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Factors and Process Affecting Deployment of Technology Management System in the Petrochemical Industry (Case Study: Pars Petrochemical Company)

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Abstract: Today, technology is transforming inputs into outputs are presented and thereby create added value and achieve the objectives of the companies/organizations plays a role. Life companies and organizations in the effort know to gain competitive advantage in a competitive market and technology as a source of competitive advantage remembers. Like other technology assets of a company should be managed. Type of research is descriptive and survey questionnaire was designed to collect data. The population of the study, 104 experts with at least 5 year experience in management and technology for the petrochemical industry were also available experts. The content validity of the questionnaire with the supervisor and six people were confirmed university professors and administrators oil industry and reliability through Cronbach's alpha coefficient is equal to 0.947 and 0.977 for the factors affecting the implementation of technology management system was calculated for the importance of technology management. According to the analysis done by descriptive statistical techniques and structural equation modeling techniques effective implementation of technology management system and its processes, namely the processes of protection, detection, operation, selection, acquisition and learning in the petrochemical industry and organizational factors, business strategy, technology strategy, businesses, governments and society.

Key words: Technology management system, factors affecting technology management, technology management processes, strategy, society

INTRODUCTION

Economic growth and material wealth of a country depends mainly on the production of a commodity that a combination of natural resources, land, capital and labor can be produced. The conversion of natural resources into sources of economic development lies in the center of the new processes and technology transform the brains of all these activities. Technology as the conversion factor, economic growth in two ways first, by increasing efficiency of resource use technology can accelerate economic growth. For example, the technology could be useful utilization of unproductive lands diagnosed assist or can be economical use of resources and raw materials contribute less valuable. Second, the technology can be efficient and effective use of resources constant value, the rate will increase production. Therefore not surprising that developed countries are also advanced in terms of technology. Since technological progress and development of science related to each other, recognizing the difference between Science and Technology (T&S) is very important for developing countries. Understanding this difference in adoption and non-adoption the policy goals and instruments of the government is inevitable for technology development.

Technology means the systematic application of science and other knowledge to practical tasks is organized (Brown, 2000). Technology refers to methods of making things and doing things (Ahmadi, 2006). Technology or technologies include tools, methods and operations to convert the consumable items (data output) is used (Richard, 1998). According to United Nations Industrial Development Organization's definition of technology is that the knowledge and skills needed to produce goods and services that power of thought and human cognition and composition rules in nature and broad application of science to industry and using the arrow procedures and regular studies to be included (UNIDO, 1989). On the technology Porter set of knowledge, products, processes, tools, methods, structures and systems used which to add value in a system is used (Porter, 1989). In this research, attention is

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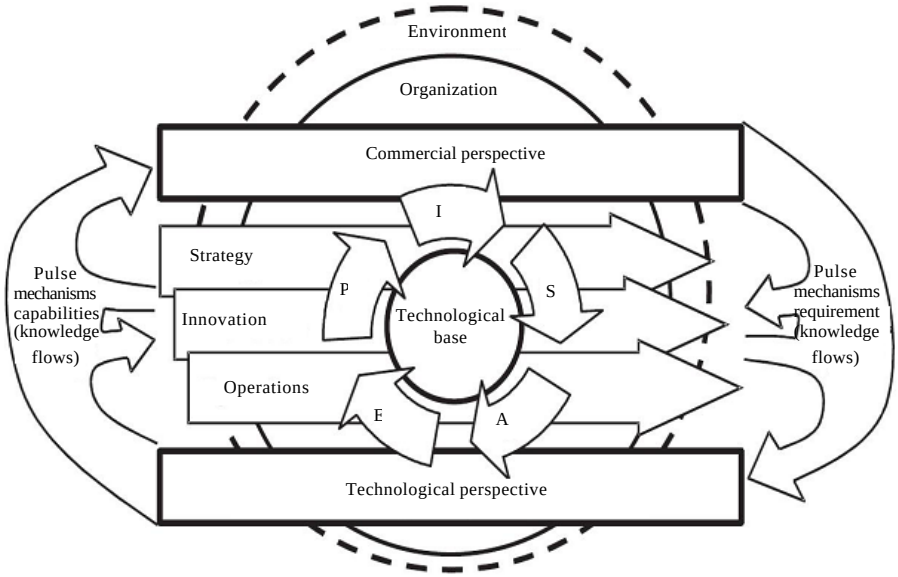

Fig. 1: Logic technology management model and colleagues

paid to technology management processes in the petrochemical industry internal and external factors affecting the establishment of specific and technology management in the petrochemical industry.

