R & D PROJECT SELECTION IN ENTERPRISES, UNIVERSITIES AND RESEARCH INSTITUTES

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ABSTRACT

Technological Development is one of the main country goals. In order to be successful in this goal it is necessary not only to have a good technological plan but execute it. This is possible if a technological plan consists of a set of entrepreneurial or academic; feasible and profitable projects. In this paper a structure to carry on that plan, the way to build a technology foresight framework and a discussion about the project selection are presented.

Governments have to allocate funds for R & D projects to enhance some prototype designs. The criteria for that selection in universities and institutes are proposed also in this paper.

Key words R & D Proyects, applied research.

INTRODUCTION

Innovation and technological advances are important factors for every country.. Both require people with good skills to achieve expected results; beside require good science, national technology and innovation policies combined with an efficient knowledge – learning process.

In competing for new technologies, many countries and governments allocate funds for R&D projects to enhance some prototype design. It is very common to use a portfolio to characterize R&D projects trough several parameters: return on investment, demand , product quality, competing technologies, sustainability level and competitive advantages.

In this portfolio, it is necessary to put the projects in a hierarchical order, using some tools-, evaluating the attributes of product quality, innovative aspects of the product and technologies that have competitive advantages- in the market.

Entities involved in the technology improving are universities, enterprises, production sectors and research centers . There is a difference between R & D projects in private sectors and in universities. In the first case, effectiveness to manage those projects means for a company to have or not a competitive advantage and in the second case means only a better image .

Technology Management is the discipline which takes advantage of science and applied science in order to achieve project exploitation to develop new technologies and products enhanced with new technologies. University scientists are not well informed about the needs of industry and less about the national needs to have a proper technological development. The first problem is how to make scientists do something useful. Besides to have high curricula most scientists should produce the advances that society claims. In this situation the link between science and applied science is the key to define how it is possible to generate new knowledge which can be exploited to satisfy the society needs.

R & D PROJECT SELECTION

Since the 80´s it has been a great discussion about the role of governments in order to push scientists to research in fields that produce in accordance to the society needs to be useful for people. So, governments are interested in achieving the principles of the market in their economies more than following a free market. Most of them define research policies for carrying research in certain directions towards desirable objectives of economy.

It has been good solution to create Consulting Councils in some universities, to define research lines and approve an Applied Research Projects ¨Portfolio. In enterprises several commissions have also been useful to review research projects or innovation projects. Finally they have also integrated portfolios to arrange hierarchically technological projects competing with other kind of entrepreneurial projects

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TECHNOLOGICAL DEVELOPMENT STAGES

In accordance with experience, there are several stages to carry out an specific project in technological development..

BASIC RESEARCH

APPLIED RESEARCH

PROTOTYPE BUILDING IN LABORATORY

ENGINEERING PROCESSES

COMMERCIAL PRODUCT DESIGN

MARKETING

PRODUCT INSERTION IN MARKET

TECHNOLOGY TRANSFER

Each stage has her own planning model with its execution, evaluation and control process.

In general, when technological projects are long scale complex systems, the first stage is sometimes developed in the academic sector. Second stage is carried by research institutes. The design and building of prototype, engineering activities, commercial product design and marketing are in general in charge of specialized enterprises. Technology transfer, an activity carried out by suppliers and users, is one of the most important goals for developing countries.

TECHNOLOGY POLICIES

It is a great difficult to conquer technology markets because technological projects have registered different problems from the economic point of view. Industrial countries as well as developing countries, both are interested in achieving proper positions in the market, but

developing countries are less efficient and have economic problems because they are paying a lot for the acquisition of new technologies when its generation are almost inexistent..

Technological learning is a very long and different process according to efficacy, capabilities, support and efforts. In many companies the technology selection is made without full information about the main involved alternatives..

BUILDING TECHNOLOGY FORESIGHT FRAMEWORK

Entities involved in this problem are enterprises, universities, production sectors and research centers. In private sectors and in universities, there is a common objective: to know the future of technologies.

In the first case, effectiveness to manage projects means for enterprises to have or not a competitive advantage . For production sectors this problem is important because it defines its international competitiveness. In the second case better R & D projects mean for universities only a better image and maybe a better economic situation. Finally, in the third case, for research centers, technological project effectiveness is the key for research business.

Technology Foresight Framework is built to give concepts and knowledge about emerging key technologies .and markets to identify which research projects should be accepted . It is necessary also integrate as many panels or study groups as sectors are in industry. It is convenient besides to have the participation in each group of members of academic community , business sectors, financial institutions and government to implement research projects for their respective industry sectors. An example, in England in 1993 were created 15 groups to implement research programs of applied science, related to basic science.

The simplest way to allocate resources to projects is to create two funds , one for basic science and one for applied science. It is difficult to link both kind of research.. In my opinion it is a good idea to define first the needed application of science and after that, conclude which part of basic science has to be developed .

CONACYT in Mexico has followed different policies in each administration period of government, but almost never has connected basic science with applied science to complete a project successful in the market.. The research project has been in general example of applied science, with some involved disciplines but with poor results .

