, competitive and sustainable food chains through Research, Technological Development, Innovation and Business Development, and Social Entrepreneurship.

Strategic: Placing the AUDES of UNACH as a model to the forefront of knowledge, technology and innovation in agrifood chains.

1. Promote organized production base with highly competitive business vision.
2. Promote the value added to agricultural products through organic production, processing and industrialization, development of products.
3. Build the foundation for the creation of a favorable investment environment based on innovation in agrifood chains.
4. To promote greater dissemination and transfer of science, technology and innovation for food chains.

The field of agricultural AUDES

The AUDES is based on the functions of the University: research, teaching and extension and is oriented to the sustainable development of food chains, serving the needs of technology, training, production and services of producers, manufacturers and consumers.

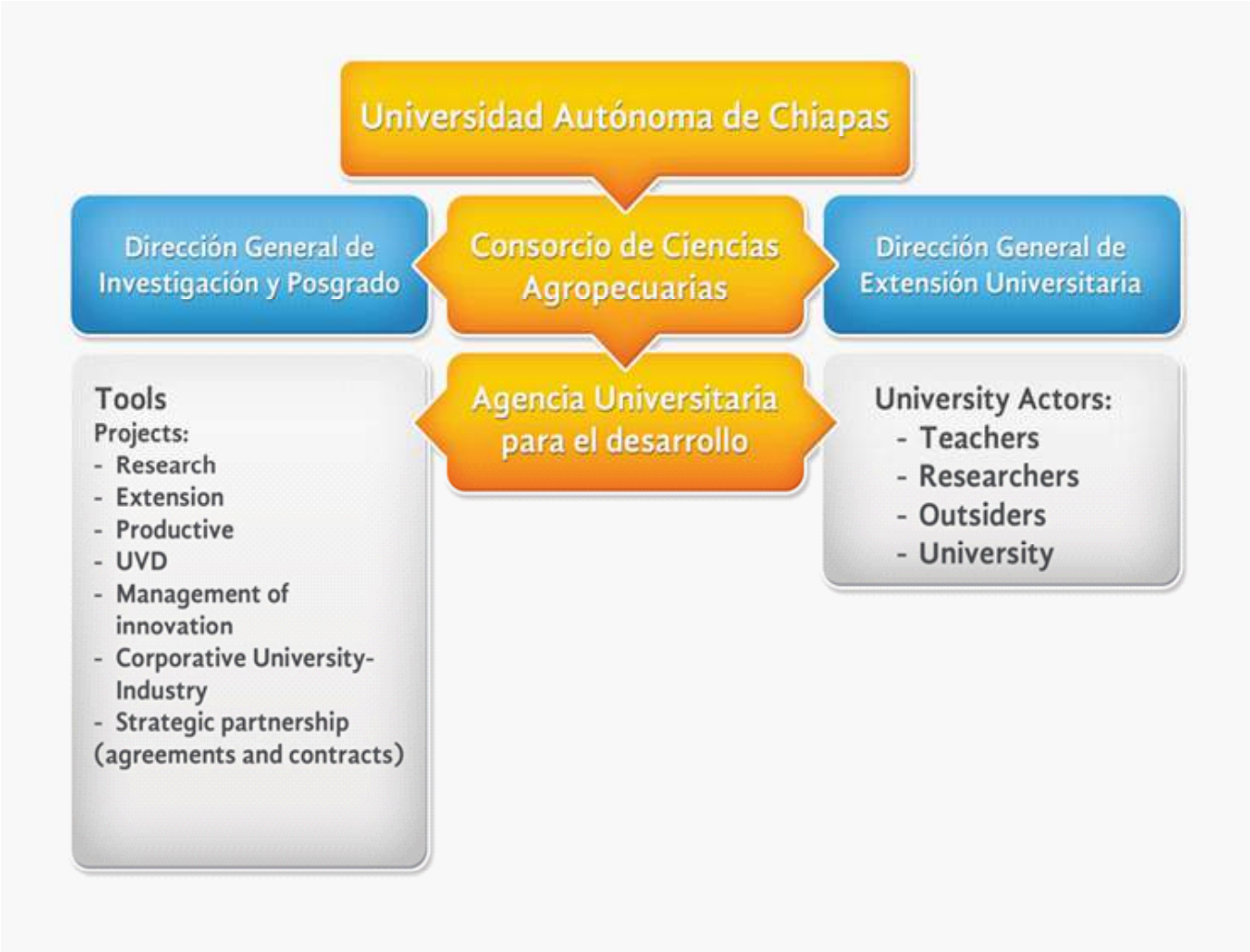

Figure 1. Tools and actors involved in the Agricultural AUDES.

In teaching, AUDES staff participates in undergraduate and graduate programs of the Consorcio de Ciencias Agropecuarias: Master of Science in Tropical Agricultural Production, Agro Specialties Tropical Plantation, Organic and Sustainable Agriculture Plant Health. At the same time, the AUDES is a space for students of these programs that develop practical work and research professional residences for thesis.

The results of the research, technological development and innovation, as well as impacting on the objectives and indicators of *Plan Institucional de Desarrollo 2018*, allow the connection with society in two ways: The first, through the dissemination of knowledge

through participation in scientific and academic publishing, technical and scientific articles, books and educational material. In another sense, it was establishing linkages with the productive sector industry and enterprise that leverage the results and innovations through technology, commercialization, and management of industrial property (patents, trademarks, designs and plant varieties, including other), production and service projects.

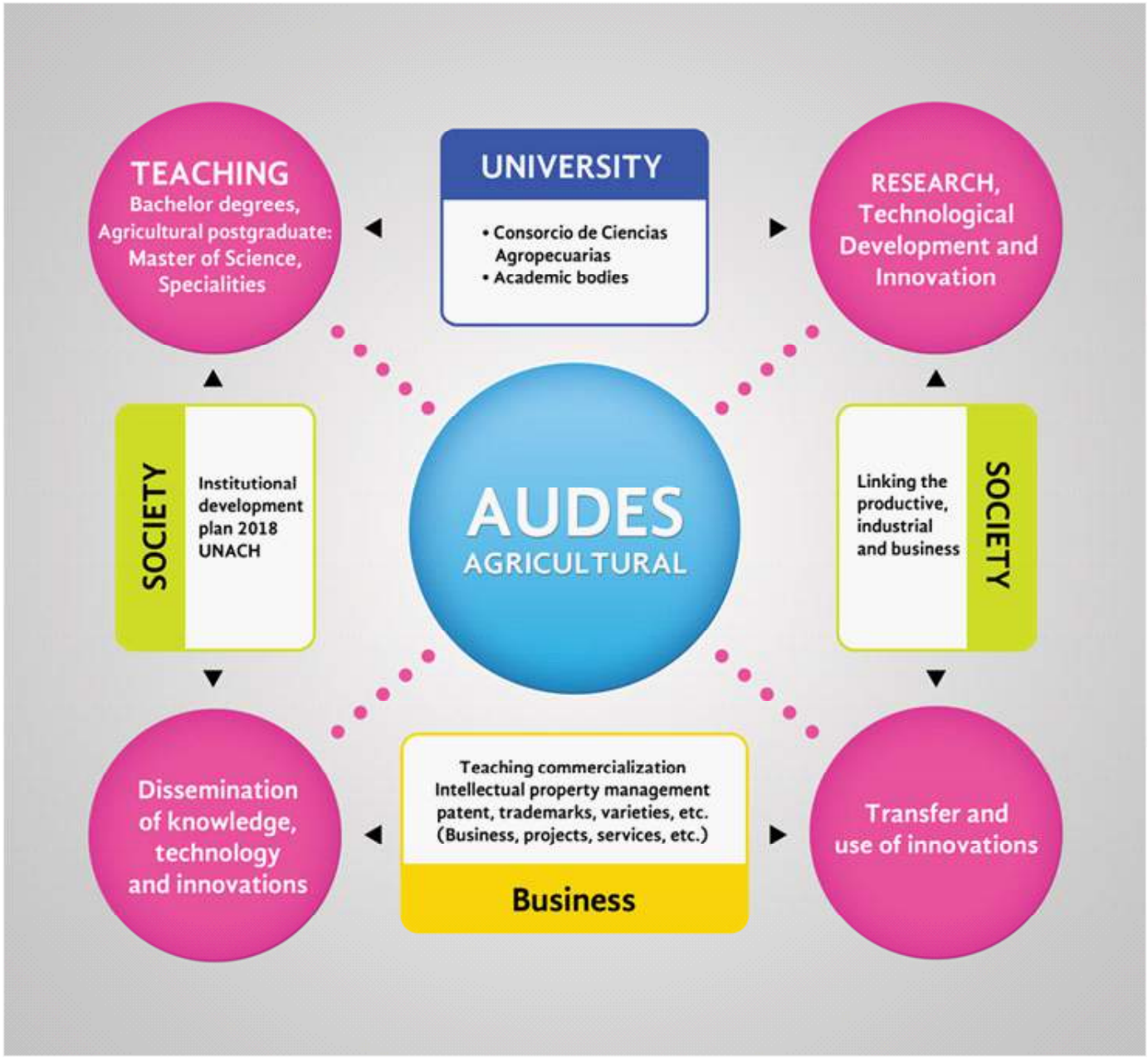

Figure 2. AUDES field of agriculture.

The concept of innovation in agricultural AUDES

The AUDES endorses the concept of innovation defined by the Organization for Economic Cooperation and Development (OECD, 2009) as a complex process that brings ideas to market in the form of new or improved products, technologies or services. A technological invention culminating in the production, distribution and operation of a new process, product, business, business model, or model of logistics service to users. According to this organization, scientific research, technological development and innovation are essential precursors of competitiveness and economic growth.

Thus both the Cocoa-chocolate AUDES and the organic milk AUDES, from the Universidad Autónoma de Chiapas, integrated innovation as a strategic element for the development of its functions, and pretending to combine scientific and technological development, with the domain, the generation, dissemination and use of knowledge, innovative technologies and products, in order to contribute to improving the competitiveness of the agri-food chains in the state of Chiapas, impacting on the consolidation of the academic bodies and quality assurance programs Education and Graduate Degree.

In this sense, incorporates the joint and strengthening the chain "education-basic science and applied technology and innovation", part of the proposals of the Ley de Ciencia y Tecnología (2002), renovated in 2009, the Ley de desarrollo Rural Sustentable (2001), renovated in 2007, and the policies of the Programa Especial de Ciencia, Tecnología e Innovación 2008-2012 implemented by the National Council for Science and Technology.

Technologies, products, designs, processes, trademarks, slogans and logos, among others, to be derived from the research and technological development will be protected (Figure 3) by registering with the Instituto Mexicano de la Propiedad Industrial (IMPI).

In the case of plant genetic resources represented as varieties, hybrids and clones and varieties of cacao tree species, timber, fruit and ornamental, developed as components of cacao agroforestry system, as established by the Ley Federal de Variedades Vegetales (1996) and Ley Federal de Producción, Certificación y Comercio de Semillas (2007) they shall be registered with the Servicio Nacional de Inspección y Certificación de Semillas (SNICS) of SAGARPA, Mexican organism responsible for the registration of property rights and issuing the Title of breeders of new plant varieties.

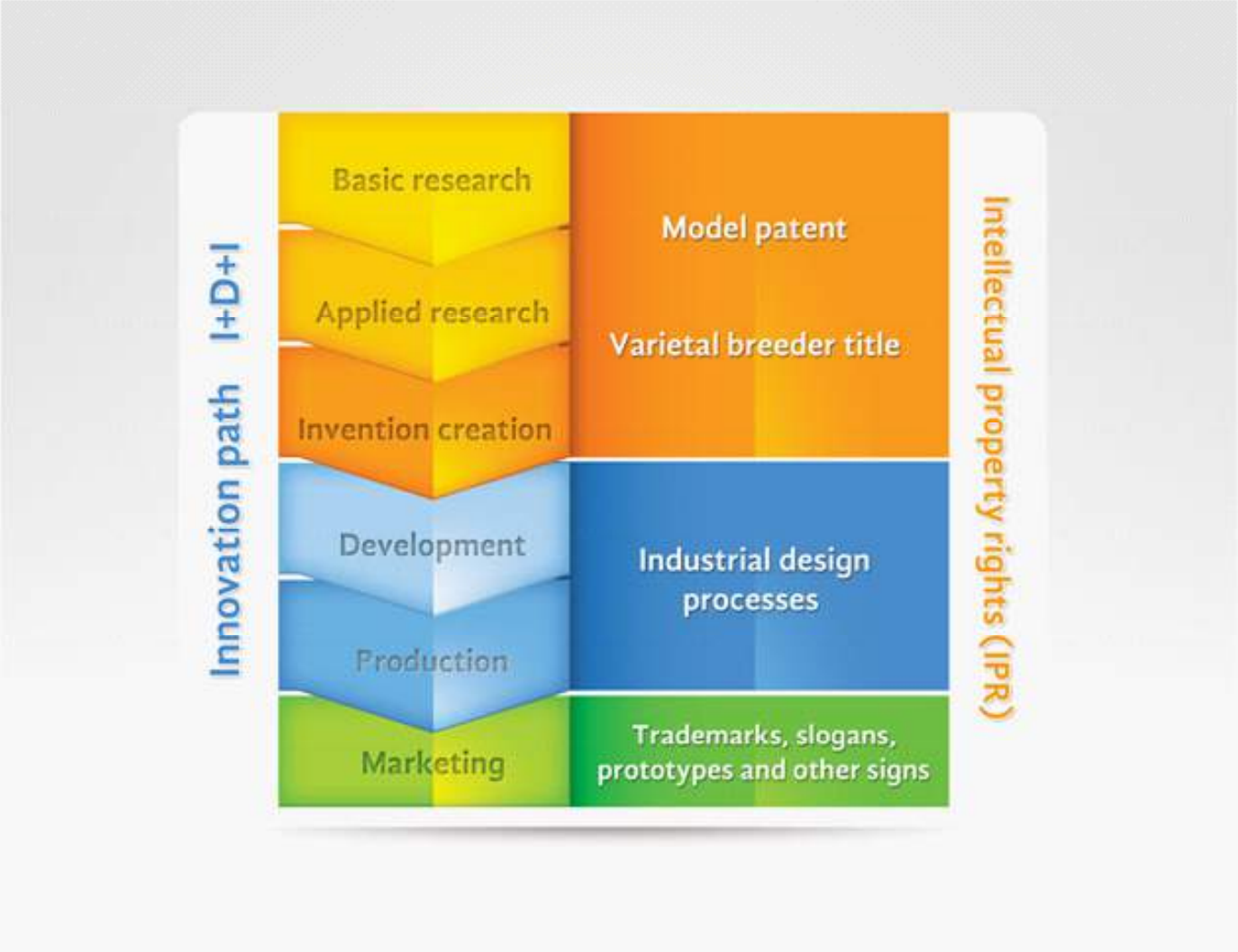

Figure 3. Articulation between scientific research, technological development and innovation and intellectual property rights and industrial AUDES raised in the UNACH

Ecosystem approach to agricultural AUDES

The ecosystem approach (Altieri and Nichols, 2000) is a strategy for agroecological management of natural resources (land, water and living resources) with technology components that promote conservation and sustainable development.