Technology management system: Technology management system is a set of processes in perfect harmony with other processes and sectors of the organization's goals and strategies systematically and automatically organized and effective utilization of technology in order to better achieve the organization's objectives promoted. In any case as any system or another system can be said that technology management system is a set of processes to identify the technologies needed to achieve the strategic goals of the organization started and after evaluation, selection, acquisition and operation of technologies to enhance and protect the wealth and technological capacity is upgraded. In other words, the deployment of the system in industrial firm's ability to compete in the constantly changing markets and current developments increase. A total of Technology Management is a set of processes that are in perfect harmony with other processes. Moreover, part of the organization's goals and strategies and to systematically and automatically the effective enjoyment of technologies in order to achieve better organization to promote the organization's goals.

Phaal Model and technology management: Phaal Model used Gregory (1995) Model and extended it by resorting to two other concept, these two concepts (Schumacker and Lomax, 2004). Differences between business strategy and technology strategy many main task management and technology integration between core business strategies identified mode and other business strategies such as an activity carried out or leaving it to contractors. In many firms, the separation of these strategies leads to effective support strategies reduced. For this purpose, in the horoscope of two types of commercial and technological prospects have been identified. Two perspectives come together through the process of technology management. And that the process technology can be placed in three levels.

Level strategy: This level is more to the overall thrust and commercial firms and more consistent with the business strategy. Identification technology lies at this level although, the selection and protection of technology is also partly related to the overall strategy.

The level of innovation: this is the strategic and operational level between the two levels of choice and protects the technology further steps in this area are discussed. Among the many companies select and protect innovative activity has been observed in some steps.

Operational level: in this level of activity, a firm that has affected more by the prospect of technical and technological factors are designed, absorption and utilization of technologies is done. Technology management processes identified in Fig. 1, (I) Selected (S), Acquisition (A), operation (E) and Protection (P) and levels of technology management, including strategy, innovation and operational. Business prospects and the prospects of technology and strategic management of both the organization and the organization itself are

affected by the environment (Phaal *et al*., 2004). The elasticity of demand in the face of pressure technology, the horoscope of this concept is also used to strengthen the process. In this context, demand elasticity is obtained from a commercial perspective, the technological landscape impact. The technology strategy board is affected demand. On the other hand technology and technology strategy makes and commercial prospects of the impact of the technology landscape and thus create pressure technology (Phaal *et al*., 2004). According to this model, the dialogue and interaction between agents, commercial and technological factors in a business in order to support effective management of technology is emphasized.

The nature of the flows of knowledge related to the internal tissues, foreign tissue is dependent and for example, business objectives, market dynamics and organizational culture pointed out (Phaal *et al*., 2004). Mahjong is a hierarchical analysis model to identify the strengths and weaknesses of the organization in the field of technology. This model has many advantages over previous models and weaknesses to fix it. Secondly, triple assessment (to evaluate the strategic review process technology management and a thorough investigation and inquiry in process) appropriate procedures to provide tables, along with evaluation forms and operating procedures. In addition, based on a process looking at the effectiveness of activities in the field of technology is considered competitive advantage. In total, horoscope and colleagues could very schematic model of technology management process is framework in the firm's image. According to this model, the dialogue and interaction between agents, commercial and technological factors within a business in order to support effective management of technology is emphasized. Technological management requires accurate knowledge flow between the two companies in terms of business and technology in order to achieve the interaction between market pull and push technology. The nature of this flow of knowledge related to the internal tissues and foreign tissue is dependent. For instance, business objectives, market dynamics and organizational culture mentioned in this context. For this purpose, in the horoscope of two types of trade and technological prospects have been identified. These two perspectives that can be linked together through the process of technology management (Lee *et al*., 2012).