In contrast most Mexican academic institutions have many projects in which applied sciences are used and proposed by researchers, but only few of them can be implemented as industrial projects in the real world.

Creation of new knowledge starting from basic science studies and applied science is hard to be achieved by researchers. On the other hand, there has not been a good evaluation through proper and valid indicators in several aspects of the research. As a consequence the research results have been difficult to be measured in economic terms,

R & D PROJECT SELECTION

So not always it is possible to improve a research development related to each project. in order to be approved for having fund resources- To have a better result it is necessary to follow some activities :

The first task is to identify a set of technologies to be studied. Then each technology should be studied from the point of view of benefits economic demands, social demands, engineering demands and development opportunities.

Based in a FODA analysis identify and analyze strengths and weaknesses of the country, industrial branch, university or institution to exploit the knowledge for achieving some opportunities in comparison to other entities.

It is also necessary to evaluate the scientific opportunity to have advances in new developments in the selected technologies.

Finally, it is convenient revaluate strengths and weaknesses of the studied entity for taking advantage in industrial sectors to compete with other countries.

SELECTION OF R & D PROJECTS

Allocation of funds to R & D projects is a risk in business. The success rate of innovation and failure of innovation are both possible. On the other hand there is a competition of R & D projects with other kind of projects like new industrsal plants , introduction of new products to the market and plant revamping. In most cases of innovation failure, the problem is marketing, a second reason of failure is the technology strategy. This problem is multi-factorial and multidimensional and it is more complicated because it is related to marketing.

A successful innovation is result of a proper fitting between a strategic behavior and a good marketing.

EVALUATION OF RESEARCH RESULTS IN ENTERPRISES, UNIVERSITIES AND RESEARCH INSTITUTES

Research leaders, research committees and individual researchers are concerned with the task of evaluation of research results in universities. In most cases the evaluation method is vague and subjective.

In this paper, we propose the AVALOS criteria based on a systemic reviewing and the consideration of 15 to 20 desirable factors depending on the entity in which it is applied,. .

ENTERPRISES

Service to society

Search for satisfy part of a specific national demand

R & D PROJECT SELECTION

Search for solutions to industrial problems

Integrate multidisciplinary teams, for consulting based in acquired scientific and technical expertise

Build a technology foresight framework

Modernization of specific process or product in the enterprise

Modernize companies through technology transfer

Modernize companies through innovation

Define a technological strategy aliened to general strategy

Organize R & D teams and departments

Provide support to agents of change.

Promote a technological learning in the work teams of the company

Approve financial resources from the applied research projects

Study new technology developments from the field competition

Develop and produce new technologies

Registration of patents

Commercialization of new developments in technology

Achieve an International participation or presentation

UNIVERSITIES

Service to society

Search for the solution to a part of a national problem

Search for the solution of an industrial problem

Integrate multidisciplinary teams, for consulting based in acquired scientific and technical expertise

Build a technology foresight framework

Modernization of the educational system

Strategic specialization

Provide support to the agents of change.

R & D PROJECT SELECTION

Promote the technological learning in the work team of the university

Generate financial resources from the applied research

Study new technology developments from the university research

Achieve an International participation or presentation

Develop research to get a Doctoral research

Precise in which parts there was new knowledge

Publication of reports to obtain master degrees

Publication of new papers

Publication of new books

Firm of research contracts in scientific or, technical ort engineering issues

Development and production of new courses

RESEARCH INSTITUTES

Service to society

Identify the set of technologies to be studied in a institute according to its field of activity

Define the industrial problems to be considered in the Institute ´s Search planning.

Integrate multidisciplinary teams, for consulting based in acquired scientific and technical expertise

Build a technology foresight framework

Strategic specialization

Provide support to the agents of change.

Promote the technological learning in the work team of the institute

Generate financial resources from the technology development

Study new technology developments from the institute research

Achieve an International participation or presentation

Precise in which parts there was new knowledge

Publication of papers to promote a

Firm of research contracts in scientific or, technical ort engineering issues

PROYECTOS DE INVESTIGACIÓN Y SU FINANCIAMIENTO

Generate new knowledge is the main objective in the research activity. National systems of production and Innovation are also related to technology and knowledge.

Science, Technology, industry and education define economic development and many of them receive the effect of others. That is why the policies need to be defined as an integral whole. Unfortunately technology policies and Technology Management are almost inexistent. In developing countries a better congruence among policies are important.

CONCLUSIONS

A Technology Foresight Framework is built to give concepts and knowledge about emerging key technologies .and markets,

For identifying which projects should be accepted it is necessary to integrate panels with people from the industry and the academic community.

It has been a good solution to create Consulting Councils in universities. for reviewing and approving R & D projects,

Integration an Applied Research Projects ¨Portfolio .in universities and institutes. allows a better link between industry and academia,

Make R & D projects selection in enterprises, universities and research institutes, require to link basic science with applied science and to consider the specific factors in each entity.

The criteria for selecting projects in universities, enterprises and institutes are different in accordance with interests and internal active. ties.

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