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The triple helix as a succesfull model for integrating multidisciplinary workgroups on innovation projects in the Technological University of Tula-Tepeji, Mexico

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Abstract

The triple helix as a succesful model for integrating workgroups on innovation projects in the Technological University of Tula-Tepeji, Mexico .Innovation is increasingly based on the triple helix model "University-Government-Industry". Since the Technological University concept was raised on the needs of create an academic entity focused on the solution of the Industrial sector, its organic structure and functioning modulate the interaction between the Government and insdustrial sector.This article analyses de methodological approach for developing an innovation project in the biomedical sector by using a multidisciplinary and inter institutional perspective. A medical diagnosis dispositive for determining the health status in three specific diseases, at short time, reliable results and economically feasible, was developed. The project was developed in two years and comprised a qualitative and quantitative analysis; a multidisciplinary inter institutional workgroup was structured; the two years´ activities were funded by the National Council for Science and Technology – Mexico by the Technologic Innovation Fund. Activities related to the design engineering, description of national consumer sectors, commercial scaling, marketing, logistics and financial analysis were developed. Students were involved in research activities. The group was integrated by researchers belonging to three different academic groups i.e., Environmental Systems and Engineering, Administrative Models, Accounting and Fiscal, and Poles of Economic Development. The three academic groups are in Academic Consolidation Level according to the Professor Development Program – Public Education Secretariat. The integration of multidisciplinary workgroups allows to its members incorporate new tools and methodologies for solving the industrial sector located in specific regions with specific demands. The National Program for Innovation offers an important niche for both, high specialization for the professors and the consolidation of groups for working with a whole perspective approach.The project was successfully accomplished and the academic groups were strengthened.

Triple helix; Innovation; Academic Workgroups; Technical Universities

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Introduction

The educational models around the world are undergoing modifications to the implementation of the competences approach. Such is the case of the National Higher Technological Education System in Mexico.

The Technological Education Subsystem (TES), represented by the Technological Universities represents an interesting option for educating both technitians and engineers in specific areas according to the needs in the geographical región where the institutions are located.

The Technical University of Tula-Tepeji (UTTT) is located in the State of Hidalgo, Mexico. The institution is Pioneer in Mexico, created in 1990.

After 25 years of its foundation the UTTT has around 4,200 students distribuited in three campi, offering grades in the follow academic programs: Industrial Maintainance, Production Processes, Environmental Engineering, Accounting and Finances, Bussiness Development, Nanotechnology, Mechatronics, Reneweable Energy, Protected and Sustainable Agriculture, and Information Technologies.

Academic Groups

As part of the academic activities in the Mexican public education system, the integration of Academic Groups (AG) is vital (Santos, 2010) not only for strenghthening the academic life at indoors level but for raising the individual and global capacities and, in this way, facing and solving specific problems at external level.

According to Tirso et al., (2006), the main activities of the GA's are related to:

- To drive the institutional development
- To respond to the need of high level training of human resources
- To ensure the compliance at a corporative level.
- To promote healthy academic environments and,
- To increase the prestige of the institution.

The Mexican Program for the Professional Development of Teachers (PRODEP, spanish acronym) identified different levels of development for de AG´s:

1. Academic group of new creation
2. Academic group in consolidation
3. Consolidated Academic Group

The National Council of Science and Technology (CONACYT, spanish acronym) declared to the AGs as an organizational model susceptible to receive economic support for developing basic and applied research (Calderón et al., 2013).

Funding Programs for developing academic activities

It was in 2009, when CONACYT presented the Program of Incentives for the Innovation (PEI, spanish acronym). It is an instrument through which CONACYT give financial resources intended to encourage business investment in innovations that could be translated into business opportunities.

The objectives of this program are:

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- To encourage investment in research, technology development and innovation
- To raise the competitiveness of enterprises.
- To increase the value added of national production.
- To promote the culture of innovation, and
- To encourage academia - industry interaction
- The Triple Helix Model (THM)

The university–industry–government relations can be considered as a triple helix of evolving networks of communication (Etzkowitz and Leydesdorff, 1997). This ‘‘triple helix’’ is more complex than the mutual interactions between the ‘‘double helices’’ on which it rests.

The triple helix model for innovation comprises universities and other knowledge-producing institutions; industry, including high-tech start-ups and multinational corporations; and government at various levels. While industry and government have traditionally been conceptualized as primary institutional spheres, what is new in the triple helix model is that the university is posited to be a leading sphere along with industry and government (Etzkowitz and Leydesdorff, 2000).

The partial overlap among university, industry and government differs from situations in which the state encompasses industry and the university, and also it depends on the product, service or innovation which is involved in the scenario.

Linking the academia with the private and government spheres

The linking of the academia with the two other components of the triple helix is fundamental for getting a succesful developing of capacities and enhancement in the resources use.

This step is at the beginning the first contact of the AG´s with the problematic scenarios, afterwards, the formalization of the federal funding framed into a specific program could be stablished.

Depending on the maturity of the AG(s), the intervention level or participation of the members is variable, Quintas et al., (2002) explains the phases in which an innovation project is involved:

1. Basic research
2. Applied research
3. Experimental development
4. Initial production, and
5. Diffusion

Is supposed that if a multidisciplinary group is integrated, the level of intervention coul go beyond the first stages.

Material and Methods

Description of the intervention environment

The State of Hidalgo is located in the Mexican central plateou, it has 2,858, 359inhabitants (INEGI, 2015) distribuited in 84 municipalities. The primary seconomic sector contribuites the 4% of the GDP, the secondary sector and tertiary sectors contribuite the 44% and 2% respectively (INEGI, 2015).