Internal factors affecting technology management

IT strategies: Among the internal factors, introduced technology management processes in the model affect horoscope, strategies and technology. IT strategy decision about a program that leads the development and application of technological capabilities (Zahra, 1996). Spital and Bickford (1992) technology strategy to a series of strategic decisions and measures taken by the managers, inputs into outputs, with the aim of achieving competitive advantage. Saren know a set of tasks and activities in the field of technology strategy, protection and exploitation of the technological assets of a company. In their view, technologies company its total capacity.

Business strategy: Several studies, Zahra (1996), Zheng and Bao (2005), Lefebvre *et al*. (1992) have reached the conclusion that the type of business strategy and technology aspects of IT strategy is effective. In the field of business strategy, typologies these two typologies by many researchers to be the dominant analytical framework in this domain have been introduced. The Miles and Snow, organizations are going to meet three important questions, namely the entrepreneur (or the realm of product-market), engineering (technology, product and process) and administrative problems (the administration) shall be coordinated strategy. On this basis and considering how organizations respond to the three questions above, they are organized into four categories: defense, opportunism, analysts are divided and passive.

Organization: Several research on organizational factors on the effectiveness of management processes and technology research and development that leads to classify these factors are as follows (Sallami and Shafipour, 2007):

- Management
- Staffing agency
- Organizational culture
- Facilities and equipment research
- Information technology
- Investment

External factors (business environment) effective management of technology: Technology innovation to the market (particularly exposed widely welcomed by the transition process and release) different effects on society, economy and natural environment. These effects are due to the systems that the society can change the level of acceptance or utility technologies.

Theoretical foundations of technology management processes

Recognition technology: Identification technology concept or a list of existing technologies for the production of products or services a company organization. Identification technology can be made with respect to the components of the technology. In one of the templates provided (Betz, 1987), identify aspects of technology, including 6 categories.

- Technology components
- Furniture
- Processes
- Systems
- Raw materials and resources
- Applications

Selection of technology: After identifying the appropriate technologies to capitalize on their assessment process (using clear decision criteria) and selecting a combination of helpful activities that contribute to achieving the company's goals and technological and commercial companies is consistent with risk preferences, essential. Having identified the advantages and relative advantages compared to other technologies as sessment is done on the basis of weighted factors. In practice, for a particular application, the ranking is based on several methods of assessment such as indicators of cost, performance, weight indicators, value analysis, cost-benefit analysis and risk analysis, hazard (Shirazi and Yadollahi, 1996).

Acquisition technology: After identifying the selected technologies, determining how technology acquisition is an important step and many experts believe that access to new technologies is possible in two ways.

Endogenous development: This means that simply using internal resources, access to technology and to better express the acquisition of technology through research and development activities, possible.

Technology transfer: This means that access to technology to help foreign sources, in other words buy (get) it is possible from outside the firm.

There are different methods for technology transfer These include turnkey contract, buying a franchise, franchise, create a joint business unit, unity, mergers, acquisitions and stock, the acquisition of technology by obtaining ownership of a company, working in the field of research and development, outsourcing, sub-contracting, employment and exchange of human resources, education, reverse engineering and industrial espionage.

Exploitation of the technology: The operation is acquired technology includes technology commercialization. On the other hand, utilization of technology from two aspects is under investigation. First, the technology to produce new products and services or improving the current products and services used second aspect is that, over time, may your primary importance for the competitiveness of the technology for many years. So organizations can try to sell it to other organizations and thereby benefit your organization undertake income (Khalil, 2002).

Protection technology: Protection technology is to protect the knowledge and skills that distinguished the technology holders. In other words, protection means protecting technology infrastructure and knowledge base of the organization against unwanted transfer or non-scheduled all or part of it out of the organization. This activity is related to a series of measures to protect the technologies developed or transferred and consider issues related to intellectual property rights protection in the organization refers.

Learning technology: Learn about the technology, it can be said that the learning process is at the heart of any technology management processes, learn important part of creating technological competencies form and enterprise technology projects and processes in order to learn from failures and successes explores.

Management system technology for the petrochemical industry: Petrochemical industry is the country's second source of income after oil and due to the high initial investment required and the impossibility of change after launching a major impact on the success of the petrochemical industry is selecting the right technology. Therefore, the establishment of technology management for technology and knowledge resources management organization in the industry, help in increasing the productivity and profitability of the company. With the establishment of technology, management in the petrochemical industry for the industry will realize the following objectives.