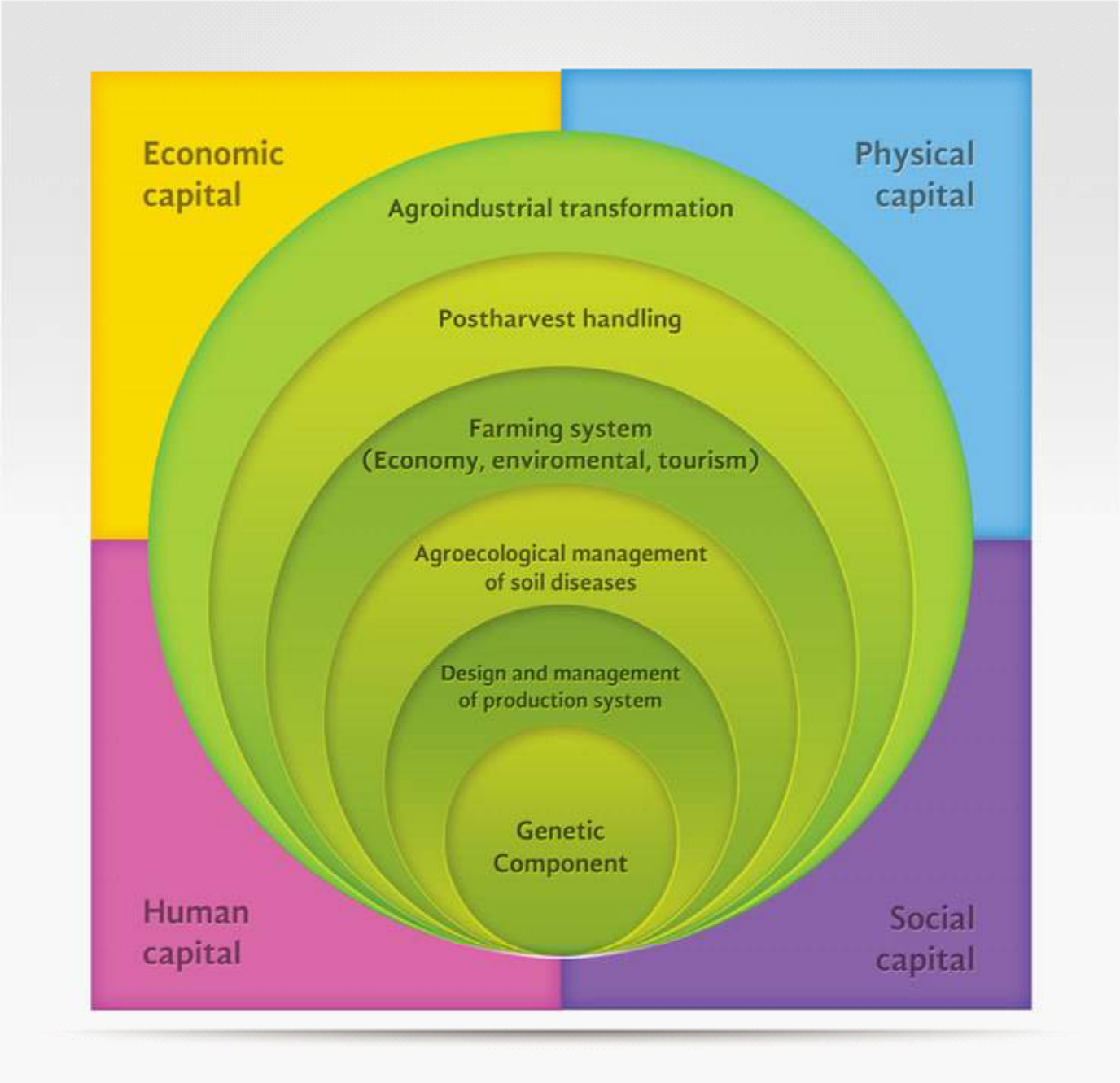

Figure 4. The ecosystem approach and development of economic capital, physical, human and social AGRICULTURAL AUDES.

It is based on the application of appropriate technologies and practices, focused on levels of biological organization, covering the structure, components, processes, functions and interactions both within and in the vicinity of the agro-ecosystem, with a high biodiversity, which can be well used. This approach poses a flexible

management of technology components, which although developed individually, are integrated into the agro-ecosystem to study their performance and profitability together (Figure 4).

The concept focuses primarily on the economic, social and environmental, and ecosystem services, and environmental agro-ecoturístic obtainable agricultural systems. It links the importance of conservation and sustainable use of these different elements to achieve long-term economic benefits. In this approach, people are integral components of the ecosystem approach coincides with the axes of sustainable rural development.

Under this perspective, AUDES organic milk and Cocoa-chocolate, intend to boost the development of organic production since the beginning of this type of agriculture promote the ecosystem approach, while allowing to add value to the raw material.

Operational Strategy of agricultural AUDES

For its operation the Agricultural AUDES have a participatory approach, systemic and holistic, based on the components of sustainable rural development (Figure 5).

The point of departure is the framework in which the participation of producers, government representatives, academics and researchers and other stakeholders in the sector, based on an analysis of the Fortalezas, las Oportunidades, las Debilidades y Amenazas (FODA), problems were identified and defined the strategic actions to implement. To finance the activities of the Agency can point sources of international, national, state, municipal, public and private funds.
Thus, for the development of research and technological development has considered the possibility of obtaining funds from CONACyT in its various forms (Joint Funds, Sectoral Innovation) and Fundación Produce Chiapas. In these instances, the base will be the formulation of projects under these organisms calls issued each year.

For extension projects, production and service is considering raising funds from the programs implemented by the Federal Government (SAGARPA, SEDESOL, SEMARNAT, and CONAGUA), State and Municipal Government. In another perspective, there is the search for additional resources through contributions from NGOs and industry and business.

It is also possible to consider the contributions of the State Committee of the Product System, institutional funds of the Universidad Autónoma de Chiapas, including resources for the implementation of Unidades de Vinculación Docente (UVD) and Institutional Research System SIINV-UNACH, the contributions of producer organizations and business and industry and abroad.

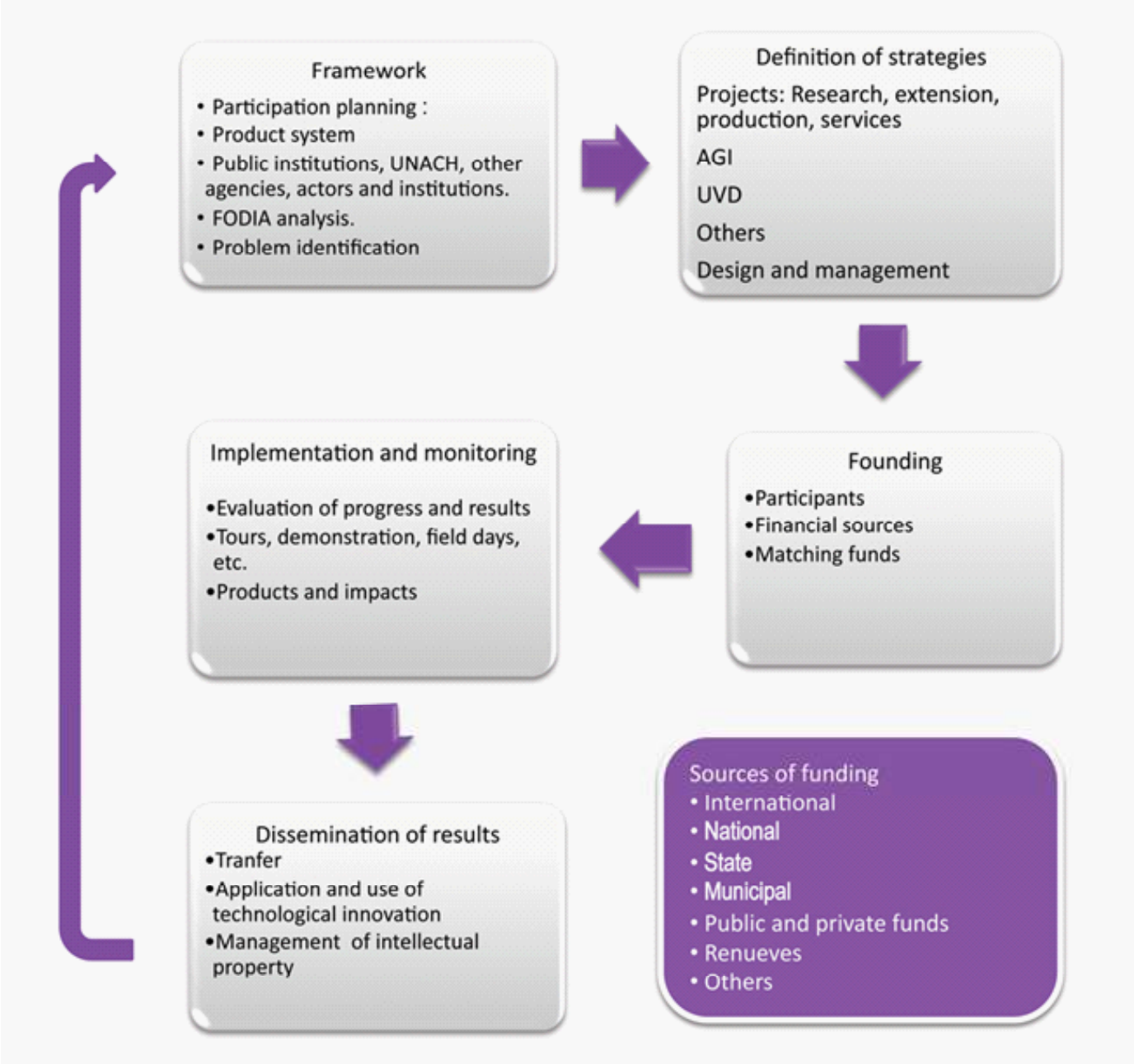

Figure 5. Operational Strategy of Agricultural AUDES

At a later stage, it is contemplated raising funds for advisory services, consultancy and training to companies and investors in the industry, the production of plant material and *agroinsumos*, and commercial exploitation of intellectual property rights (royalties and licenses exploitation).

In order to assess progress and compliance with the objectives, meetings shall be held annually and evaluation program in which presenting the progress, the results are discussed and the difficulties presented and proposed adjustments. These meetings will be held with the participation of researchers, managers of Product System Chiapas state, government representatives, participating institutions, funding sources, producer groups and university authorities.

These meetings will provide a space for dissemination to the scientific and research community, regional, national and international, the progress made, while allow interaction with researchers from other places that may be developing similar processes of development and technological innovation.

There are other scenarios of local, regional, national and international, to be utilized for the dissemination of the results of work of the AUDES, such as: conferences, seminars, workshops, symposia, meetings, conferences, exhibitions.

In order to establish networks, strengthen interagency partnerships through collaboration agreements that allow the integration of collaborative work.

Main achievements of agricultural AUDES

AUDES cocoa-chocolate

One of the main achievements that have had the cocoa-chocolate AUDES is the integration of cooperative partnerships with actors in the production chain, starting with Cocoa Producers Associations of both the state of Chiapas and Tabasco, Comité Nacional y Estatal del Sistema Producto Cacao, financial and industrial entities chocolate, mainly with the company ERCUS SA CV, clearly only company producing Mexican chocolates, so it has been possible to link together the major players in the cocoa-chocolate chain, AUDES being an important partner

for contacting and seeking consultation mechanisms to improve production primary marketing and processing.

With regard to training, it is primarily aimed at producers and technicians of the states of Tabasco and Chiapas, methods for the production of cocoa, made in different cocoa areas of these states as well as the realization of the First International Course on Techniques Modern for the production and processing of cocoa in Tapachula, Chiapas. Support organizational processes of the SPR Tecpateco Cocoa and continuous training of its members on issues of vital importance for the improvement of their cocoa plantations. Also it was conducted a socioeconomic and productive characterization of union members to the association, information vital to the implementation of development projects for cocoa communities.

There have been three UV to students from the Faculty of Engineering degree in Agronomy Mezcalapa Center of Agricultural Studies, contributing to the formation of human resources and supporting communities of cocoa producing in the Mezcalapa region.

Development of research projects funded by Fundación Produce Chiapas, CONACyT mixed funds, with impact on the generation of technologies to improve the cultivation of cacao, the product of which already have three patent records UNACH name of products developed for the control of pests and diseases affecting cocoa.

It has also participated in the selection and characterization of cocoa genetic material of high performance and quality of Soconusco areas, central and northern Chiapas State, finding materials tailored for each of the regions and with good yields and high chocolate quality parameters.

It is noteworthy that the first exhibition organized AUDES cocoa - chocolate and the first children and youth's drawing contest of cocoa in the city of Tuxtla Gutierrez, with great success and with the participation of Chiapas and Tabasco chocolatiers and with over 250 drawings with the theme of cocoa and lecturer of the leading research institutions, marketing, manufacturing, and public officials producer organizations (Figure 6).

AUDES organic milk

The work on organic farming started in 2006, when it began the relationship with various organizations of producers in the central

Florida area. Since then it has carried out several research projects, technology transfer and technological innovation, with local funding, state and federal. It was implemented a UVD has been in operation continuously since 2007 to date.

It also has collaboration agreements with the Universidad Autónoma Metropolitana Unidad Xochimilco, the Universidad de Chapingo and the Colegio de la Frontera Sur. Of these projects it has been obtained the following results concerning human resources training, it has completed 23 graduate theses, dissertations and 3 is supporting a PhD thesis.

Regarding scientific production, it has been organized and presented 37 papers at regional, national and international, it has been also published articles in refereed journals indexed and research and extension (English, Italian, German and Spanish), have written 7 book chapters, a book, 5 manuals and various documents. In regard to training and technology transfer, it has been given more than 20 courses to over 1,000 producers, technicians and students from various municipalities and institutions, both in Chiapas and other states.

Within the systems product UNACH is the vowel system in the product organic milk and beef in organic beef cattle. Among the several hundred groups Cattlemen Validation and Technology Transfer (GGAVAT) that exist in the country, only four are organic, which were formed by management UNACH with producers and Ocotepec Tecpatán.

In 2010 the first group certified social nationwide organic milk producers and earlier this year the second group, which Chiapas ranks as the national leader in this area. It is currently under construction in the town of Raudales Malpaso, the first organic dairy processing plant in the country, the social sector. Future projects continue. The greatest achievement is that it has created awareness among farmers of the region of the importance of caring for and conserving water, land, animals and people involved in the production of healthy food, fresh, quality, produced environment-friendly manner (Figure 7).

Discussion and conclusions

Research and technological development, technology transfer and extension work, they are elements of agricultural development

accelerators. Technology transfer is to disseminate new things and more efficient forms of production in this context the transfer of technology has an important role in Rural Extension.

The agricultural extension work as a concept, it involves sharing knowledge, information and technologies generated at an institution of education and/or research, to users whether they are individuals, groups, productive organizations, companies or government programs.

Since the beginning, in the nineteenth century, formal education in Agronomy universities, the transfer of research results in the form of knowledge and technology to producers, it was considered of utmost importance. This new knowledge and ways of doing things, when applied to daily work on farms, resulted in an increase in yields, more efficient ways of production and a decrease in production costs, ie. net profit in producer incomes and greater food supply for the population.

In Mexico, despite the high number of universities that teach agriculture at the national level, the involvement of these institutions is low in the development of the agricultural sector, therefore, technological development and transfer of technologies and knowledge to producers and companies sector is very limited, both in importance and in the form of transferring technological innovations generated.

It coincides in this sense with the observation that in OECD Mexico there is no efficient agricultural extension service and colleges participate very little in it.

In another context, the figure of the Academic Bodies (CA) is institutionalized in UNACH on the basis of the Faculty Improvement Programme (PROMEP) of the Secretaría de Educación Pública. In the agricultural area are recorded in the UNACH currently 10 academic bodies.

However, the institutionalization of CA and these efforts lead to the degree of consolidation, the results have been unsuccessful, the consolidation is difficult to reach and some of them show little development in recent years, highlighting the lack of financing mechanisms and allowing scholars meet PROMEP activities required to achieve the consolidation of their respective CA.

In this regard and in order to generate initiatives that lead to better standards of consolidation of CA, the AUDES allows formalize linkages and collaboration networks between CA and programs, both within and outside the UNACH, it through networks that favor the generation of intra and inter-agency support in the areas of research, teaching, extension and services, ensuring academic and administrative structure with greater flexibility, promoting participatory and collaborative work between academics and programs.

From the point of view of financing, the AUDES allows access to public and private funds to attract external funding through traditional channels which is complicated institutional and inoperable.

Thus, the creation and implementation of the UNACH AUDES, has helped establish mechanisms to link all the potential of the university and the productive environment, creating bonds of cooperation and dialogue, as well as dynamic responses and strategies accurate to the real problems presented by the agricultural sector, which has allowed national and international recognition for UNACH *expertis* maintaining in sectors such as cocoa and organic milk production.

This model allows to address the deficiencies in the Mexican Rural Extension, thus involving an institution of higher education as the way not only UNACH agronomy professionals, but is involved in rural development through research, development technology, technology transfer, production organization, integrating vision, business and sustainable development.

The AUDES is a comprehensive model that manages to link the main actors involved in agricultural development, so they are a tool with great potential for the University to be linked, act and generate innovations and development in high-impact sectors agricultural state.

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Assessing the physical condition state of structures in risk areas in the city of Tuxtla Gutierrez, Chiapas, Mexico

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Abstract

It is reported the development of a model for the evaluation of structures which allows to determines the status of a construction condition. This evaluation model propose a structure analysis from the stand point of structural and functional , applying to each main factors depending on the deterioration having the structure has at the moment of the inspection. With these two factors established the parameters and indices that qualify the structure in any of the five states of condition for the proposed.

Key words: Assessment, functional index, structural deterioration

Introduction

In previous research has developed research campaigns to social housing located in risk areas in the city of Tuxtla Gutierrez, Chiapas, Mexico, (Alonso, 2007; Gómez, 2008) with in order to determine the condition and to evaluating the damage depending on the pathology are presented. Various models have been used for evaluation; however, they do not fulfill the expected results that are the main reason why it has been proposed the development of a model based in experimental models with adjustments in line with the deteriorating conditions that these areas presented. It may be mention the significance of this model is the structure evaluated from the standpoint of the structural and functional main importance lies on the evaluation of the structure seen from de structural and functional point of view. The functional index to evaluate the structure from the point of view of the service provided to the user, allowing properly perform the functions for which the structure was built. The structural index provides the structural deterioration having the structure the time of the inspection, and it is calculated by taking in to account the deterioration that may have the slabs, walls, confinement or reinforcing elements and foundations.

Background

The city of Tuxtla Gutierrez is the capital of the state of Chiapas, which is located in the southeast past of Mexico; it is one of the most populated, urbanized and largest city in the state, even though it does

not have a touristic or cultural importance, as the other cities; it is in fact, the economical and political center in the state. It is located in the central region of the state at 16°45' 11" North Latitude and 93°06' 56" West Latitude and 550 AMSL. It has an area of 412.4 km2.

