The Impact on Research Projects, Technological Development, and Innovation in the linkage Administration.

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Abstract

In an industrial city like Monterrey, that is called "The city of Knowledge", because of the creation of innovation projects which have been achieved for the strategic implementation of the triple helix, which is known around the world as a win to win relationship among its members, and whose objectives that were seen in a long term now are daily facts. The State University of Nuevo Leon through The Mechanical and Mechanical Engineering School, and with the support of the federal government by the way of the announcements of the Science and Technology National Council has been the leader and pioneer in the realization of Research Projects, Technological Development, and Innovation together with the industry. In the last three years the Mechanical and Mechanical School has developed more than 33 projects, committing on the knowledge, students formation, and the specialization of researches. The being of this project is to show in a very clear and objective way some of the achievements that can be obtained from the link among the academy, the private sector, and the government. Where it appears that taking each one its role better results are obtained.

Keywords: Linkage; Projects; Industry.

1 Introduction

This document is about how the activities of research, technological development and linkage administration try to contribute in the development of capacities and the continuous improvement of competitiveness and productivity. This purpose is accomplished through knowledge transfer processes, administration of projects, technological surveillance, and the establishment of cooperation networks, among other technological tools, favoring the setting up of the Alliance among the academy, the actors of the Science National System, technology and innovation, the productive sector, and the state; as well as the international cooperation.

The Mechanical and Electrical Engineering School (FIME by its acronym in Spanish) of the State University of Nuevo Leon (UANL by its acronym in Spanish) acts as a mechanism of link among the scientific, investigative, and technological capacities with the companies that develop the technology , the technological and productive capacities of the companies, solving the aspects which make the existence of knowledge and the technology do not satisfy the problems and needs of a enterprise, the sector, the regions, or the country. These aspects go from the effective administration of projects, the mobilization of resources from the state and the entities of development, the articulation of different actors in a same project, the administration of intellectual property, and the administration of the innovation, to the appropriation and technological transfer and knowledge, which are important aspects where it is required familiarity with the capacities and business needs.

1.1 Justification

In the global context, the capacities of technological innovations which are understood as research and development, technology of manufacturing, organization, design, quality control, and marketing, are some of the determining elements of competitiveness of the companies. However, Cimoli (2000) points out that the Competence is not the only model of behaviour that regulates the patterns that explain the technological change; the complementary role of the cooperation, the coordination, and the competence is crucial to analyse the change patterns and the decisive success or failure.

The innovation is being getting more interactive, and it is based on interchange processes organized by the market. The accumulative effects of learning and the innovations are developed through strengthening in the micro level and thank to the cooperation relationships between the companies and the group of close institutions to the grouping

where they act. The innovation and the creation of technological competences get under these conditions, a collective character (Meisser, 1996).

Corona and Hernandez (2000) mention that they are not only the organisms oriented to the manufacturing and the selling of properties and services: they constitute the beginning and the end use of a very important part of the innovation activities that generate the industrial city in the country. The companies can be adapting centers, production, and spreading of technological knowledge with economical purposes. The elements in the modern industrial society favor the economic growth and the technological development, are the ones that determine the business capacities to innovate, by which depends on the network of connections that the company has with the economic and social environment.

In Mexico, they have tried to established business networks for the innovation through the establishment of an organizational model of subcontracting which is defined as a contractual relationship between two companies or institutions, where the final product or assembly (organizing company or contractor), request to other company to manufacture parts or semi-finished (subcontracted company) to integrate the final product, so they have to tell the specifications and program the delivery, so the subcontracted company get the funding, raw material or technical assistance.

In general terms, the projects consist on a group of control and coordinated activities with a beginning and an end, carried out to achieve a goal according to the specific requirements, which include the period, costs, and resources:

Research (I): Original creative task carried out in a planned and systematic way to increase the volume of knowledge to a world level in the scientific and technological area. Including the knowledge of the human being, the culture, and the society. The source of usual financing of the research activities comes from the state through its entities of development and entities of international cooperation.

Technological development(D): Application of the results of a research, or from any other type of knowledge to the manufacturing of new materials, products, to the design of new processes, production systems, or service benefits, such as the substantial material improvements , products, processes, or pre-existing systems. The financing of the technological development projects come from the productive sector, although it has the governmental support through the entities of development and it is less frequent through the international cooperation.

Innovation (i): It is the introduction of a new or meaningfully improved product (benefit or service), from a process, from a new commercialization method , or from a new organizing method in the internal practices of the company, the organization of the work place, or the external relationships that impact the success indicator of the organization positively (example productivity). The financing of the innovation projects usually, come from the productive sector, although it has the governmental support through the entities of development.