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This places Hidalgo in a very active and productive state whit important investments in the process ans services sectors, however the distribution of the richness is concentrated in 14 of the 84 municipalities, generating unequility and unbalanced economic developing poles.

In the state there are settled 7 industrial parks, most of them in the southern belt of the Hidalgo territory.

One of them is located in the municipality of Atitalaquia, where exist industrial activities of at least 14 antional and international enterprises; one of them is a medium size national company dedicated to the developing of biotechnologic products focused on the clinical and medical diagnosis.

The company was economically granted by the PEI-CONACYT program in 2014 and 2016. As part of the agreement the academic link was done with the UTTT.

Characteristics of the academic link

The Project was developed in two stages (2014 and 2015) both of them funded by the PEI-CONACYT national program.

The UTTT has a specialized department for developing projects linked to the industrial and entrepeneur sectors; this department link the industrial needs twith academic personnel focused not only in teaching but in researching, belonging to different academic programs; a plan of activities is developed and submitted to the enterprise, is reviewed and modified if is necessary and, the legal departartment of the university sign an agreement for supporting the activities and paying the corresponding fees to the acdemic participants.

After finished the activities, a technical report is written, authorized by de UTTT and the enterprise and submitted to the CONACYT for formaly closing the Project.

Workgroup characteristics

The academic UTTT workgroup was integrated for 4 members through the two stages, belonging to different academic groups e.g., Environmental Systems and Engineering, Administrative Models, Accounting and Fiscal and Poles of Economic Development, all of them are categorized as "in process of consolidation".

Development of the academic work

In order to organize the academic work, periodical meetings were done.

The activities were distribuited according to the academic profile of the workgoup members, the development was reviewed and any advance was given to the enterprise staff.

Some visits to the enterprise were executed in order to clarify or going in deep of an specific objetive planned, to receive more information or to express new ideas.

General content of the work plan

The project was focused on the development of strategies for the introduction of a new medical diagnostic equipment based on the analysis of DNA material by using the PCR method. The equipment results new in the diagnosis market, reliable, cheaper tha other, and gives results quickly; the engineering development was done by the researchers staff of the enterprise together to other mexican university.

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The activities developed by the UTTT work group were related to:

Stage 1 (2014):

- The description and analysis of the Mexican medical service
- The estimation of the critical values for the economic scaling of the prototype.
- The estimation of: production volumes, storage and distribution and,
- Preliminar estimation of total costs (considering the prototype characteristics and two scenarios of production)

Stage 2 (2015):

The activities were focused on the implementation of the previous stage, considering the inclusion of the suppliers and service providers.

In this stage the marketing strategy was developed and represented the central core of this phase.

The total cost was adjusted to the prototype modification.

The structure of the projects were done by using the CANVAS model (Ferreira-Herrera, 2016).

Results

Connection between the Technical University of Tula-Tepeji and the industrial sector

The Technological University of Tula-Tepeji through the industrial services department conducted and analysis of the needs in the industrial and services sectors, classifying which are related to the generation of basic research, knowledge transference or technology development.

As part of its regular activities, the department of professional services has facilitated the participation of the University as provider of academic and technology services, receiving fundings provenients from federal programs.

During the last three years the Technical University has collaborated in 26 projects following the triple helix model in which professors members of academic groups have participated, developing skills and giving solutions to the industrial and services sectors.

The UTTT occupies the second place as provider of services as academic and technology developer centre in the state.

Academic Groups interactions

The AGs reinforced the academic activities. During the regular meetings the exchanges of ideas allowed us to understand different perspectives and methodologies for getting the objectives.

The group had members with expertise in economic, administrative processes, marketing, logistics, finances and biotechnology, it had a remarkable effect on the proposed alternatives and final report.

It was possible to know and understand new concepts and methodologies in different fields of knowledge, as now the groups are strengthened and the professors show a higher adaptability for solving problems in a holistic way.

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The inclusion of students gave the opportunity for enriching the strategies to teach and learn, giving to them real cases to analyse and discuss; to apply the knowledge and to develop new sways for solving the problem.

As part of the evaluation systems by the PRODEP-SEP, the inclusion of technical reports and participation in multidisciplinary workgroups provides evidences for being considered, and eventually, could impact on the PRODEP level assignment to the AGs.

Project implementation

The project stages were concluded according to the plan. The final reports were delivered and approved.

According to the Technology Readiness Level methodology by the NASA (Mankins, 1995) the project is situated in Level 2 with important components of Level 3, it means that the next activities should be driven to the technology validation in proximal or real environments.

Recommendations

The public and private institutions focused on education and research, specially those belonging to the Tecnological Universities Subsystem, have an enormous opportunity niche for applying proposals of participation for solving industrial problems, since the academic personnel have the expertise in practical and real scenarios.

The students of the TES have the opportunity to develope a professional internship in the industry and it opens their insertion as colaborators in the projects which is permitted by the PEI projects.

One successful strategy for increasing the academic productivity and participation in projects is the integration and articulation of multidisciplinary workgroups; it implies that would have at least two AG that could be benefited in productivity and experience gained.

A new organizational structure should be articulated in order to facilitate the activities, promoting the insertionof professor in projects, reducing the bureaucracy and expediting the tramitology, considering the researching duties as part of a vibrant and necessary life of academic development.

Conclusion

The constant change in markets and integration into global scenarios, must mean the modification of models of intervention by universities.

The model of the triple helix is perfectly suited to the needs of industry and the philosophy of the Technological Universities , however it is still necessary to refine the mechanisms of participation, it might be given in an harmonious and productive environment, understanding that this activity resolves more of one priority item; on one hand the solution to immediate problems of the industrial sector and secondly, allows to get better training to students by integrating them to real scenarios, enrichment of teacher expertices and to reach new levels of prestige and academic recognition.

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