In recent years, the city of Tuxtla Gutierrez has had a very important economic benefit generated by the private sector, who have invested in the construction and development of commercial and hotel complexes, as a result this spill has lead to the construction of s the of housing units producing an increase in the urban infrastructure and population.

Unfortunately, the city of Tuxtla Gutierrez city is located the Central Depression presenting a land with mountainous reliefs in the north and south part of the city, which is the reason why several housing units are being build in zones that can be consider risk areas due to the instability of the ground. In addition to this, each unit has different structural characteristics that does not allow the unification or the homogenization of the structure (floor structural system and foundation system), given this, it is common that the structures present several pathologies which does not allow the identification of the cause that produce the structural deterioration, given that it is not feasible to identify the cause that produces the injuries founded and it makes impossible the corrective action required to the problem presented.

Another factor that can be considered as a cause of failure is that the underground of the city of Tuxtla Gutierrez has some special features (clays) that make the proposals of foundation should be studied properly in each case required because depending on the zone where it will build it should be count with proposals for improvement or stabilization of the foundation soil on which the structure must be removed to avoid these faults during the process of volumetric changes of the terrain.

Finally, the city of Tuxtla Gutierrez is included in Zone C (Figure 1) within the Seismic Regionalization of the Federal Electricity Commission (CFE, 2008), which causes together with the accelerated pace of construction presented in housing units, the diverse construction processes and in some cases poor quality materials or supervision, which present a series of structural pathologies caused by the dynamic action and can jeopardize the structural stability of a home.

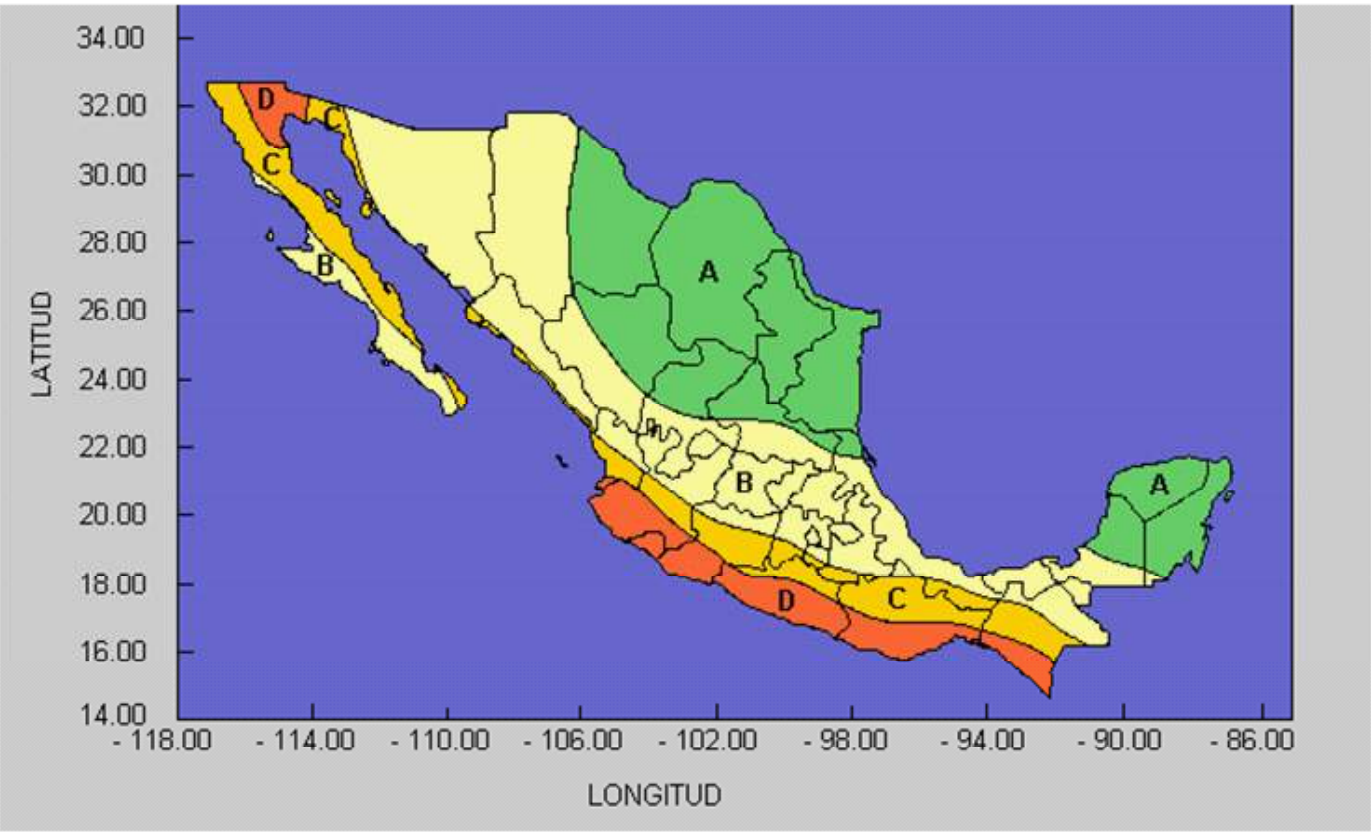

Figure 1 Seismic Regionalization of the Federal Electricity Commission (CFE, 2008)

Assessment of condition model

This article presents a model to assess the state of physical condition of a structure based on data collected in inspection campaigns. It builds on the model proposed in Alonso (2007), but with two main variants, as described below.

This evaluation model proposed the structure analysis from the standpoint of structural and functional, applying for each weight factor depending on deterioration having the structure at the moment of the inspection.

Therefore the state of condition of a structure is evaluated from the State of Condition Index (IEC)

$$IEC = IF + IE$$

Where IF = Functional Index
IE = Structural Index

At this rate, it is calculate the state of condition of the inspected structure taking into account the values given in Table 1, which describes the state of IEC obtained depending on the condition, description and extent of injury as the NTC- 04.

IEC	Condition Status	Description	Harm magnitude (NTC-04)
0.00 1	1 - Excellent	The structure presents no damage	
0.01 - 4.99	2 - Good	The structure has minor damage which can be solved with minimum maintenance	Negligible, which affects not relevant structural capacity (resistant and deformation). The repair will be surface type.
5.00 - 9.99	3 - Acceptable	Undamaged structure under emergency repair and long minor term maintenance	Lightweight, when slightly affects the structural capacity. Remedial measures are required for most simple elements and modes of behavior.
10.00 - 14.99	4 - Regular	The structure has major damage that can endanger the stability of the structure and it requires maintenance actions	Moderate medium term, when moderately affects the structural capacity. The rehabilitation of the damaged elements depends on the element type and mode of behavior.
15.00 - 19.99	5 - Poor	The structure presents several damage needing strengthening actions in a short period of time	Severe short term, when the damage significantly affects the structural capacity. The intervention involves extensive rehabilitation, with replacement or reinforcement of some elements.
20.00 - 59.00	6 - Damaged	The structure has major damage needing immediate enforcement and very serious actions	When damage has deteriorated the structure to the point that they are not reliable. It covers the total or partial collapse. Rehabilitation involves replacement or reinforcement of most of the elements, or even partial or total demolition.

Table 1. State Structure Condition

Functional Index Analysis (FI)

The previous model did not refer to the service state of the structure from the user's point of view, therefore it is proposed in this model using a functional index that allows assessing the structure from the point of view of service it provides to the user, and perform properly the functions for which the structure was built.

This index is calculated by the following equation:

$$IF = FF * FM$$

Where FF = Functional Factor
FM = Maintenance Factor

Functional Factor (FF) is a factor that assesses the structure from the functional point of view and assigns the values given in Table 2, depending on the discretion of the inspector at the time of evaluation. The proposed values for each observation in this table were taken from the study of 77 homes inspected in the city of Tuxtla Gutierrez located in risk areas (Figure 2), gathering the most frequent comments that caused a failure in the use of the home.

The AUDES is a business-minded organization, staffed by professionals with technical and scientific profiles, women and men, with multidisciplinary training, disciplinary experience in primary production, industry and enterprise development.

Figure 2. Location of houses inspected

FF	Harm magnitude (NTC-04)
0	The structure is in excellent condition
1	Presence of dirt on walls, slabs and floors
2	Presence of peeling paint, doors and windows with minor defects, coating detachment
3	Small stains with minimal leakage, electrical and hydraulic malfunctions, missing tiles and carpet tiles, broken glasses
4	Detachment in four walls, and floors, major leaks, doors and windows in disrepair, missing glasses
5	Excessive leaks, damaged doors and windows
6	The structure is uninhabitable

Table 2. Functional Factors Values

The maintenance factor (MF) is a value placed on the type of maintenance that requires the structure to provide the best service status with respect to the functional requirements of the user. There are two types of maintenance: preventive and corrective. Most researchers define preventive maintenance as an activity related to cleaning, painting or coating replacement of structural elements, while corrective maintenance covers a wide range of activities ranging from the rehabilitation, repair, retrofitting or replacement of structural items that could support the actions that may occur. In the case of setting the values involved in the maintenance factor, it was taking into account only the activities that take place in preventive maintenance, ranking lower, medium and higher. The values assigned are described in Table 3.

FM	Description
0	The structure does not require any type of maintenance
1	Minor maintenance, general cleaning of the structure
2	Medium maintenance, restoration, glasses reposition, tiles, carpet tiles, hydraulic and electric restoration, total painting, under seal application in the slabs.
3	Higher maintenance, covering reparation, windows, doors and under seal application.

Table 3. Values for the Maintenance Factor

The previous values were taken from the inspection campaigns applied to the houses in the city of Tuxtla Gutierrez and taking into account the houses and each element within were tested to permanent use which causes a regular deterioration to each one and to preserve the good service throughout its utility and proper usefulness. The previous imply applying proper house care and knowing each element in the house.

The benefits generated by the correct use and maintenance in the housing are the following:

- Avoid the deterioration of the house, preserving the good state of it along its life.
- Improve the physical appearance of it.
- Prevent damages in the structural elements.
- Identify minor problems and solve them on time.

Structural Index Analysis (IE)

The structural index provides the structural deterioration presented in the structure at the moment of the inspection, calculating and taking into account the deterioration that could exist in the four main elements in the structure of the house which are: slabs, walls, confinement or reinforcing elements and foundations.

The expression to calculate the structural index (IE) is the following:

$$IE = DL+DM+DEC+DC$$

Where
DL = Slabs deterioration
DM = Wall deterioration
DEC = Confinement elements deterioration
DC = Foundation deterioration

Each of these deteriorations provides a list of damage that every structural element may content based on the three factors: Damage Factor, Action Factor and Urgency Factor.

The damage factor (FD) represents an index the engineer in charge of the evaluation established and this depends of the damage

observed in the structural element at the moment of the inspection and of the probable cause that originate them.

The Action Factor (FA) represents the corrective maintenance level required, at least, the structural element returns to its original development level. This maintenance type may goes from the minor to the considerable reinforcements of the housing.

And finally, the urgency factor (FU) indicates the urgency of the intervention or action that requires the element taking into account the damage observed at time of inspection.

The values for each of the factors determining the structural deterioration of each structural element were established according to the observations obtained in the inspection campaigns carried out in various parts of the city of Tuxtla Gutierrez, taking certain structural characteristics and use when conduct random sampling of homes to inspect.

In Table 4 shows the frequent pathologies observed during the inspection campaigns and the coincidence numbers of each one.

Pathology	Coincidence
Detachment in the coat of the walls	48
Crack in supporting walls	47
Crack in walls by lose land	36
Stains in slabs by humidity	32
Coating detachment on slabs	21
Crack son floor by contractions	21
Cracking on floors	21
Crack son supporting walls	20
Crack son walls by lose land	19
Slabs cloating flaking	16
Dirt stains on walls	15
Bulging of sidewalks by volumetric changes	15
Coating flaked walls in moisture	12
Crack in walls	10
Detachment in walls caused by ornaments	10
Lack of anticorrosive painting in metallic elements	9
Coating peeling in slabs with efflorescence	8
Gaps in floor and walls	8

Cracks in slabs by contraction	6
Gaps in walls between axis	5
Holes in supporting walls	5
Steel corrosion in the support of the slabs	4
Gaps in floors	4
Stains in slabs caused by corrosion	3
Cracks in slabs caused by inflections	3
Settlements in walls	3

Table 4. Pathology Types and coincidence numbers

The general classification of each of these pathologies regarding to the classification of the structural element are shown in Table 5 and Figure 3.

Structural Elements	Incidence Numbers
Slabs	48
Walls	47
Elements of confinement	36
Foundations	32
Total	**21**

Table 5. Structural pathologies observed in structural elements

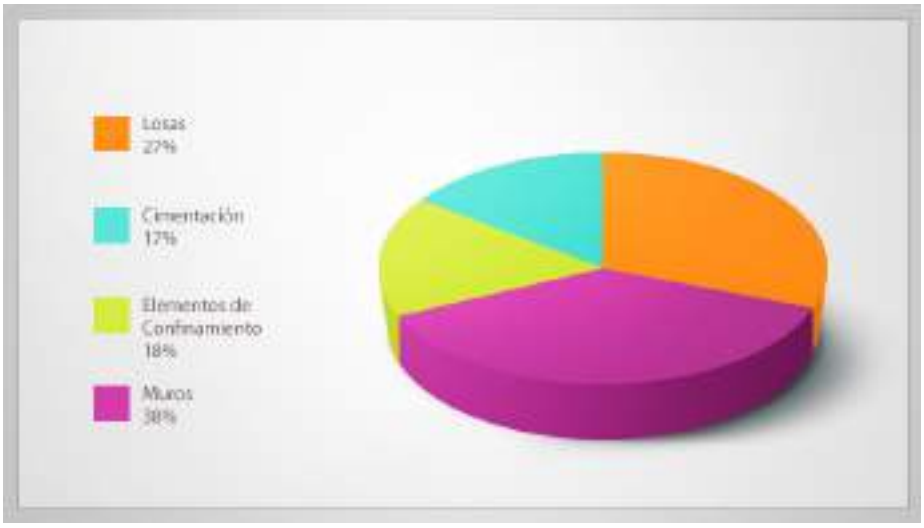

Figure 3. Percentage of deterioration in each structural element

Based on the analysis to the observations of the pathologies obtained during the inspection campaigns and proposals made by authors like Bellmunt et al. (2000), Emmons (2005), Escolá (1993), Garcia (2002) and Gomez (2008), set out the values for each of the factors determining the deterioration in the proposed structural elements.

Impairment Slabs (DL)

The DL is then calculated with the following expression

$$DL = FDL * FAL * FUL$$

The index for damage factor in the slab element (FDL) is established, as mentioned earlier, mainly to study the housing inspected and determined according to the pathology observed and representing each one of them with respect to total damage in the element. Assigning this value depends on the discretion of the evaluator. The values of these indices are shown in Table 6.

FD_L	Description
0	• There were no pathology
0.01 - 0.05	• Small cracks caused by shrinkage of less than 5 cm in length • Paint flaking caused by moisture. • Dirt stains
0.05 - 0.10	• Cracks caused by shrinkage between 5 and 10 cm in length • Minor fissures caused by bending under a 5 cm long • Coating peeling least 10% of the area
0.10 - 0.25	• Blocks fissures between 5 and 20 cms by bending or contraction. • Coating the scaly 10 to 20% • Small spots caused by humidity • Small leaks in the slab
0.25 - 0.50	• Cracks less than 5 mm thick with lengths less than 10 cms • Remarkable vibration of the slab • Coating the scaly from 30 to 50% • Moisture stains or efflorescence oxide presence • Detachment in particular less than 10%

0.50 - 0.75	• Cracks over than 5 mm in thickness with variable length • Humidity stains with spalling and excessive presence of rust or efflorescence • Detachment of concrete with rebar visible by 20% • Excessive vibrations
0.75 - 1.00	• Excessive leaks with rust stains and spalling of concrete • Cracks than 5 mm thick, with variable length and rust stains • Reinforcing steel and visible corroded • Detachment of coating steel exposed to over 20%

Table 6. - Factors proposed depends the pathologies analyzed for FD_L

To determine the Damage Factor, if the slab, it was observed that most diseases presented in the housing analyzed overall reinforcement required, so that these values were set as shown in Table 7.

FA_L	Description
0	Does not require any repair
1	Minor repairs cleaning consisting of small scaled, seal cracks
2	Minor repairs consisting of patching cracks and small landslides
3	Major repairs consisting detachment repair and cleaning or replacement of corroded steel
4	Major repairs consisting slab reinforcement

Table 7. Values for Action Factor in Slabs

In Table 8 it is presented the actions required in these slabs to recover at least its original performance level.

FU_L	Description
1	Long term action
2	Medium term action
3	Short term action

Table 8. Values for Urgency Factor in Slabs

Impairment Walls (DM)

The DM is then calculated with the following expression

$$DM = FDM * FAM * FUM$$

Damage Factor walls (FDM) is a factor from 0 to 1 and depends on the discretion of the evaluator and it is a factor of the amount of damage that has the wall element of the overall structure in Table 9 proposes some values for the FDM.