The research projects, technological development and innovation (R+D+I) are different from other type of projects, in their high level of uncertainty and risk, due to the execution and the results of the project they can be different from the initial goal and can be equally worthy.

Due to the this high level of uncertainty and risk, it is necessary arrange the administration of the effective projects to make sure the accomplishment of the purposes of the project in the budget and the available period. Through the years FIME and the UANL have developed capacities and a successful scheme to the administration of the R+D+I projects (planning, formulation, execution, and closing), under the standards of Project Management Institute (PMI), and these are put in service of the sector, these are:

- Technical structuration and finance company of projects.
- Execution of projects.
- Sectorial projects.

In the last years FIME has developed a high quantity of R+D+I projects with a joint participation with state enterprises. In 2009 FIME turned into a recognized institution by CONACYT, standing out in a great level the support to projects linked to the companies, besides the national level of the IES with a great economical amount gotten in the same year.

Figure 1: Views of the FIME-UANL, Nuevo León (Monterrey), México

2 Scope

In Mexico has been encouraged the development of the Projects (R+D+I) through the announcements of the Science and Technological National Council (CONACYT by its acronym in Spanish), through the incentive programs which is a support program for the companies to invest in projects (R+D+I) directed to the development of new products, processes, or services. This program has the general objective to encourage in a national level the technological development and innovation through the granting of complementary incentive, in such a way that these incentives have a great impact on the national economy competitiveness (CONACYT, 2013).

Within the specific objectives of the program we can mention:

- To foment the annual growth of the investment of the national productive sector in R+D+I. It is important to mention that this program gives supplementary economic support, but this doesn´t mean the substitution of the investment that the companies make in R+D+I activities during the tax year. To favor the linkage of the companies in the chain of knowledge "education-science-technology-innovation", and its articulation with the productive chain of the strategic sector.
- To form and incorporate specialized human resources in R+D+I activities in the companies.
- To generate new products, processes, and services of valued added, and to contribute to competitiveness of the companies.
- To contribute to the production of intellectual property in the country and to the strategy to make sure the appropriation and protection.
- To extend the hedge of support to the national companies since a decentralized perspective.

This program is directed to the Mexican companies registered in the National Registration of Institutions and Technological and Scientific Companies (RENIECYT by its acronym in Spanish), that make research activities, Technological development and Innovation (R+D+I) in the country, in individual way or in connection with the Institutions of National Public and Private Higher (IES by its acronym in Spanish), and/or Centers or Institutions of National Public Research (CI by its acronym in Spanish).

The program includes 3 modalities:

- Technological Innovation for micro, small and medium companies (INNOVAPYME by its acronym in Spanish): Modality oriented to proposal and projects whose component can be MIPYMES companies. In this modality the companies can make proposals in an individual or linked way with Higher Education Institutions (IES by its acronym in Spanish), Research Center (CI by its acronym in Spanish), or both.
- Technological Innovation for the big companies (INNOVATEC by its acronym in Spanish): Modality oriented to proposal and projects whose component can be big companies. In this modality the companies can make proposals in an individual or linked way with Higher Education Institutions (IES by its acronym in Spanish), Research Center (CI by its acronym in Spanish), or both.
- Project on Network oriented to the innovation (PROINNOVA by its acronym in Spanish): Modality oriented to proposal and projects that can be linked with at least two Higher Education Institutions , or two, Research Center (CI by its acronym in Spanish), or one of each one.

All this based on the triple helix model of university-government-business, which can be seen as a complement sociological economic models, and often "economísticos" in innovation studies (Albert & Laberge, 2007).

FIME of the UANL has developed in the last three years more than 33 R+D+I projects linked with different local companies, with the participation of over 120 students in the development of these projects (with an average of 4 students per project), obtaining an income of about $ 38,000,000.00 M.N.