FD_M	Description
0	• There were no pathology
0.01 to 0.03	• Small shrinkage cracks in the coating.Paint peeling.
0.03 to 0.10	• Small cracks under 5 cm in length diagonally in the top of the wall. • Small cracks under 5 cm in length diagonally in the bottom of the wall. • Small cracks under 5 cm long horizontally on top. • Small cracks under 5 cm in length vertically. • Small cracks under cm long at the junction with the elements of confinement. • Detachment of coating up to 10% of the wall surface.
0.10 to 0.20	• Cracks between 5 and 10 cm length of a diagonal into the top of the wall. • Cracks between 5 and 10 cm length of a diagonal of the bottom wall. • Cracks between 5 and 10 cm in length in a horizontal upper wall. • Fissures between 5 and 10 cm vertically. • Cracks between 5 and 10 cm at the junction with the containment elements. • Detachment of coating up to 10% of the wall surface.
0.20 to 0.30	• Fissures between 10 and 15 cm in length diagonally into the top of the wall. • Cracks between 10 and 15 cm diagonal length of the bottom wall. • Cracks between 10 and 15 cm in length in a horizontal upper wall. • Fissures between 10 and 15 cm long vertically. • Cracks between 10 and 15 cm of length in union with the containment elements.
0.30 -0.40	• Cracks up to 10 cm length of a diagonal in the top of the wall. • Cracks up to 10 cm length of a diagonal in the bottom of the wall. • Cracks up to 10 cm in length in the horizontal upper wall. • Cracks up to 10 cm in vertical length. • Cracks up to 10 cm in length in union with the containment elements. • Detachment of coating more than 20% of the wall surface.

0.40 to 0.50	• Cracks between 10 and 20 cm in length diagonally into the top of the wall. • Cracks between 10 and 20 cm diagonal length of the bottom wall. • Cracks between 10 and 20 cm in length in a horizontal upper wall. • Cracks between 10 and 20 cm in length vertically. • Cracks between 10 and 20 cm of length in union with the containment elements. • Detachment of coating more than 20% of the wall surface.
0.50 to 0.60	• Cracks between 20 and 40 cm in length diagonally into the top of the wall. • Cracks between 20 and 40 cm diagonal length of the bottom wall. • Cracks between 20 and 40 cm in length in a horizontal upper wall. • Cracks between 20 and 40 cm vertically. • Cracks between 20 and 40 cm of length in union with the containment elements.
0.60 to 0.80	• Cracks between 40 and 80 cm in length diagonally into the top of the wall. • Cracks between 40 and 80 cm diagonal length of the bottom wall. • Cracks between 40 and 80 cm in length in a horizontal upper wall. • Cracks between 40 and 80 cm vertically. • Cracks between 40 and 80 cm of length in union with the containment elements.
0.80 - 1.00	• Cracks of more than 80 cm in length diagonally into the top of the wall. • Cracks of more than 80 cm in length diagonally into the bottom of the wall. • Cracks of more than 80 cm in length horizontally at the top of the wall. • Cracks of more than 80 cm in length vertically. • Cracks of more than 80 cm in length at the junction with the elements of confinement

Table 9. - Depending on the factors proposed to FDM analyzed pathologies

Worth mentioning that the assessor can use their experience and qualify with an index that considers adequate although it is not well specified in the table above.

In Tables 10 and 11 are show values for FUM and FAM, respectively.

FA_M	Description
0	Does not require any repair
1	Minor repairs cleaning consisting of small scaled, seal cracks
2	Minor repairs consisting of patching cracks and small landslides
3	Major repairs consisting of repairing of the damaged wall
4	Major repairs or replacement consisting of wall reinforcement

Table 10. Values for Action Factor in Walls

FU_M	Description
1	Long term action
2	Medium term action
3	Short term action

Table 11. Values for the Urgency Factor in Walls

Impairment Confinement Elements (DEC)

The DEC is then calculated with the following expression

$$DEC = FAEC * FUEC * FDEC$$

The FDEC is a factor from 0 to 1, it depends on the discretion of the evaluator and it is a factor of the amount of damage that has Confinement Elements of structure in general, in Table 12 suggests some values for FDEC.

FD_{EC}	Description
0	• There were no pathology
0.01 to 0.03	• Small shrinkage cracks in the coating. • Paint peeling
0.03 to 0.10	• Small cracks less than 5 cm in length in the underside of the containment element. • Small cracks under 5 cm in length in a diagonal direction to support • Small cracks under 5 cm in length in a diagonal direction to support
0.10 to 0.20	• Cracks between 5 and 10 cm long on the lower face of the enclosure element. • Cracks between 5 and 10 cm of length in diagonal direction to the support. • Cracks between 5 and 10 cm long in the direction diagonally opposite to the support. • Detachment of coating up to 3% of the surface of the landfill. • Corrosion or efflorescence stains up to 10% of the confinement surface.
0.20 to 0.40	• Cracks up to 10 cm long on the lower face of the landfill. • Cracks up to 10 cm in length in a diagonal direction to support. • Cracks up to 10 cm in length diagonally opposite direction to support. • Coating detachment between 3 and 5% of the surface of the landfill.

0.40 to 0.50	• Cracks of between 10 and 15 cm long on the lower face of the landfill. • Cracks between 10 and 15 cm in length in a diagonal direction to support. • Cracks between 10 and 15 cm diagonally in the opposite direction to support. • Detachment of the concrete, reinforcing steel visible to 5% of the confinement surface.
0.50 to 0.70	• Cracks between 15 and 20 cm long on the bottom of the landfill. • Cracks between 15 and 20 cm in length in a diagonal direction to the support. • Cracks between 15 and 20 cm diagonally in the opposite direction to the support. • Concrete detachment corroded reinforcing steel visible to 5% of the confinement surface.
0.70 - 1.0	• Cracks with lengths bigger than 20 cm in the lower face of the landfill. • Cracks with lengths bigger than 20 cm in diagonal direction to the support. • Cracks with lengths bigger than 20 cm diagonally opposite direction to support. • Detachment of concrete with visible corroded reinforcing steel of more than 5% of the confinement surface.

Table 12. - Factors pathologies depending proposed for FDEC

Considering the most important structural deterioration in these elements, it was identified an action factor most important in the above items. Table 13 shows the values for FAEC.

FD_{EC}	Description
0	Does not require any repair
1	Minor repairs cleaning consisting of small scaled, seal cracks
2	Minor repairs consisting of patching cracks and small landslides
3	Major repairs consisting of repairing of the damaged wall
4	Major repairs or replacement consisting of wall reinforcement

Table 13. Values for Action Factor in Confinement Items

However the values for emergency measures to repair are the same as the above elements to take into account of non-imminent failure if not reinforced, the deterioration can be controlled with bracing. Table 14 shows the values for FAEC and FUEC

FU_{EC}	Description
1	Long term action
2	Medium term action
3	Short term action

Table 14. Values for Urgency Factor in Confinement Elements

Impairment Foundation (DC)

The DC is then calculated with the following expression

$$DC = FAC*FUC*FDC$$

The determination of the indices for the deterioration in the foundation, could not be made taking into account the comments of the pathologies in the inspection campaigns, because many of the pathologies that were the cause foundation problems were made subjectively since the inspection campaigns were only visual character, but with the support of the literature reviewed these indices were determined, which are shown in Table 15.

Percentage	Description
0	• There were no pathology
0.01 to 0.05	• Small cracks of not more than 5 cm in length in the foundation.
0.05 to 0.10	• Cracks between 5 and 10 cm long in the foundation. • Detachment of concrete in less than 5% of the surface.
0.10 to 0.20	• Cracks up to 10 cm in length in the foundation. • Concrete detachment 5 and 10% of the surface.
0.20 to 0.40	• Cracks of between 10 and 15 cm long in the foundation. • Detachment of the concrete between 10 and 15% of the surface. • Settlements or heave by volumetric change causing cracks up to 5 cm at the bottom of column or bearing wall.
0.40 to 0.70	• Cracks between 15 and 20 cm in length in the foundation. • Detachment concrete with visible steel between 15 and 20% • Settlements or heave by volumetric change causing fissures up to 10 cm in length.

0.70 - 1.00	• Cracks between 15 and 20 cm in length in the foundation. • Detachment concrete with visible steel between 15 and 20% • Settlements or heave by volumetric change causing fissures up to 10 cm in length.

Table 15. - Factors proposed depends the pathologies analyzed for FD

Similar to the confining elements deterioration, damage to the foundations of actions required to ensure the stability of the structure, Table 16 shows the values for FAC.

FA_C	Description
0	Does not require any repair
1	Minor repairs cleaning consisting of small scaled, seal cracks
2	Minor repairs consisting of patching cracks and small landslides
3	Repairs major repair consisting of part of the foundation
4	Major repairs or change consisting of the reinforcement elements of the foundation
5	Major repairs consisting of total foundation reinforcement using new components and underpinnings

Table 16. Values for Action Factor in Walls

And this structural element to be responsible for transmitting the loads acting on the structure at ground rudeness, actions have to be done if you have damage to endanger the stability of the structure should be immediate. Table 17 shows the values for FUC.

FU_C	Description
1	Long-term action
2	Medium term action
3	Short-term action
4	Immediate action

Table 14. Values for Urgency Factor in Confinement Elements

Conclusions

It was evaluated the 77 homes inspected using the proposed model and compared the states of each housing condition with the model proposed above, obtaining as result differences between each model. These differences were mainly due to the previous model only visual opinion based on housing status from the point of view of the obtained structural inspection; however the proposed model, using both the functional and structural index, provided values of states more real condition of visual observation of the home. However, it is necessary to continue the validation of the model to calibrate the ranges proposed for each of the indexes.

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Holoversidad as a model for the University open systems

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Abstract

The *holoversidad* is a model for university level education, it seeks the new meaning of perception, knowledge and social practices. The *holoverso* is the joint of multiverse, ie. all possible real universes, parallel, imaginary, present and to come, which proceeded from the curricula and training deployment; the anthroposphere and the biosphere.

Open systems are enriched with the concept of feedback, which refers to the processes by which corrects the path to achieve certain objectives. And that correction systems to achieve their goals, is done by self-adaptation or self-regulation of their behavior, or restructuring phenomena of each system.

The substantive functions of the university are in multiple actions; *holoversidad*, is an educational project, expressed the most relevant categories (holons) deployment in communities *ecosóficas* (generalized interaction) and holistic (relational hierarchies) which allows to display projects teaching in an informative and educational.

It is introduced the *holoversidad* institutional model for top-level education and Open University system. While, it is true that education as a social fact is the transmission dynamics of the culture of an older generation to a younger generation, modern states have a responsibility to public education. And since there is a private area, the school is an institution that allows meanings to knowledge and social practices.

The substantive functions of the university are teaching, research and extension of the benefits of culture to quality population and are expressed in multiple actions, mention the most important:

> • Serves organized social demand for higher education, specifically "a university UNAM is proudly public, secular, popular mass"[1] like many other autonomous universities that operate legally in the Mexican national area. Conversely those who enter must do so to make the most personal, appropriate and make a subjective rigorous and deep heritage, for meanings to their life trajectory. Its graduates are aimed at addressing the priority issues (education, health, housing, and safety among others) the national and planetary.

Mexico needs (...), engineers, (...), scientists, new careers, increasingly underpinned by technological developments, but I still think and I am absolutely convinced that Mexico beside them still need philosophers, poets and theater directors, and scientists social.

These disciplines, the humanities and social sciences, urgently require renewed support in the national context, because they have been gradually displaced by others that only have, at best, minimal expression in current joint labor markets.[2]

> • The University learning contents are legitimized by the philosophy, science, art and technology, but in turn the university not only transmits and preserves, also produces and reproduces. The university is opposed to common sense, the doxa ...

Not exist ... some order in ideas if there were also things or state of things a anticaos goal: (...) when the encounter of things and thought, it is necessary that the feeling is played as the guarantee or the testimony of their agreement, the heaviness whenever weigh cinnabar, the red every time I contemplate with our body organs not receiving this without imposing conformity with the past. This is all we ask to forge an opinion, as a kind of "umbrella" to protect us from chaos. (2005, 134)

[1] Principles relating to the movement of 1999 - 2000 the CEU.

[2] Speech UNAM rector, Juan Ramon de la Fuente, during the delivery of a recognition that made the College of Mexico. Mexico City. August 23, 2007 [http://seminarios.colmex.mx/videoseminario/ponencias/ponencia.doc. Reviewed by JVGM October 8, 2007]

> • In the University is not enough that students are aware of the results of research, read literature or science, transcribe the fundamental ideas, it is also necessary to research, design, invent, and build, speak and write, it is urgent that find the naturalization of doxa, the knowledge of daily life and the naturalization of social practices learned in the spring atmosphere of privacy.

From all this we make our opinions. But art, science, philosophy require more: draw plans into chaos. These three disciplines are not as religions that invoke dynasties of gods, or the epiphany of a single god to paint on the umbrella a firmament, like the figures of a Urdoxa3, which derive our opinions. The philosophy, science and art require tearing apart the sky and want us get deeper into chaos. Only at this price will win.

The three disciplines come by crises or shocks, differently, and the succession is what allows us talk about "progress" in each case. It would seem that the struggle against chaos cannot occur without affinity with the enemy, because there is another struggle that develops and becomes more important, against the opinion however that sought protection from the chaos itself.

In a wildly poetic text, Lawrence describes what poetry: men incessantly manufactured umbrella protects them in the bottom of which draw a firmament and write their conventions, their opinions, but the poet, the artist, practicing a cut the umbrella, ripping the sky itself, to input a bit of free and windy chaos and to frame in a sudden light a vision that emerges through the tear ... has three daughters chaos depending on the plane that cuts: are Caoideas, art, science and philosophy, as forms of thought or creation. Caoideas called realities produced in planes that section chaos. The junction (not the drive) of the three planes is the brain. (Deleuse: 2005, 202-204)

This proposed model of *holoversidad*, is an educational project and expressed the most relevant categories (holons) and its deployment in communities as a *ecosófica* organic strategy (generalized interaction) and holistic (relational hierarchies) which allows to display a pedagogical projects formative and informative manner.

The model is subsidiary *holoversidad* of utopia, while it shares its components (philosophy, science, art and technology as priority cultural expressions) and its rationality (the fantasy of a better world for every one). The *holoversidad* as university open systems model is explained and project.

If current physics is proposing multiverse model is presented as Deutsch (1999, 233) and the world of philosophy proposes fractal model to explain the reality, with the model we are proposing the *holoverso* it is a *holoversidad* as sustenance. The joint is *holoverso* multiverse, biosphere and anthroposphere, ie. all possible universes real parallel, imaginary, present and to come, they come from the curricula and training deployment.

The word "universe" has traditionally been used to mean "any physical reality." In this sense, there can be only one universe. We could keep this definition and say that the entity we are used to define as "the universe"-that is, all matter and energy directly perceptible around us, and the space is just a fraction of the true universe. Should we invent a new name for this small tangible portion. But most physicists prefer to continue using the word "universe" to refer to the entity as always, even if it happens to be now only a small portion of physical reality. A new term, multiverse, has been coined to describe the totality of physical reality. (...) The multiverse is divided into a

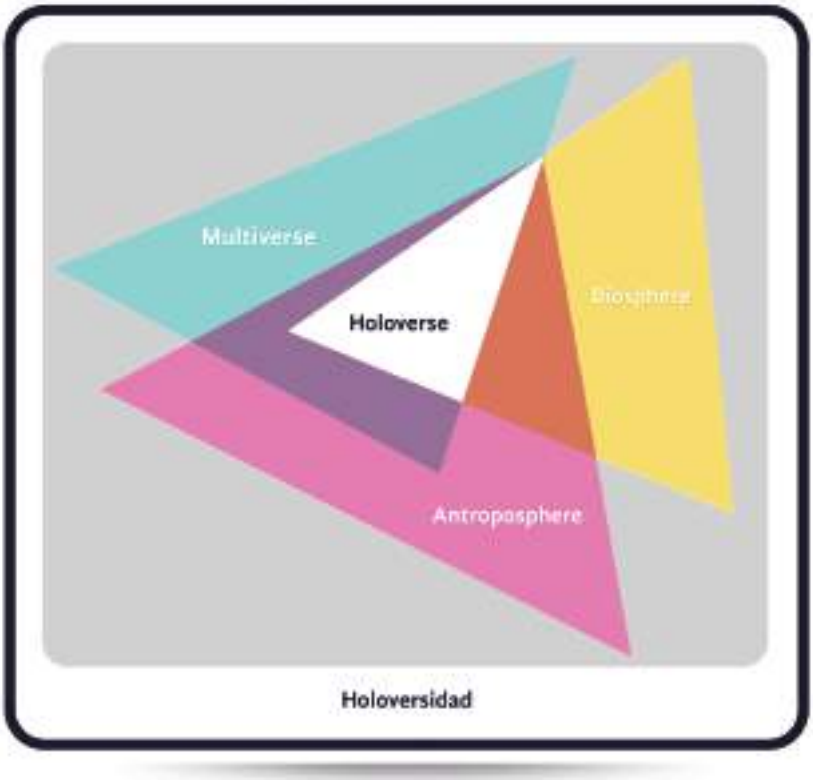

Figure1. *Holoversidad* Elements Model interactions

The anthroposphere realizes the relationship NATURA-CULTURE-FUTURE. The biosphere realizes life on the planet including Homo sapiens. The school is the perfect place to display subjects, caring for their bio-materiality, body shaping their character, and a body that is not made with interchangeable devices. Of a body that has life and death that the health-disease is a false choice. Life is not at the meeting with the disease. Life is an association to health, quality of life, not only to preserve contemplative. In fact the health and life seem to be an unlikely system, the more dynamic, more unlikely.

The school is a condnucive institutional body to prove that all complex skills can only be developed on the basis of a competition biocorporal allied to Hygeia no to Panacea. Where the disease, if it occurs, it is an event and not a destination in advance by *Las Parcas*[3]. That life-health is built on a *holoverso* in every possible between the macro, meso and microcosm. The needs are solved culturally and economically, thus encouraging further developments and cultural displays.

The school is the precise scope to combat prejudice and problematize, first the relationship of subjects with his body, his face and the use of pleasures, then the man's relationship with nature, but a living body, it consumes and excretes, kills to live, not angelic body sexless, sterile and contemplative, but a voluptuous body and aggressive with the environment. Also, the real environment is an environment for human life crossed, the urban environment, that metaphor of the human body is alive and has also predated the nature, the growth of the urban area, megacities, cities, towns, villages and hamlets, ie, all settlements are made at the expense of transformation and inhibition of the natural environment. Something we hard time explaining, but mostly live: human settlements are inherent holoverso (multiverse, biosphere and anthroposphere) but are not parallel, are interwoven to intersect and intertwine be unintelligible, but not stuck the anthroposphere the biosphere and the multiverse as a label or stamp is part of *holoverso*.

The *holoversidad* part of the following principles:

1. Recognition of man in me, which articulates and functionally displayed on your body (as experience ranges from being a body and having a body) needs, thought, feeling and will.

2. Recognition of the body such as construction and basic element in any human training or job creation. Where body and body systems are recognized as related.

[3] [Moiras Parcas. They are the personification of destiny of every human being, nor the gods can change. They were daughters of the night. Their Greek names were Clotho, Lachesis and Atropos and Latinos, Nona, Tenth and Morta. They attend the birth of every being, spin your destination and preach their future. Clotho was responsible for spinning the destiny of mortals. Lachesis responsible for rotating the spindle and randomly pull the thread of human destiny and Atropos which cut when the end came. Juliet Valentina Garcia Mendez http://www.webmujeractual.com/biografias/nombres/moiras.htm November 24, 2005]

3. The necessary link-World-Human Being Future.

4. Education, as an object of study, involves the areas of practical rationality, cognitive, logical and epistemological, and ethical areas, aesthetic, and ontological ecosophic. Where subjectivity operates several "records" of reality and subjective systems to be built organized.

5. Structuring the world-anthroposphere-like construction, as a set of complex relationships constructed from conflicts and struggles over spaces of action and power.

6. Elaboration of the subjective beyond the subject, as a result of a multiple process of struggle, conflict and passion.

7. Education as a social fact is different from a project-oriented education by teaching expressed specifically in school and college to the *holoversidad*.

Felix Guattari (1996: 18) says that if it is not, as in previous periods, class struggle or defense of the "socialist fatherland" of running a unique ideology, it is conceivable; however, the new reference lines indicate ecosophic reconstitution of human praxis in the most varied domains. In all individual and collective scales, both in regard to everyday life and to the reinvention of democracy, in the register of urban, artistic creation, sports, among others, is always interested in what could be devices ranging production of subjectivity in the sense of a resingularization individually and / or collectively rather than in the manufacture of a "mass-media" synonymous with anguish and despair. The perspective that does not totally exclude the definition of unifying objectives such as the fight against world hunger, the deforestation brake or blind proliferation of nuclear industries. It is said, it cannot be stereotyped slogans, reductionist, which remove most unique and other issues involving the promotion of charismatic leaders.

I argue on these lines the most important traits for building a contemporary pedagogical model to aim toward our future, towards the common good of all and sundry. See Figure 2

Figure 2 shows the weft and the warp of the most important lines for building a contemporary pedagogic model. Some of the goals of the general theory of systems are:

- Integrating natural and social sciences

• Find an exact theory of nonphysical fields of science
• Develop unifying principles (unity of science)
• Systems are sets whose elements are in widespread interaction, the main issue is to study organized complexity.

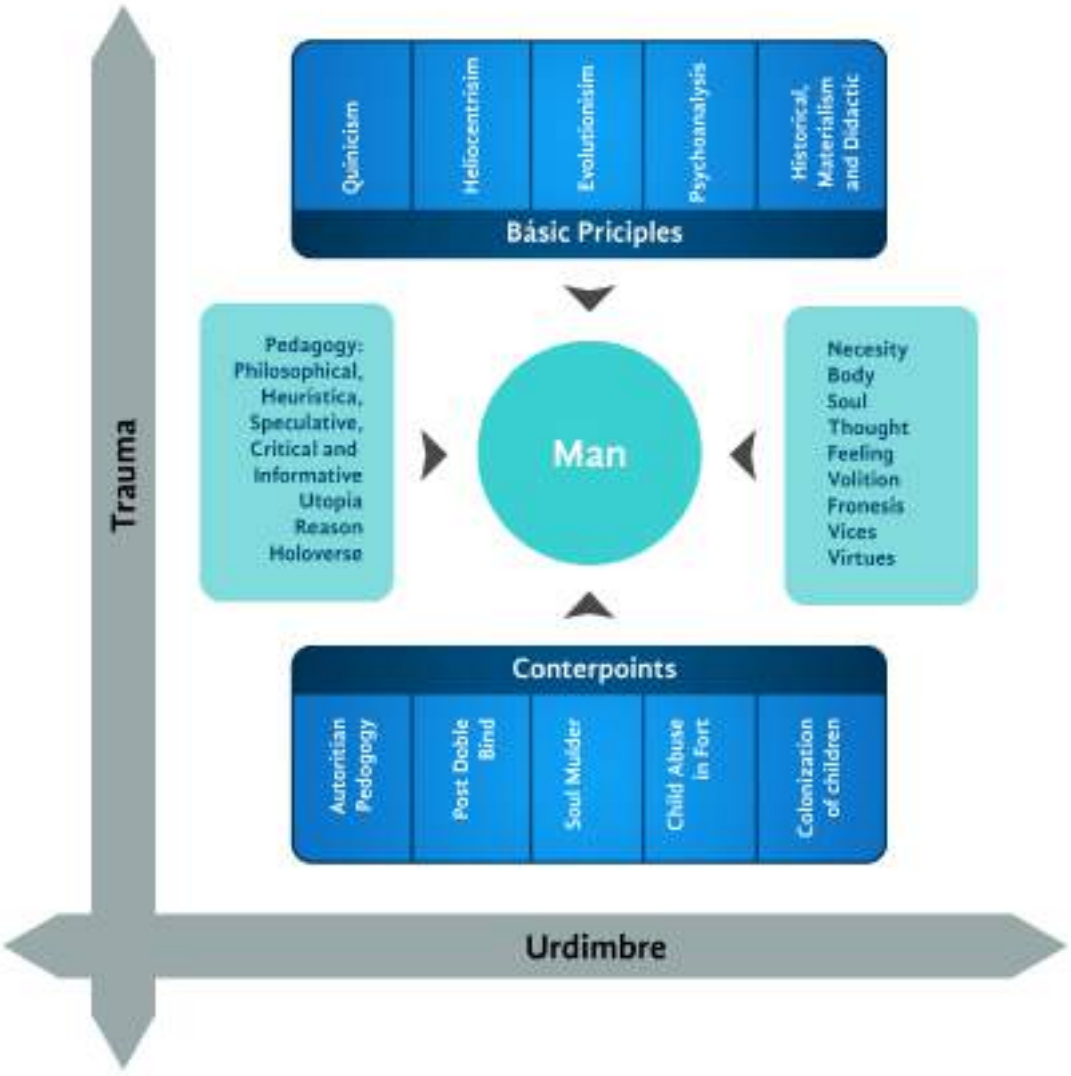

Figure 2.

Open systems or informed, enriched with the concept of feedback, which refers to the mechanisms by which corrects on the fly, the route to achieve certain objectives. And that correction systems to achieve their goals, is done by self-adaptation or self-regulation of their behavior, or restructuring phenomena of each system.

Open systems are those in interaction with the surrounding environment through the addition and removal of material, without reaching a steady state, but remained at a steady state. It is characteristic of these systems, the possibility of increasing and decreasing order entropy, since it tends towards a state of greater organization.

Who influences definitely search and refine the idea of General Systems Theory are the work of Fritjof Capra in his works: The Turning Point, The Web of Life and The Hidden Connections, among others, to realize the further development of especially since this theory shows how the models are able to live in contradiction and despite all the new changes. This is the case of the mechanical model and its coexistence with the quantum model, to mention the most important.

Capra (1998) also introduces the concept of living systems, not just open:

The intellectual tradition of systems thinking and models of living systems and theories developed during the first decades of the century, formed the historical and scientific conceptual framework that addresses this book. In fact, the synthesis of theories and models that propose here can be seen as the outline of an emerging theory of living systems able to provide a unified view of mind, matter and life.

But Capra goes further exposure in a model of the same features as the "Baker model". On the next lap, the same model as explanatory plasticity incorporates new elements.

The terms "holistic" and "organic" in their meanings differ slightly and it seems that the first one is less appropriate than the second to describe the new paradigm. A holistic view of, for instance, a bike means seeing it as a functional whole and consequently understand the interdependence of its parts. A green vision would include this, but add the perception of how the bike is inserted in its natural and social environment: where their raw materials come from, how it was built, how their use affects the natural environment and the community in which it is used. This distinction between 'holistic' and 'organic' is even more important when it comes to living systems, for which connections to the environment are much more vital.

Capra (1998, 45) also introduces concepts such as autopoiesis. Self-regulation and self-organization that exceeds that of the organization.

(...) The concept of organization has been refined to that of "self-

organization" in contemporary theories of living systems and how the pattern of self-organization is the key to understanding the essential nature of life.

In the latest work of Deleuze and Guattari (2005) What is Philosophy? we find concepts and notions that overflows Capra, demonstrating once again that everything is related to everything and that we can dare to go beyond the limits for a better explanation. Capra (1998, 142) highlights the usefulness of models to explain complex phenomena, without reducing them to absurdity to be understood, however, realizes a simplified complexity.

An iteration of this mapping operations will cause repeated stretching and refolding, much like those that made a baker with its mass, which is why this iteration is called, appropriately by the way, "Baker's transformation." As you move the stretch and refolding neighboring points of the segment will be displaced further and further apart, until it is impossible to predict what position will be a certain point after multiple iterations.

The concept of Capra (1998, 83) of dissipative structures and the difference between data and information are central concepts in the understanding of systems:

The term "information" is used in information theory in a highly technical sense, quite different from our colloquial use of the word and without any relation to the concept of 'meaning'. From this we have derived endless confusion. According to Heinz von Foerster, a regular participant in the Macy Conferences, this is due to an unfortunate error linguistic confusion between "information" and "signal" - that led to his theory called cyber and information instead of calling signal theory.

Interesting to note that in the crucial point, it also highlights the same Capra:

This is how modern physics reveals the basic unit of the universe, shows that we cannot decompose the world into independently existing smallest units. As we penetrate into matter, nature does not show us any isolated basic building block, but rather appears as a complicated web (sic) of relations between different parts of a unified whole. As Heisenberg put it, "The world thus appears as a complex set of events in which connections of different kinds alternate or overlap, or combine, and thereby determine the texture of everything."

In this sense all elements of a system having a double logic, while they are self-assertive, are relational.

The systems are sets whose elements are in widespread interaction, the main issue is to study organized complexity. The generalized interaction is what gives it its organic character. In that sense, we are working holon concept that is both the whole and the particle, in a self-assertive and relational logic. With this logic model is developed so that each element is likely to be explained like a everything, everything that makes sense in relation to all the other elements, or holons.

We assume moreover, that the assessment is given in that trajectory correction, ie. if my starting point is not clear to the end point B, we can make operation flexible and refeeding detours, but also capitalize the driving force that enriches our data, and these are the principles of assessment. See Figure 3.

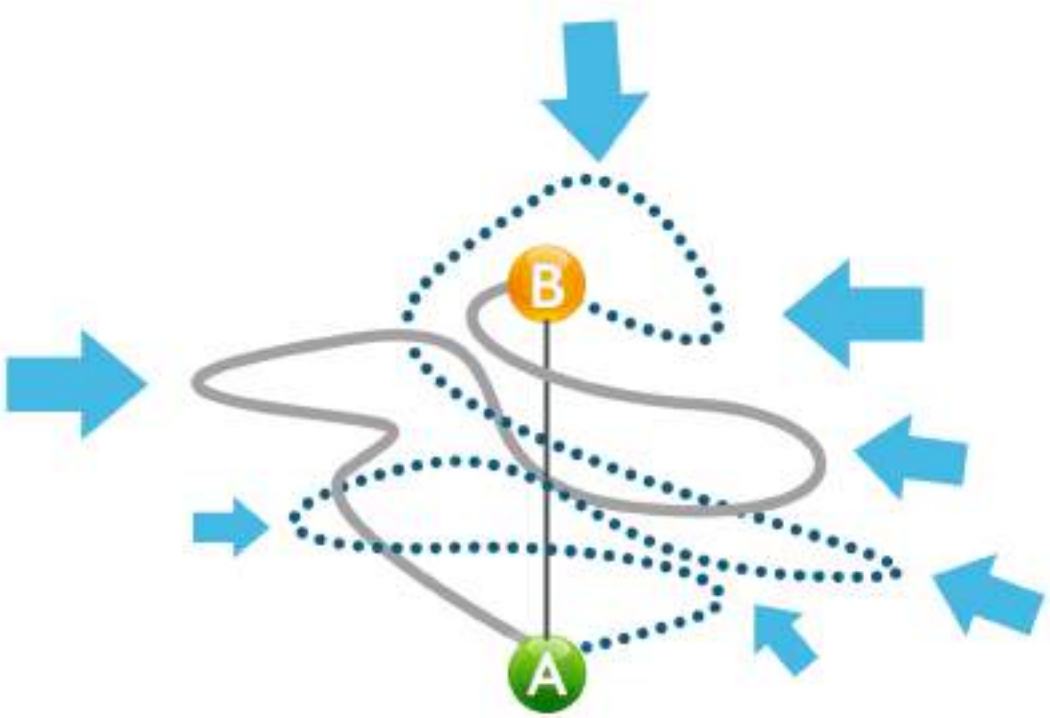

Figure 3.

In Figure 3, illustrating the principles of the evaluation, rigorous in purpose and flexible in its trajectory correction operation.

In closed systems, the final status is usually determined by the initial conditions, whereas in open systems, the same final state can be reached from different initial conditions and the same objective can be achieved in different ways. That's why this model takes as guiding the pedagogical model and proposes a relaxation practices to configure macro competencies and academic skills to make intelligible the *holoverso*.

In short, the open system concept is organized complex point where the system is represented as complex whole, the whole is more than the sum of its parts, delimiting the categories and their interactions for separable and restore them after the everything. The whole and its parts are treated with a logic synthesis-analysis-synthesis.

If one of the entities behave in a particular way should possess properties that produce such behavior and organizational rules.

Notion of model

The model aims to foster *Holoversidad*[4] discussion organized higher education in order to improve and innovate their knowledge and practices.

It is appropriate to note that the dynamic and complex nature of institutional education in this approach is the opportunity to be widely expressed, with an inclusive and diverse logic. When you're doing modeling reality appears more orderly than it actually is, but that's the challenge, to account for the complexity of a simplified basis of discussion and in guiding the educational institutional innovation trends rational knowledge and practices.

The model, then, is the product of the synthesis of various career paths in education are debated constantly.

Each category included in the model has theoretical and methodological inclusive logic; it is pulling together various positions in his explanation point to the diversity and the organic.

The construction logic describes a helix. See Figure 4.

[4] The concept model is always tied to theories; models in this sense can be interpreted as illustrations of the theories.

Represent reality in this model is the education provided by the institutions (formal education) university specifically, understanding that their graduates make up a network of networks in their employment.

It is an open model, dynamic, inclusive, flexible in operation, self-referential, self-regulating and certainly perfectible. It is assertive, while explaining the institutional educational and relational processes, because it maintains dialogue with the pedagogical model and practices deployed in terms of this model through ecosophic projects communities.