Table 1: Projects R+D+I developed in 2010, 2011, 2012

# of projects	Name of the project	Company	Person Responsible in the UANL	Modality
179648	Innovative Process of thermo-shaping of windshields for the automotive industry.	Vitro Automotriz, S.A. de C.V.	Dra. Martha P. Guerrero Mata	INNOVATEC
178617	Development of the optimum cooling process to prevent the distortion of Steel rings. (Stage II).	Frisa Forjados, SA. de CV.	Dr. Luis Leduc Lezama	INNOVATEC
175721	Strengthening of the Center of Automotive Technological Development of Meritor Mexicana en Monterrey	Meritor Mexicana S.A. de C.V.	Dra. Patricia del C. Zambrano Robledo	INNOVATEC
179700	Development of a ultra light stretcher integrating new geometry and technologies of Steel shaping of ultra high resistance.	Metalsa S.A. de C.V.	Dra. Patricia del C. Zambrano Robledo	INNOVATEC
178229	Strengthening of scientific and technological capacities through a research center for the human development and product validation.	Sistemas Automotrices de México S.A. de C.V. (SISAMEX)	Dra. Patricia del Carmen Zambrano Robledo	INNOVATEC
184555	Development and innovation of transportations belts for slippery urban remains.	Fabricaciones OPRESA, SA DE CV	Dr. Guadalupe Alan Castillo Rodríguez	PROINNOVA
184556	Innovative continuous Line of application of electrostatics paint in powder.	Fabricaciones Productos DYM, SA de CV	Dr. Guadalupe Alan Castillo Rodríguez	PROINNOVA
184550	Development of a new process to obtain metal pieces from a quick prototyping.	Mercantica, S.A. de C.V.	Dr. Marco Antonio L. Hernández Rodríguez	PROINNOVA
180270	Innovative Development of heating technology by microwaves for industrial applications.	Vitro Automotriz, S.A. de C.V.	Dra. Martha P. Guerrero Mata	PROINNOVA

184488	Technological development of innovative toolkit for the aluminum injection molding.	Comercializadora Juan Pablo, S.A. de C.V.	Dr. Arturo Juárez Hernández	PROINNOVA
178807	Laboratory of prototyping on injection pieces and material transportation for metal-mechanic and food industry. Stage 1: Development of a covering through physical deposition of steam.	Grupo de Servicio Industrial y Maquinaria, S.A. de C.V.	Dr. Marco A. L. Hernández Rodríguez	PROINNOVA
181156	Continuation of the technological development of an original dental implant with a titanium base of quick integration.	MAGEOTEC S.A. DE C.V .	Dr. Marco A. L. Hernández Rodríguez	PROINNOVA
179303	Development and technological integration of a system to increase the reliability based on dimensional monitoring processes – structural and rehabilitation of toolkit use in shaped processes of metals and plastic injection molding.	Innovación Tecnológica en Soldadura y Superficies, S.A. de C.V.	Dr. Marco Antonio L. Hernández Rodríguez	PROINNOVA
179534	Development of a nanostructured covering for ceramic paving Stone with non-stick properties and inhibiting of growth, and reproduction of microorganisms though chemical reactions, and redesign of the process of manufacture for the application.	Porcelanite Lamosa, SA de CV	Dra. Patricia del C. Zambrano Robledo	PROINNOVA
177023	Idti polymer in emulsion 100% acrylic type nucleous-shield and waterproof of high life use, sustainable and globally competitive.	Pinturas Térmicas del Norte S.A. de C.V.	Dr. Antonio García Loera	INNOVAPYME
185007	Second stage of monitoring in real time of the regulation in unities of generation for the stability of the interconnected electrical system.	SENSA CONTROL DIGITAL S.A. DE C.V.	Dr. Arturo Conde Enríquez	INNOVAPYME
185010	Secons stage of the gathering machine for intelligent substations.	SENSA CONTROL DIGITAL S.A. DE C.V.	Dr. Arturo Conde Enríquez	INNOVAPYME
185011	Implementation of automatic sectioning systems in distributions networks through the use of coordination algorithms and hybrid mechanisms of disconnection.	SENSA CONTROL DIGITAL S.A. DE C.V.	Dr. Arturo Conde Enríquez	INNOVAPYME
178618	Development of a technology for the art state for polymer materials, with simultaneous capacities to identify a wide variety of colors since opaque to transparent, high speed and material cuts including low roughness.	Criser, S.A. de C.V.	Dra. Patricia del C. Zambrano Robledo	INNOVAPYME
152154	Development of an unmanned flight Air System.	QUETZAL AEROESPACIAL S.DE R.L. CV	DR. PATRICIA ZAMBRANO	INNOVAPYME
153911	Technological development of an original dental implant with a titanium base of quick integration.	MAGEOTEC SA DE CV	DR MARCO A. L. HERNANDEZ	INNOVAPYME
157595	Gathering Machine for intelligent substations.	EMPRESA SENSA CONTROL DIGITA, SA DE CV	DR ERNESTO VAZQUEZ	INNOVAPYME
157191	Monitoring in real time of the regulation in unities of generation for the stability of the interconnected electrical system.	EMPRESA SENSA CONTROL DIGITA, SA DE CV	DR ERNESTO VAZQUEZ	INNOVAPYME