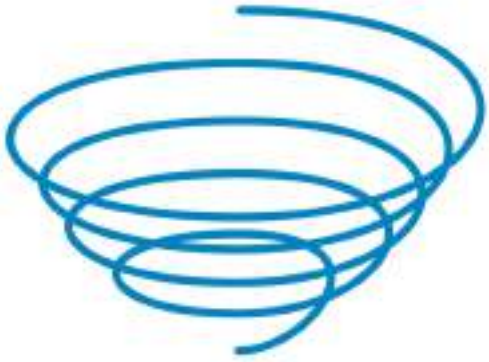

Figure 4. Helix.

At this point in development, it is the basis of the model center to enlarge gradually, with the contributions of its partners. See Figure 5.

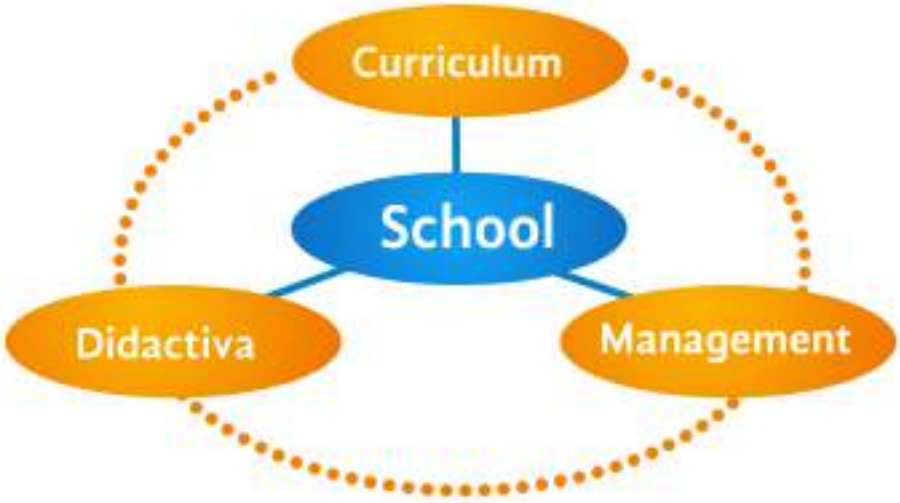

Figure 5. Main reference model

The reason

A basic concept as the reason that operates constantly in man is the reason joint has three poles of which are in tension and are according to figure 6

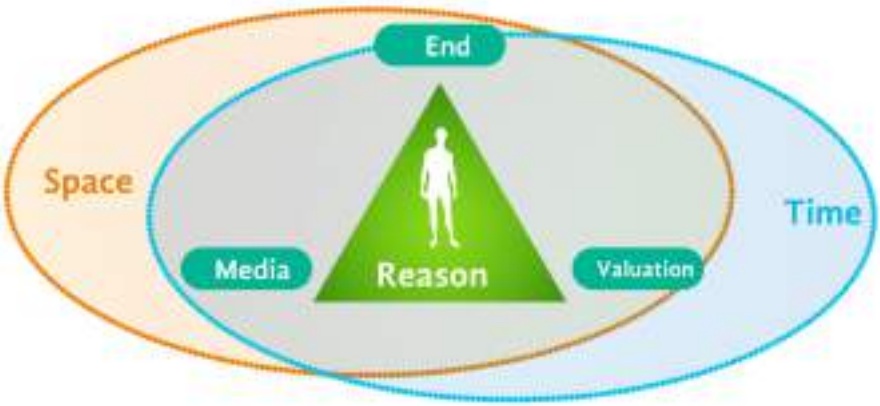

Figure 6. Reason and its three poles of articulation

In Figure 6, expresses: the ratio of articulation with three poles in the forming voltage and constitute the ends, means and assessing their axes in space and time.

The intent and purpose gives meaning to their action. The action itself aims to use means to achieve ends, invent, build, discover and perfect, assessment of both the end and the means. The interweaving of these elements impels man to seek new alternatives ... A reference space-time system.

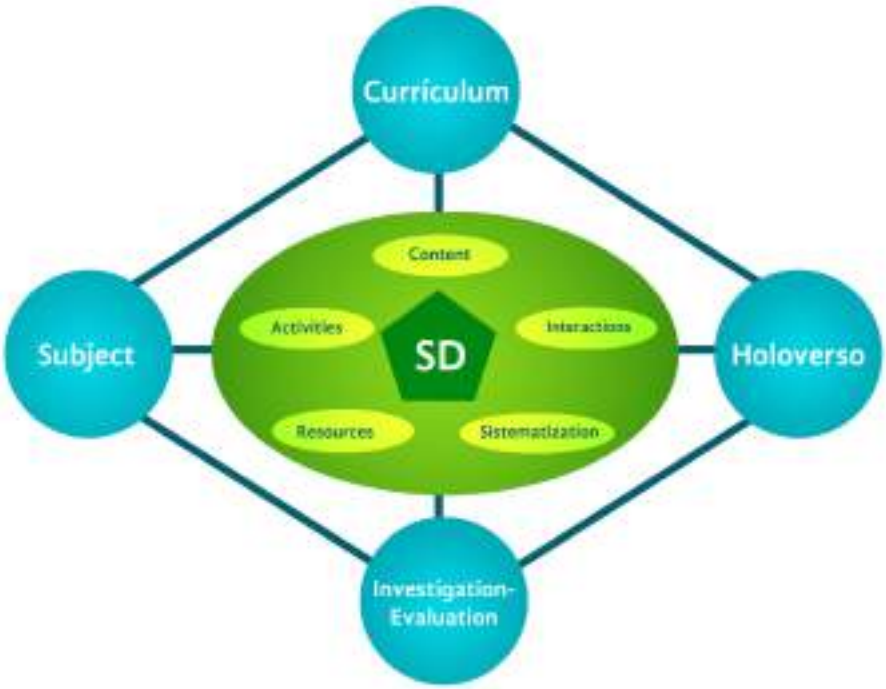

Figure 7. *Holoversidad* open systems model for university

Figure 7 shows the interaction elements *Holoversidad* generalized model for open systems university. The educational system in the center, above the curriculum, research-down assessment, subjects left and right side of the *holoverso.*

Curriculum

The school curriculum is negotiating space between:

- The state education policy, subjects, culture, cultural fields, and problems of contemporary local and global, and
- The university response, reinterpreting and imprinting their own propositional logic through institutional philosophy and in turn set their own educational policy. See Figure 8.

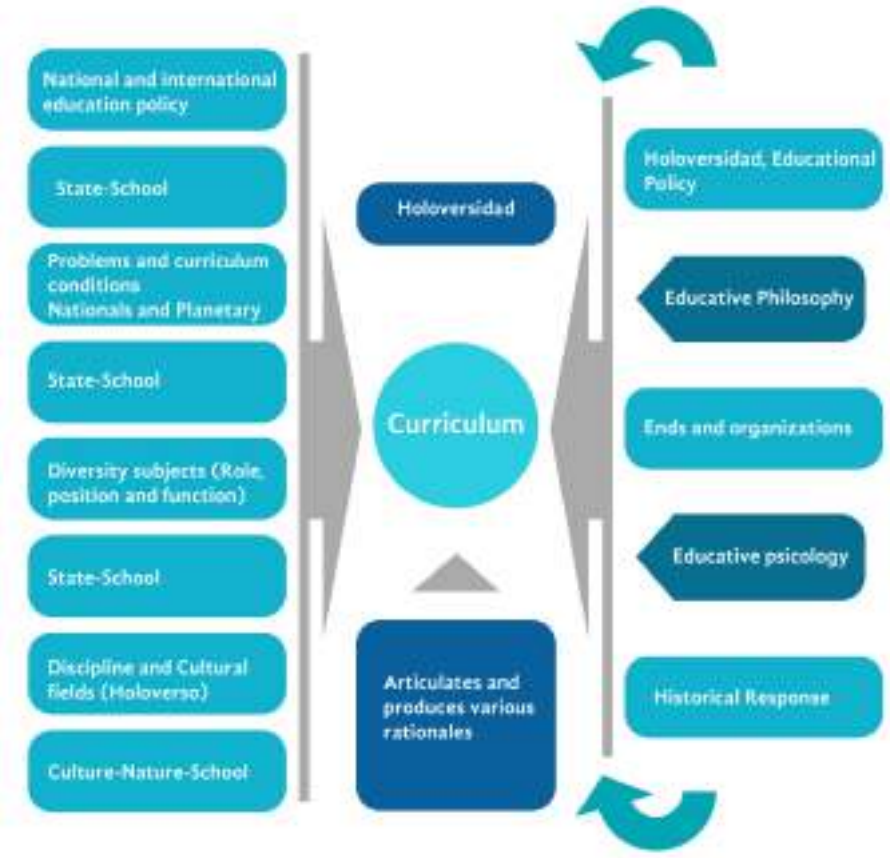

Figure 6. Reason and its three poles of articulation

The curriculum at the university expresses the spirit that historically based. It is the proposal coordinates and directs institutional purposes and institutional actions. The curricular approach expresses tacit or ostensibly an educational project and utopian philosophical affiliation. It is an expression of institutional intentions, as the objective and means of expression are the curricula. Each approach has its own curriculum content and it is named as embodied and expressed in the plans and programs of study are eligible.

Figure 9 shows a model for flexible and innovative curriculum, rigorous in its structure and flexible operation.

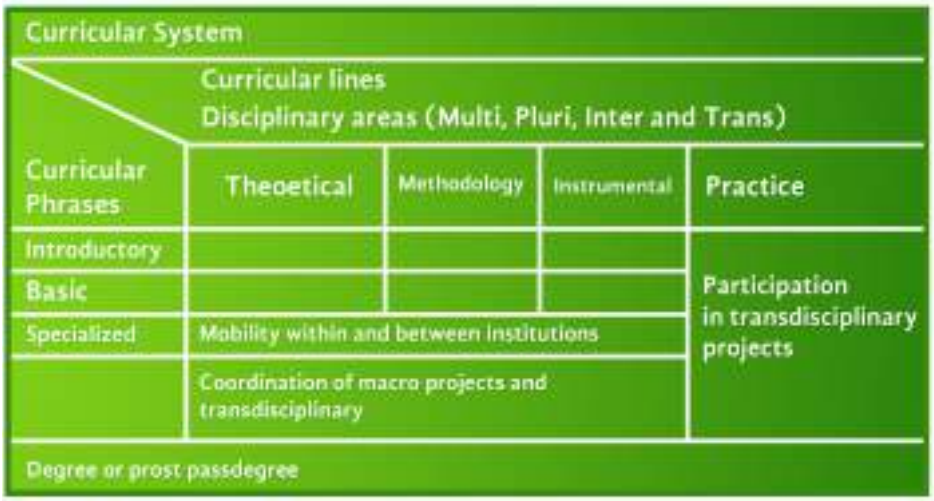

Figure 9.

The curriculum, as *holon* is both assertive and relational approach that guides the actions of individuals and corporate goals expressed by the general objectives of the various degrees and relational by its organic link with the educational system that gives meaning to orientation.

Management system, such as self-assertive and relational *holon* is under that, as autonomous institutions, universities legally have the power to organize and manage their resources, in turn, it must be accountable to the state. They are included in the management styles of governance (management or arrangement), management (planning, development and evaluation), and linking intra and extramural university with various social sectors.

Subjects

Subjects' category is a social formation in which the man is questioned by the school and is subject to his speech, speech begins with a cash aspiration for the mere fact that the university is there. Once inside, the institution gives to the subject roles, positions and functions. Only the position is not interchangeable because it is the only place that each individual has in the institution and in front of it. When man can not submit to the institution or the institution leaves or throws. College is not a total institution so it is a college dropout speaking too, because they always have the option to leave if they wish to return. Furthermore, permanently or temporarily leave the university is not in any way an act of defection[5].

Evaluation Research

The educational institution undergoes an evaluation system as part of management subjects and the processes involved. But in the educational process which cannot be evaluated should be investigated.

The educational system

The educational system is as assertive and relational *holon* as the action functional deployment of subjects, found that although the approach used to signify curricular practices, also redefine and improving their ability to return or cancellation of your hypothesis.

Learning goes beyond the training of individuals for the effective performance of the role. Action is justified in its own right as well as being a role and a function, learning, identity and experience in set construction. In the educational system, as expressed, the teacher and the student exchanged the role and function as dialogic me - I, subject and object of knowledge. While the school confers a job (paid), the teacher, this guarantees a longer time spent in the institution the student and makes it subject to responsibilities, rights and obligations different from the student. But that difference is not a disadvantage.

The curriculum at the university expresses the spirit that historically based. Is the proposal coordinates and directs institutional purposes and institutional actions. The curricular approach expresses tacit or ostensibly an educational project and utopian philosophical affiliation. It is an expression of institutional intentions, as the objective and means of expression are the curricula. Each approach has its own curriculum

[5] Defection. (From the lat. Defectĭo,-onis). 1. f. Action separated by unfairness or bias because they belonged to. [http://buscon.rae.es/draeI/SrvltConsulta?TIPO_BUS=3&LEMA=defección. JVGM consulted on February 15, 2007]

content and it is named as embodied and expressed in the plans and programs of study are eligible.

The explicit and formal teacher training has been a central concern of groups of teacher educators institutional. There have been many streams and lines that have developed proposals in this regard. It is important that teachers in schools organized meet discuss and propose the graduate profile, content and methodological approaches with which they work. The educational system and project articulates three basic processes of education: Teaching, learning and communication. See Figure 10.

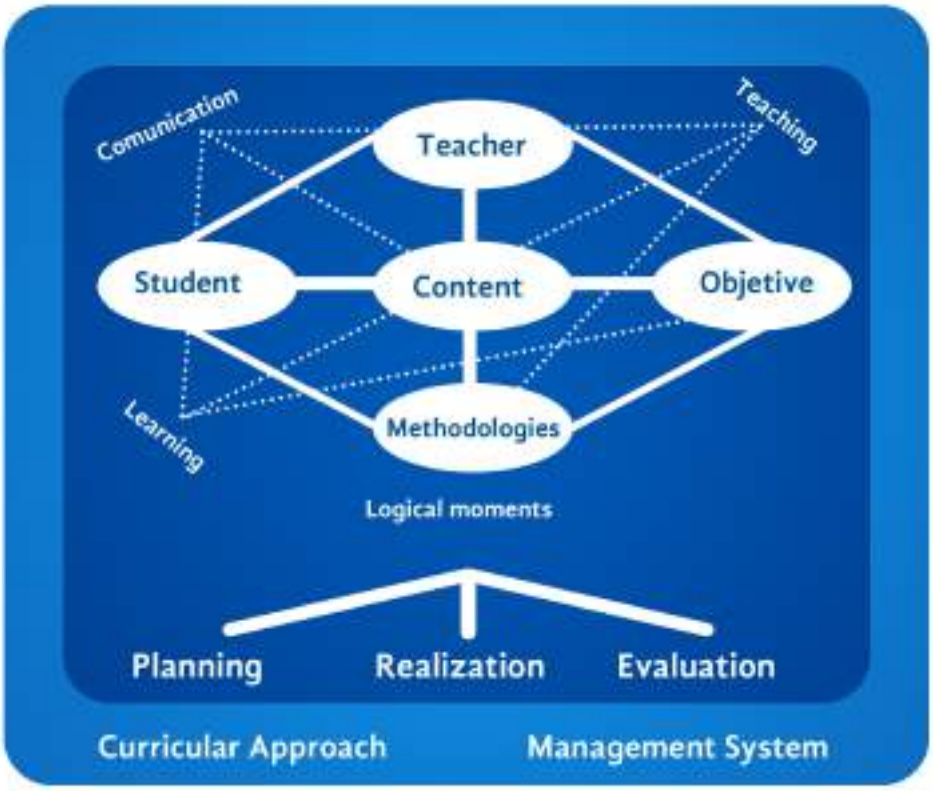

Figure 10. Shows the processes that articulate the educational system, the pivot point is the content..

These three processes overlap in three categories namely:

- The **man** as subject and as a knower institutional.
- The **knowledge objects** knowledge, practices and expressions that are the content and the *holoverso* coming.
- The **action** that is linked and as subject and object of knowledge.

Learning and teaching intentions and communication involving both the man and his circumstances, and the nature of the object of study, which will be promoted as well as the information on the nature of the action to be deployed for training.

This learning relationship informs and shapes the subject, according to the guidelines set out in the curriculum approach.

The training system consists of five organic elements and four logical moments (not sequenced in time):

Subjects with two roles (interchangeable) teacher and student, three functions (complementary) teach, learn and communicate, and two types of fixed positions in the ratio academic and student teaching.

- The student
- The teacher
- Content is the point of joint student-teacher.

The purpose or purposes that describe the level of content and how to address it in relation to curricular approach.

- The teaching methodologies that can be grouped into problematized content design, learning activities, materials and resources, and systematization interactions.

Learning

Domains or academic and professional skills are as substrate both the subject of knowledge (teachers and students) as the object of knowledge (already configured as curricular content). Ie. domains or competencies can be developed only in subjects and educational activities, in the logic of meaningful learning. Meaningful learning is due to the orientation of incorporating subject to disciplinary fields, fields of significance, considering the actual consciousness of the subjects and their possible transition to consciousness. See Figure 11

The purpose of teaching is to enable students to learn. The teacher makes five methodological works to make this learning possible, however these activities for the student teacher's basically unnoticed esprezzatura effect, which is the art of making the difficult look easy. It is the art of concealing any artifice. What is hidden in the deployment training. Finally in Figure 12 shows the main teaching methods and their implications.

Figure 11. shows the implications of meaningful learning for the deployment of complex thought.

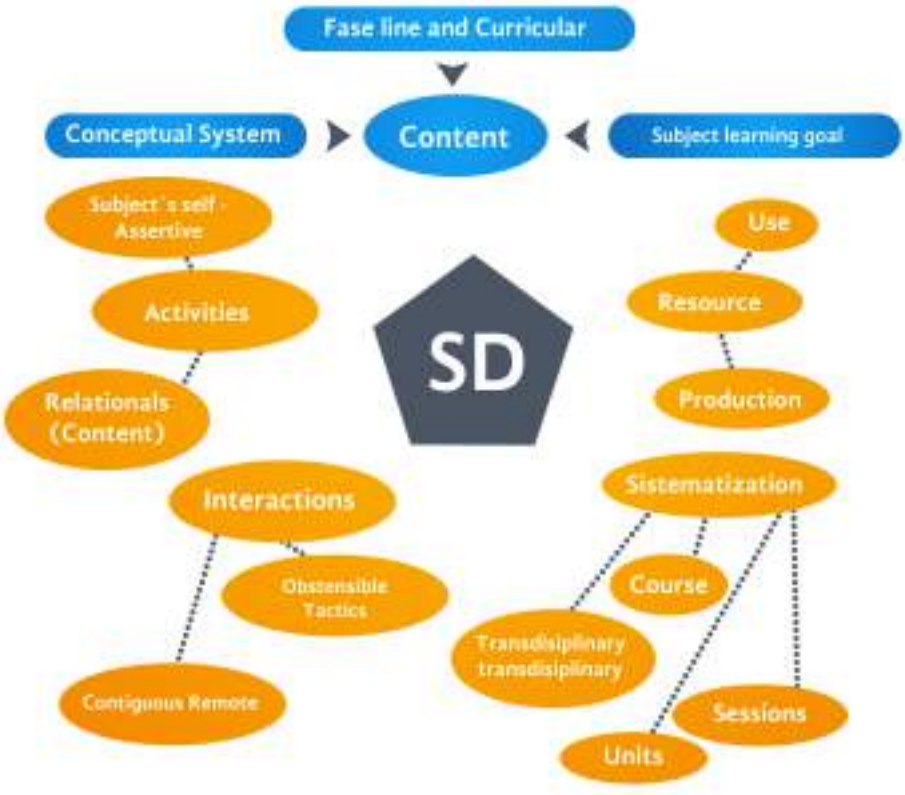

Figure 12. teaching methodologies

Conclusions

The *Holoversidad* as open systems model for university, the proposal is part of a contemporary pedagogical model construction and is based on the concept of pedagogy as the discipline of education, anthropogony with philosophical vocation, heuristics, speculative, purposeful, critical, rational and transforming seeking the common good of all and everyone in this life, that's optimistic but not naive, as cultural field has a correlation with the utopias as propulsion of his thought, his will to be and doing.

This participation demonstrates the urgency of transdisciplinarity (confluence of professions and professionals for troubleshooting lancinating) and forging the conviction of the urgency of its spread.

Model building can be the way to project utopias new meaning militancy and unfinished, but can also be a kind of tightrope walking, if it has enough tension and point of orientation, is in danger of falling into place that was fleeing.

Everything is connected to everything, but that cannot be explained, just for that propose models to open a debate on the most relevant core problems, in the belief that the most valuable of these models is that they are written and therefore can be discussed, copy, resume, challenge, ignore and share.

From an exclusively of Pedagogy is not possible to see the world, but no sense Pedagogy.

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Are we really doing Mechatronics?

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Abstract

This paper shows the current existence of a limited conception of Mechatronics. It usually referred to as a simple combination of disciplines. This notion it is explained by historical and evolutionary factors. In Mexico and even in the world is necessary to emphasize the benefits of innovation that would bring the proper use of the synergies of technologies and disciplines involved in Mechatronics. The ideal setting for growing synergies is the solution of the social needs presented in engineering projects.

Introduction

Mechatronics is a philosophy[1] (Grimheden & Hanson, 2005) design (Roberts, 2010) of products and production processes that are currently in the process of consolidation. It has evolved from a purely practical approach to those of scientific and educational research. Currently prevails, little effort to achieve synergy between disciplines within it. It should perhaps, in education, the paradox between choosing the path of specialization in disciplinary knowledge (Grimheden & Hanson, 2005) or to choose the path of cultivating the ability to integrate this knowledge (Acar, 2010). In the field of industry, perhaps, to ignorance of the benefits of synergy itself. It is therefore relevant task of finding synergies in the design of Mechatronics systems.

Origin of Mechatronics

Generally it is accepted that the Mechatronics was born as a practical necessity in the industry, since the term was coined in the 1970s by Tetsuro Mori Company Yaskawa Electric Co., Japan (Robles Aquino, Corona Ramirez Fernandez Nava, & Raven Pinto, 2010). This is true, assuming that philosophy originated in the time when the term was coined. Otherwise, it has set that it was the result of some evolutionary engineering, as suggested by Figure 1, (Vantsevich, 2010).

[1] Here, "Phylosophy" is used in its inception of the particular understanding system of life (the engineering) and everything related to it (Diccionario de la lengua española, 2005).

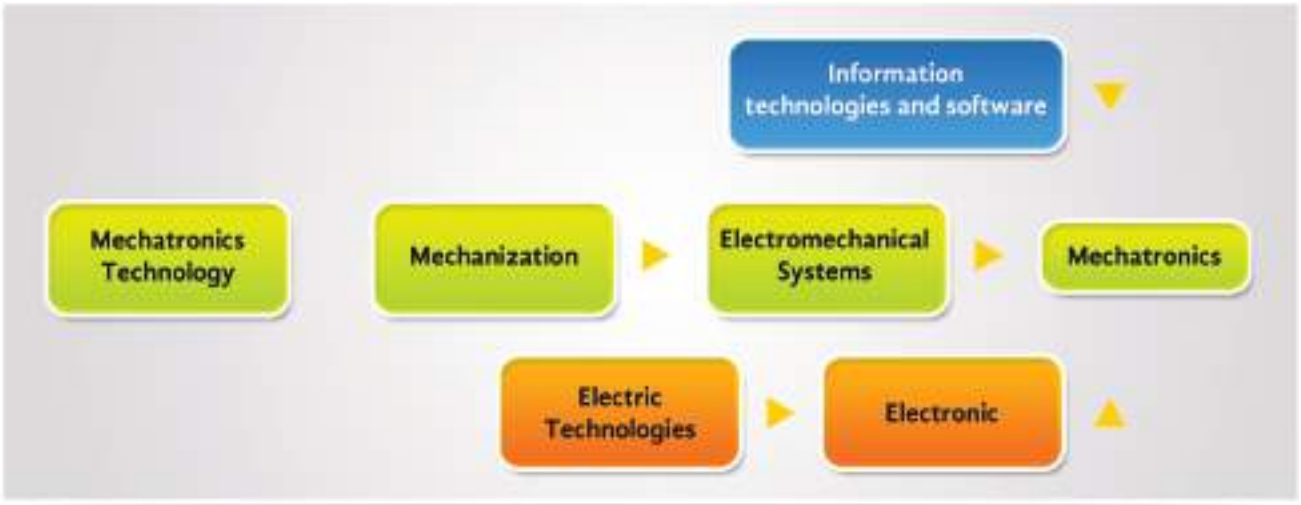

Figure 1: Mechatronics evolutionary technological appearance

In this illustration can be interpreted that the advent of this engineering philosophy was "natural" given the appearance and development of technologies that comprise it. That is, by the appearance of machining techniques and electrical, and mechanical engineering based, emerged the field of electromechanical systems. This trend continued in a similar way to the birth of Mechatronics.

The path that has led to the current point Mechatronics also can be tracked through its definitions over time. At its inception, with Tetsuro Mori, perhaps it was only the union of mechanics and electronics, as it can guess from its name components "mechanics" and "electronics". You can see that the first definitions of philosophy here occupies treatment consisted of her "only as an interdisciplinary subject," in the best case, or as a "union between the mechanical and electrical engineering, control theory and computer science, all wrapped in a single area of engineering "(Grimheden & Hanson, 2005).

Common understanding of Mechatronics

The concept outlined in the previous paragraph is still rooted in some universities in Mexico. For example, the concept as "the mechanical-electronic engineering specialized in control, instrumentation and industrial automation". See Figure 2 (ITESM-CEM, 2004).

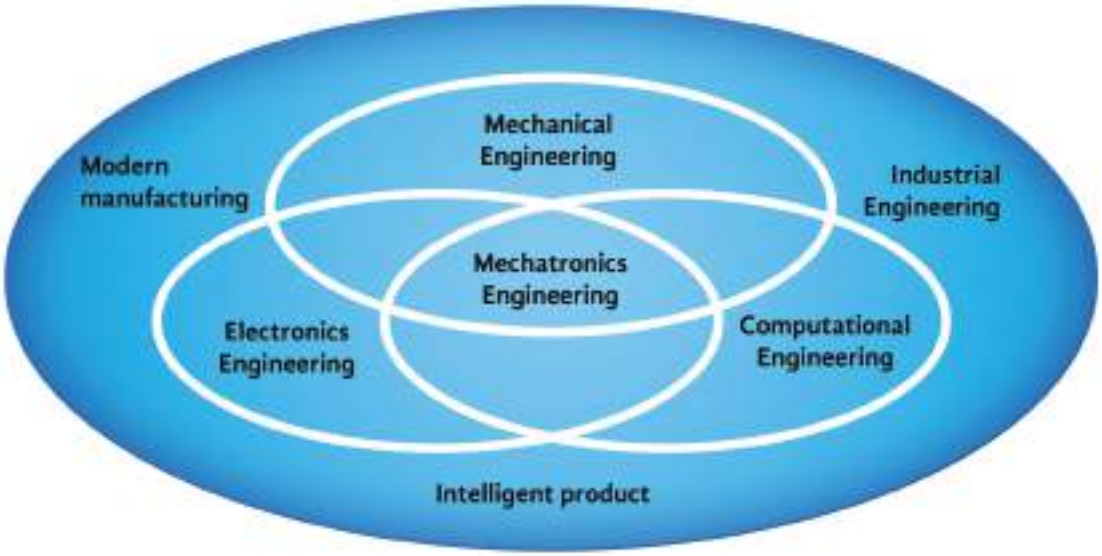

Figure 2 Concept of Mechatronics of a Mexican institution

i When Mechatronics is understood in these terms, the concern focuses on academic mastery of a wide number of topics. This is reflected in textbooks that focus their attention on the exhibition, without detail, various issues (Bolton, 2010). Even the titles of certain books (Bolton, 2010), (Bradley, 1991) indicate a poor understanding of the philosophy in question. Mechatronics hint that is only the addition of electronic consumer products or electronic control to mechanical and electrical systems. The union of disciplines implies instructing personnel or students with a variety of expertise and different engineering topics.

It is not uncommon to find students in advanced semesters of Unidad Profesional Interdisciplinaria de Ingeniería y Tecnologías Avanzadas, Instituto Politécnico Nacional, exclaiming: "Oh, so Mechatronics is Automation". Saying this implies an oversimplification of the philosophy in here explained that evidences a perfectible and training in it. This may be because some educational programs do not take responsibility for teaching Mechatronics, but only focus on teaching a variety of subjects. Thus the responsibility for the Mechatronics relies in the student, who did not even know they have this responsibility. Even engineering graduates say the main advantage of Mechatronics is the dialogic ability between engineering converging on it (www.facebook.com/dario.cuervopinto/posts/184323054934994). This assertion is supported by experts, they say that the contribution of Mechatronics should not be overestimated, even though it is recognized the

need for disciplinary specialists to communicate their ideas of having a "translator" between them. It is said the challenge of Mechatronics course designers it is to establish a balance between depth knowledge and the ability to act in integrating activities in a wide range of environments (Vantsevich, 2010). Other authors argue that students should be deep enough knowledge in at least one area of technology in order to make effective contributions in that area, while ensuring a breadth of knowledge necessary to give credibility to interact with other specialists (Bradley & Russell, Mechatronics in Action, 2010).

Internationally, we have examples such as the Master of Science in Mechatronics at KTH: "Generally, students are enrolled in programs of mechanical engineering, vehicle engineering and industrial management. Course culminates with a completely organized by project and problem-based learning. Students are asked to applying their knowledge in a technology project in collaboration with industry. This will teach students the Mechatronics is a philosophy and that can hardly be taught in theory, but it has to be experienced "(Grimheden & Hanson, 2005). Note that the concept of teaching is highly practical.

Another example is the International Master of Science in Mechatronics Systems Engineering at Lawrence Technological University, which expects students

> i. "Learn the mechanical principles in the design of Mechatronics systems,
> ii. develop strong math skills and application of analytical dynamics and adaptive Mechatronics systems,
> iii. provide expertise in the areas of logic design of Mechatronics systems, development of intelligent control algorithms and robust, classic and modern, and design of mechanical systems in conjunction with control systems,
> iv. develop analytical skills in optimizing Mechatronics systems,
> v. learn design principles and are skilled in implementing control algorithms to hardware. "

Note that it is privileged variety of topics such notion of Mechatronics education. This degree is taught collaboratively by the departments of Mathematics and Computer Science, Electrical Engineering and Computer, and Mechanical Engineering, thereby giving a scientific character to it. By fusing their practices and principles is achieved

> • "Mathematical modeling of dynamic Mechatronics systems and optimization,
> • Logic control algorithms with robust and intelligent

• Mechanical systems with electrical and electronic hardware,
• Computer programs for the implementation of control algorithms with robust logical and intelligent,
• Programmable logic devices. "

On the other hand, in industry, not many companies are willing to accept Mechatronics graduates as an important contribution to the traditional titles (Vantsevich, 2010).

Modern notion of Mechatronics

In recent times it has been postulated that the main theme is the mutual benefit between disciplines, ie "the synergy of precision mechanical engineering, electronic control and systems thinking in product design and manufacturing processes" (Grimheden & Hanson, 2005). The radical difference in this approach is the modern term "synergy", it is defined as the "union of several forces, causes, etc.., for greater effectiveness" (Dictionary of the Spanish Language, 2005), or as the "action of two or more causes whose effect is greater than the sum of the individual effects" (Royal Spanish Academy). It follows that the application of the Mechatronics should focus efforts on achieving synergies between disciplines from the time of design. The small change is not involved and, in the case of the union of disciplines, concerns only the subsystems disciplinary interfaces, and in the case of synergy, the eventual rise of new technology (Grimheden & Hanson, 2005). The knowledge society "requires innovations and changes in traditional forms of training, production, disclosure and access to public and private services" (Ministry of Education, Culture and Sport, 2003).

Achieving synergy

Bradley & Russell, (Mechatronics in Action, 2010) while recognizing the importance of synergy, not clearly address. It is sometimes proposed as a means to achieve a concurrent design approach. A concurrent engineering cycle is the first stage of requirements definition. In a second live stage conceptual design, design for manufacturing, quality, design, testing, marketing, industrial design and interface design. A third crystallization stage is composed of design, service and support, and manufacturing processes. The fourth stage is the manufacturing and, finally, the fifth, the finished product. All with possibility of feedback, in either direction (Bradley & Russell, Mechatronics in Action, 2010). Note that at no point discussing interdisciplinary or synergy. More successful, it is stated that the essence of Mechatron-

ics is achieved by considering all disciplines together since the beginning of the design. However it is possible to do this and even then not achieve synergy.

One way we can begin to address the need for synergy is the thematic approach (Grimheden & Hanson, 2005) to either Mechatronics, assimilating that training courses should be directed to the product (Vantsevich, 2010). But historically it has been shown recently, any educational institution has thematic identity.

The identity of a discipline, in academia, is the definition of the same discipline. The identity of the philosophy in question has evolved from a first tier of disciplines separated, going through one multidisciplinary second, then one third cross disciplinary, one curriculum, one organizational fifth and must eventually reach one sixth theme. See illustration 3 (Grimheden & Hanson, 2005). In it, the circles represent disciplines, namely, mechanical, electronics, Control, etc., which are completely separated and are incorporated each other until their borders disappear.