155133	Development of products and solutions of thermal isolation for the energy saving and substitution of importations.	OWEN CORNING MEXICO, S DE R.L	DR SIMON MARTINEZ	INNOVATEC
155323	Prototype of a new hybrid marble-porcelain and an experimental pilot line for its own manufacturing process.	PORCELANITE LAMOSA S.A DE C.V	DR. PATRICIA ZAMBRANO	INNOVATEC
155395	Establishment of a new automotive technological center in Mty.	MERITOR MEXICANA, S.A DE C.V	DR. PATRICIA ZAMBRANO	INNOVATEC
152586	Strengthening of the technological capacities for the prototyping of milling tools and micro milling of advanced materials stage 2: laboratory of nano structured coverings for medical applications, aerospace and energy.	3G HERRAMIENTAS ESPECIALES S.A DE C.V	DR. PATRICIA ZAMBRANO	PROINNOVA
149613	Development of a prototype of flexible manufacturing process and of two solar heating prototypes of high efficiency for the rising sectors.	CORPORACION BIOTECNICA S.A DE C.V	DR. FAUSTO SANCHEZ CRUZ	PROINNOVA
150774	Optimization of cooling to prevent Steel ring distortions 42cr	FRISA FORJADO S.A DE C.V	DR MARTHA PATRICIA GUERRERO MATA	PROINNOVA
154326	Technology development of hardening with sprinkling water and shaking applied to steel of high and low tempera.	RASSINI, S.A DE C.V	DR MARTHA PATRICIA GUERRERO MATA	PROINNOVA
155275	Development of a printed component through the trailer calculus theory and fatigue prediction, stage 2.	PINTURA, ESTAPADO Y MONTAJE, S.A DE P.I DE C.V	DR. ARTURO JUAREZ HERNANDEZ	PROINNOVA
155159	Characterization of lubricants for printing processes of sheets.	PINTURA, ESTAPADO Y MONTAJE, S.A DE P.I DE C.V	DR. MARCO ANTONIO LOUDOVIC	PROINNOVA
157611	Design and development of process prototype and product of medical equipment that consist of heart balls and treatments of neurological pathologies, centrifuge bio pumps and metallic guides for the brain and heart.	BMC MEDICAL MANUFACTURE, S.A DE C.V	DR. JAVIER MORALES CASTILLO	PROINNOVA
156981	Design and development of a mechanical automatic prototype and triangulation of coordinates of projection of photos, tuning with monitoring in real time of therapeutic equipment of degenerative bone diseases, bone and muscular trauma and for the improvement of the development of professional	TOOLS $ SERVICE DE MEXICO S.A DE C.V	DR. JAVIER MORALES CASTILLO	PROINNOVA
156961	Design and development of an agro environmental system prototype of climate control for the continuous farming in warm and extreme climates.	ALFA GRUPO TECNOLOGICO, S.A DE C.V	DR. JAVIER MORALES CASTILLO	PROINNOVA

In the coming years that Mexico seeks more development projects achieve education institutions generate higher quality human resource and benefit the country.

3 Objectives

FIME has considered continuing participating in the development of R+D+I projects with which hopes to contribute more in the generation of new technology and quality human resource for the growth of the state and the country. The participation of the linkage scheme favors the creation on research centers. FIME has some of these research centers, such as:

Figure 2: CIIDIT – Innovation, Research and Development in Engineering and Technology Center

It is a multidisciplinary and integrative center of excellent where it is generated and applied in innovative way cross-border knowledge in the engineering and technological area, specifically in:

- Nanotechnology.
- Advanced materials.
- Mechatronics.
- Software engineering.

Locations: Research and Technology Innovation Park (PIIT by its acronym in Spanish) in Apodaca, N.L.

Figure 3: CIIIA (by its acronym in Spanish). Research and Innovation Aerospace Engineering Center

Its objective is to contribute to the national and regional development of the aerospace industry, general aeronautics and trading, for which two academic programs were created, one for aerospace engineering and other for the aerospace maintenance technician.

Principal Activities:

- Research and technological development.
- Generation of human capital for the aeronautic sector.
- Technological services for the related sectors.

Location: North Airport in Escobedo, N.L.

Within these centers the participation of researchers and students is paramount because of the great research that is done to the creation of new and innovative technology projects that benefit the state and the country.

4 Conclusion

This document expects not only to contribute with the information mentioned here but to make conscience to continue with the participation of universities in the triple helix scheme to foment the collaboration between the government and the industry, and to strengthen the technological development and the innovation of the countries, so it can continue with the generation of knowledge and quality human resource, since it is shown that the participation of universities in these projects can be obtained lots of funds that contribute to the growth of Higher Education Institutions and to establish more industrial and technological parks in which human resources of quality are formed.

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