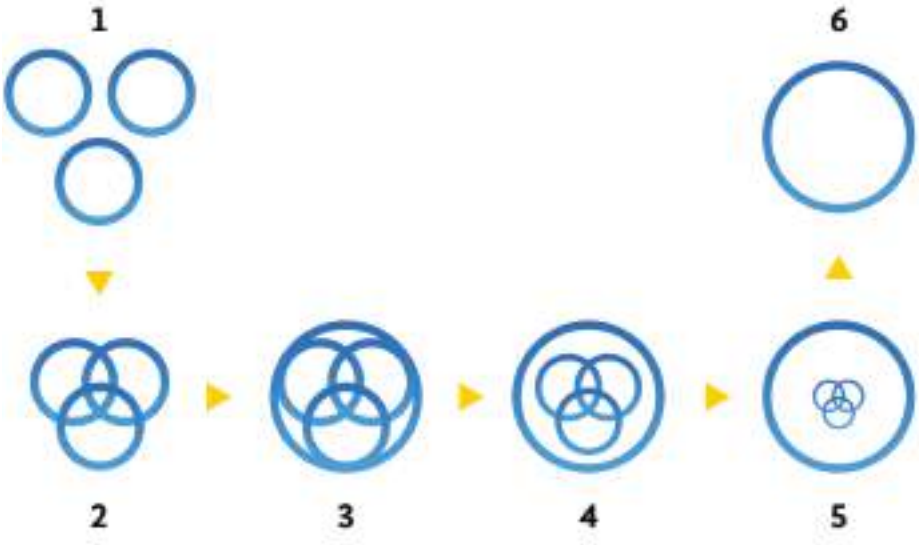

Figure 3: The evolution of Mechatronics as an academic discipline.

In stage 1 if Mechatronics is only because the disciplines that compose it exist and coexist in a haphazard way. In stage 2 students, on its own initiative, take courses in various disciplines only to widen its field of action; However, the educational system still has separate disciplines. In stage 3, is already an interest from the education system

incorporate courses from other disciplines to an original discipline, for example, courses on electrical engineers in mechanical systems.

Such courses are called "mechatronic". Stage 4 is responsible for the creation of an entire curriculum for Mechatronics, same that tries to meet the cross disciplinary courses and who attends, in part, the identity of Mechatronics. Note that disciplinary identity is declining to give rise to the thematic identity. Stage 5 involves an almost complete disappearance of the original disciplines. This is possible thanks to a complete change in the academic organization, for example, with the emergence of departments led by teachers with experience in Mechatronics. This situation requires some time for its realization. The last stage involves treatment of Mechatronics completely as possessor of a thematic identity. Perhaps because not found any institution or organization that has come to the last point, the description of this not addressed clearly in Grimheden & Hanson, (2005). Thus, we see that, even in the literature that complaint the problem of lack of concentration in the synergy, the problem is left open.

Teach a repository of knowledge and various engineering topics does not mean a training in mechatronics, because this, rather than a set of knowledge, is a design philosophy. Learn about topics of mechanics, electronics, electrical and computer, will hardly provide us a particular way (philosophy) to address the problems that we have to solve through the engineering design.

Synergy implies working thematically. By contradiction, you can define the theme as that which does not imply disciplinary divisions, what privileges the synergy between disciplines. It may be considered that the theme will be achieved when and where the Mission of study programmes is the satisfaction of the needs of local industry and the proposal of solutions to global problems. The contribution of Mechatronics Engineer is not alone in its ability to Dialogic, not only in its ability to project management, nor in the proper balance of their theoretical and practical knowledge. Their contribution is where specialists in specific areas not arrive, synergy. Which must satisfy in the daily practice of problem-solving in common situations in the industry.

The real problems are interdisciplinary and complex (Chávez Tortolero). The thematic identity of Mechatronics will be highlighting the synergy, conceptually and operationally, addressing social needs such as projects. Social needs, are inherently complex, interdisciplinary and thematic, can not be solved with a single discipline and its optimal satisfaction crosses by the synergistic effects that gives the Mecha-

tronics. We can finish proposing the following notion: Mechatronics is the philosophy that considers the methodological, optimal and intimate participation according to specific applications of competencies such as electronic, mechanical and control in obtaining products and complex processes for sustainable development since the beginning of the design process.

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Some learning strategies in high performance organizations

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Abstract

Learning in organizations is currently the most important and competitive strategic advantage, it is one of the key factors that determine the success or failure of organizations. Organizational knowledge is considered as a production factor as important or more than land, labor and capital and as an energy source postmodern, off electricity and oil at the time.

During the last three decades, the advancement of scientific knowledge - in many cases using various strategies within organizations- has impacted the business scenario up to become the main factor leading to the development of organizations to be given to promoting the current era as "the knowledge society and information."

The production and knowledge management, organizational learning activities under, are now vital aspects in world class organizations which increasingly rely on their ability to create knowledge that their assets and capital as traditionally had.

Keywords: Organizational Learning, Organizational Knowledge, Learning Strategies, Competitive Advantage.

Introduction

In the context of fierce competition for world markets, rampant technology and the speed with which changes occur, during the last three decades it has received special attention a proposal to bring an explanation of organizational performance, considered by experts as a factor leading to the disappearance of continuity or organizations.

This perspective, which evidence may be in the early Industrial Age companies and organizations strengthening in the late twentieth century, has to do with their ability to expand their borders through activities to learn and acquire new knowledge. We refer to organizational learning, which according to many theorists, turns out to be the turning point for the success of today's organizations, through innovation, creativity and continuous improvement.

Although learning in the organization was given continuously through the areas of Research and Development (R & D), in formal

and systematic managers suffered myopia to ignore personnel from operating there was a potential of knowledge as important as that generated the scientific R & D.

It was with the arrival of the school of human relations and people-centered management, during the fifties, which began to take into account this knowledge that people were willing to contribute to the continuous technological enrichment of the organization.

Then recognized from research achievements in world-class organizations, mainly Japanese and American, that success and survival lies in their capacity for learning and knowledge creation, through continuous improvement, creativity and innovation, to bring to market high quality, economical, high performance and other features that consumers demanded, making maximum customer care center.

Learning in organizations, while recognizing their genesis in the study of technical learning, Taylorism, is located in postmodernism with a more humanistic approach, which allows the survival of the organization and the people who work there. The new mandate is to learn and generate knowledge within the organization, through a transit positivist outlook, rationalist and empiricist initial reflective approach, continuous improvement of learning by doing, ie. metalearning.

Principales authors on organizational learning

Many authors who have studied the phenomenon of learning and knowledge in the context of organizations almost from the start of the Industrial Revolution, most recently include the following in relation to strategies, facilitators and inhibitors of knowledge.

According to Nonaka and Takeuchi (1999) a strategy for organizational learning is to stick to the phases of knowledge creation, such as: sharing tacit knowledge, creating concepts, justifying concepts, building an archetype and distribute knowledge. According to Von Krogh, et. al (2001) a key issue in the creation and facilitation of knowledge in organizations is the support that the people involved in the process may receive from other members of the organization at all levels.

According to Peter Senge, author of The Fifth Discipline (1998) the learning organization cultivates the following disciplines: personal mastery, mental models, shared vision, team learning and systems thinking.

Companies that engage their business partners, says Robert Mai (1996), such as customers, distributors and suppliers, in the process of developing knowledge, increase their chances of organizational learning, and distinguishes the following strategies for organizational learning: breaking the limits, promote team learning, open door policy, changing learning habits and learning partnerships.

In studies of organizational learning, most authors devote significant factors distinguish facilitators. Schein (2002) identifies the following: concern for people, belief in people's capacity to learn, loose coupling and diversity, open communication, what in the world is malleable, team work and think systemically.

According to Argyris (2001) learning facilitators are understandable and reliable system, participation of management, model simplification, sensitivity to human needs and organizational development program.

For Nonaka and Takeuchi these are the main facilitators: organizational intention, autonomy, fluctuation and creative chaos, redundancy and variety of requirements, create a vision of knowledge, develop staff knowledge, build a field of interaction in front, supported by the process new product development, administration adopt a center-up-down and build a knowledge network with the outside.

Yeung et. al. (2000) identified the following skills as facilitators: generate ideas with impact, generalizing ideas with impact and identify the seven learning disabilities. For Von Krogh et al are instilling a knowledge vision, driving conversations, mobilizing activists, creating the right context and globalization of local knowledge. Also a high dose of support from management and lateral levels.

According to Clegg and Clark (1998) organizational learning facilitators are learning about themselves, industry and competition, have permissive regulations, capital improvements and trust between people.

As facilitators are identified, also distinguished the factors that act as inhibitors or obstacles to organizational learning. According to Schein, are the legacy patriarchal and hierarchical, male dominance, control and leadership of rugged individualism. Argyris identifies defensive routines, masters programs or defensive mental models and ambiguous communication.

Yeung, et. al., identify them as learning disabilities and are blindness to the environment, the candor, the homogeneity, the tight coupling, paralysis, learning and dissemination poor superstitions.

Grogh Von, et. al., call these barriers, both personal and organizational, are: 1) the individual: limited capacity to incorporate and threat to personal identity, 2) organizational: a legitimate language, anecdotes of the organization, procedures and paradigms Company. Distinguish a classification of barriers to knowledge: strategic, organizational, cultural, and individual infrastructure.

Robert Mai identify intended and unintended barriers, created both by the organization and by the people and called perspective barriers and barriers of reason. The former identifies vision problems, self-imposed blind spots, incompetence and myopia capacity or near vision; between motive is fear and the need to retain control.

Schein emphasizes that the lack of communication between the three cultures of the organization's culture-operators, engineering and management, can be cause of failure in organizations.

The literature reviewed for purposes of construction of this space allows me to reflect to propose different strategies that can lead to organizational learning, including the following may be mentioned.

1. Creating learning committees. A committee of organizational learning represents an instance consists of people from different areas and different hierarchical levels, committed to learning, established and conducted by senior management. The strategy is to determine the needs of organizational learning through a diagnosis, and then organize and manage learning events. This diagnosis will have many needs, which must be sorted by priority, according to the mission statement and overall goals of the organization. The committees may be formed by learning teams by functional areas whose leaders act as representatives. The committee is actually a self-directed team led by senior management.

2. Set concept maps. People by nature are curious to learn and learning resistance is due to many factors that have noted the authors. However, in my opinion, one of the main inhibitors of learning it is the absence of strategies people to learn, and more importantly, to recognize that ignorance does not know. In this case, top management should facilitate learning through teaching people to think and build thoughts through concept maps, which we consider a key strategy for learning. Teaching concept maps should be on all levels, starting with the very top management to operational levels.

3. Development of a reflective culture. Most authors agree that one of the sources of organizational learning is the ability to tap into their own experiences and the experiences of others. No desire to discriminate the other strategies proposed, is the strategy that most closely adheres to organizational learning, as it is based on a reflective activity, which in itself implies an epistemological cognitive activity. The learning culture represents a subsystem of the overall organizational culture, guided by the mission of the company and directed to encourage, by all means available, continuous learning behavior in the organization. It becomes a form of organizational life.

4. Rules that encourage innovation. The establishment of a learning organization involves a vision of change, in addition to meeting the current needs and requirements, must strive for constant revision of the status quo, aimed at determining their current situation compared to the desired situation. To act in such a scenario, top management among its main functions will develop a set of rules whose content is aimed at promoting innovation through organizational learning.

5. Feedback processes. Also known as feedback or feedback. English comes from the feedback, that cyber means the return action of the regulations of an information system on the system control center. The concept was introduced following the administration of the integration of computer systems and organizations through the decision making process. Actually, the concept is used in many organizations just like that, as a concept, and in my opinion has underutilized the enormous untapped potential of.

It is also one of the key elements to aspire to acquire a good level of organizational learning, since it involves learning from their own experiences and those of others, through self-reflection or assessments which others have of our performance. Largely involves practicing the skills of emotional intelligence to achieve cognitive epistemological moments. In the new organizational language also appears as iterative activities.

6. Establish processes of unlearning. Few qualified authors who dare to speak of unlearning, these include Hedberg, Schein, Senge and Nonaka, most authors are unlearning in current psychological works of NLP. Consequently the theory and the literature is sparse, however, agree with Hedberg in which to learn new behaviors that often involves organizational learning re-

quires downloading that impede knowledge, such as defensive routines (Argyris) or mental models Senge. The application process involves a process of unlearning full vector includes learn-unlearn-relearn, which ends in the process of learning to learn and organizational learning.

7. Identify and promote organizational learning facilitators. Although preceding paragraphs summarize the enabling factors identified by researchers in the field, it is important to say that this stage is of great significance for the organization doomed to learning, which should distinguish, within their own functions and activities, which elements can act as facilitators of learning, as well as incorporating those reported by the authors. According to its own internal culture each organization has a set of factors in a very particular can act as facilitators, task for sponsoring the organizational learning.

8. Identify and dispose of resistance to organizational learning. This is similar to the previous point, in addition to recognizing and incorporating inhibitors or hindering factors of organizational learning, it is up to the same set, according to their internal culture, factors that can act as inhibitors, with order to remove them to make way for learning. In both cases the methodology can vary from simple observation to the use of questionnaires and surveys of staff involved in the learning process.

9. Management should develop a transformational leadership. A key factor that should be considered a learning organization, agrees most researchers, is related to the role of senior management. It is likely that the starting point of any effort to turn the organization into a learning organization, start by converting the mindset of executives, ie changing the leadership paradigm of a simple management by objectives based on the leader-follower relationship, a relationship of leader-follower power transformer, and probably not converted to upper management intended all efforts towards achieving organizational learning, will be in vain.

10. Achieving a shared vision and goals. This strategy is closely identified with the previous one, to develop a transformational leadership. Most authors defend this thesis organizational learning to achieve a vision and be able to share it with the staff of the organization. Perhaps one of the most prized skills of execu-

tives consists of the ability to establish a realistic and formulate objectives to achieve, but also requires the ability of managers to communicate that vision to all staff. This vision is to display and transmit a continuous learning organization based on the constant generation of new knowledge to foster innovation.

11. Creating organizational learning programs. Motivational theories in management sciences deal extensively with issues related to how to motivate staff, and some of them weigh more stimuli intangible issues such as participation, recognition, challenging tasks, pushed into the background a factor essential motivators for most people in the organization: the stimulus cash or in kind. Most of the workers, it is clear, is eager for economic stimulus, therefore, a basic strategy of top management in relation to organizational learning is to implement programs to improve staff incentives and encouragement to help others improve . This means offering and meet employees with attractive rewards in cash, kind, promotions and other mechanisms to promote organizational learning. Thus, in the end organizational learning becomes money for everyone.

12. Management of information and knowledge systems. New technologies based on learning management and organizational knowledge have led to world-class organizations to incorporate this feature into significant levels of the structure. Functional areas have been created to address general levels of knowledge management, that is, the institutionalization of learning and knowledge in the organization becomes part of the strategic areas of the same. The area of knowledge management (also known as knowledge management or KM, for its acronym in English) is concentrating function and promote the initiatives and efforts to generate knowledge from all areas of the company, using many of the strategies described in this section, as well as being the repository of knowledge throughout the organization, which represents its competitive advantage and its essential heritage.

13. Establish planning Organizational Learning. Closely related to the previous strategy, and as one of its main functions, the organization, through its knowledge management area, must implement planning programs of organizational learning, involving various aspects of the administration process, from the mission, vision and goals of higher order, diagnosis, forecasting, scheduling, self-planning, organization, implementation and control of learning actions, setting their own goals, standards,

policies, management of resources both financial, human, material, logistics.

14. Evaluation of organizational learning. An organization that claims to be oriented to implement organizational learning processes learning assessment at intervals to allow promote rather than inhibit at different levels that can be found on the organization learning, ie, individual, group and organization . For this you can make use of the information collection techniques such as surveys, interviews, observations, among others.

15. Applications of the techniques to deal with change. There are different techniques to deal with change in organizations, most of them, but arose independently, have been integrated into the overall strategy of organizational development, considered a model of planned change designed to address both scenarios of change : spontaneous change, natural and the change brought about by human intervention to generate innovations. In my view, the best model of change is found in the field theory of Kurt Lewin forces, widely known in academic circles.

According to Beckhard and Pritchard (1996) processes of learning and change are part of each other, the change is a learning process and learning is a process of change and argue that the learning process includes: 1) thawing of current beliefs, knowledge or attitudes, 2) adopt new attitudes or behaviors or alternate, 3) refreezing in the new state. Similarly in the change process comprising: 1) a current or current, 2) a state of transition, and 3) an altered state. Although the authors do not mention it, it appears that this process is based on the theory of Lewin's force field.

Conclusions

As mentioned in the introduction to this article, the ability to learn and create new knowledge in an organization allows you to create strategic competitive advantages and establish the position of market competition. Most world-class companies, several authors agree, are in leadership positions simply because they have used the learning that the business environment has given them, and if they fail to acquire knowledge at the speed that they have done, in soon lose its privileged position.

One of the main problems in this learning in organizations is that managers and people in general do not know what to do with their experiences, not document their learning, share knowledge no, no consciousness of daily learning, there are many types of resistance (to learn, to teach, to provide), being of a social knowledge is difficult to work in teams, organizations do not know how to generate learning and create an environment for this purpose.

In this paper we propose several strategies for organizational learning, among which: the establishment of committees of learning, learning concept maps, developing a culture reflective, setting standards that encourage innovation, and establish feedback processes unlearning, identify and promote organizational learning facilitators, identifying and eliminating the inhibiting factors of learning, develop transformative leadership management, develop a shared vision and goals, creating organizational learning programs, establishing knowledge management systems.

Each of these strategies are actions that require a multi-stage development, which lead to different routes so as to obtain access organizational learning. Implementation of these strategies, as noted above, can take from a few months to several years of work, depending on the nature and complexity of the organization.

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