Identify new and appropriate technologies in the industry. Appropriate technology selection and optimization of production lines. Localization of equipment and consumables. Based on the review of the proposed models of technology management system processes and technology management system and technology management models including models horoscope often have emphasized the identification process technology, technology selection, technology acquisition, exploitation of technology, protection of technology and learning technology. Therefore, considering the needs of the petrochemical industry and the company's strategy,

MATERIALS AND METHODS

The aim of the present study, the study considered practical, since in this research is the relationships between factors (variables) are not manipulated and discovered. This research is an analytical study descriptive. The study used a cross-sectional study in which data are collected during a given period.

Table 1: Results Cronbach's alpha

Questions	Cronbach's alpha	Number of questions
Factors related to the implementation of technology management	24	0.947
On the importance of technology management processes in industry	30	0.977

Table 2: Descriptive results of research data on technology management processes in pars petrochemical company

	Relative frequency distribution						
Process technology management	Too much (%)	Much (%)	Average (%)	Little (%)	Very little (%)	Total (%)	Average main factors
Identification technology	18	34	37	11	0	100	3.61
Choice of technology	9	31	49	11	0	100	3.47
Acquisition technology	8	24	54	14	0	100	3.25
Tapping technology	10	38	46	6	0	100	3.54
Protection technology	16	46	30	8	0	100	3.70
Learning technology	8	29	49	14	0	100	3.32

Population and sample: The population consisted of experts with at least 5 year experience in technology management and technology research unit of the organization is particularly Petrochemical Company and contains petrochemical industry experts. It should be noted in this study, the experts do not sampled Petrochemical Company and all the population and are questioning the petrochemical industry experts, the number of samples, sample size is available.

Scale used: In this research, due to the quality of content and to facilitate questionnaire or Likert Scale total score has been used 5 times with relatively equal intervals on which items are on a spectrum that is responsive evaluation of each question measures the range of 1-5.

Validity and reliability: In this study was used to check the validity of the formal approach and reliability using Cronbach's alpha coefficient was calculated using SPSS Software Table 1. As seen Cronbach's alphas calculated is higher than 0.7, so the reliability of the questionnaire is necessary.

Methods and tools for data analysis: In this research to test hypotheses and determine the effect of latent variables used structural equation modeling techniques. This study seeks to identify the processes and factors affecting the establishment of the petrochemical industry are technology management. In this study, in order to fulfill this objective questions:

- What are the technology management processes in the petrochemical industry?
- What are Internal factors affecting the implementation of technology management in the petrochemical industry?
- What are external factors affecting the implementation of technology management in the petrochemical industry?

It should be noted, that according to a review of previous similar studies and interviews with experts and theoretical foundations, factors affecting the implementation of appropriate measures following features and technology management and technology management processes were identified based on the horoscope and went on to collect the data necessary to assess the goodness of conceptual model of the factors affecting the establishment of technology management for the petrochemical industry after reviewing the reliability and validity of a questionnaire designed and distributed among the sample. After collecting the questionnaires distributed in this season was to analyze the data.

In this chapter initially using descriptive statistics, knowledge of status and demographic characteristics of respondents offered and then used a structural equation is used to answer the questions. It should be noted that all analyzes performed in this section by Software SPSS 20, Lisrel 8.80 and Excel is performed (Table 2).

Normality test data: Given that one of the prerequisites of parametric test normal statistical distribution is variable, it is first necessary to examine the normal distribution of variables. In this section, quantitative data for normality test Kolmogorov-Smirnov used. According to Kolmogorov-Smirnov test is shown in Table 1-4 of this study was normal variables and statistics Kolmogorov Smirnov is >0.05. About 10-2-fit the conceptual model with structural equation modeling techniques.

Figure 2-4 shows estimates of the conceptual model in standard mode. As can be seen in this study, all load factors is higher than 0.3 and therefore the default relations in this concept all have been approved.

To determine the exact model that specifies the amount of t-value in all relationships is higher than the 1.96 number it is estimated that shows the significance of relations estimate the level of 5% in standard mode (95). The following table shows the summary results of structural equation. As can be seen in the table all the criteria and are in a fit state model, a model is estimated.

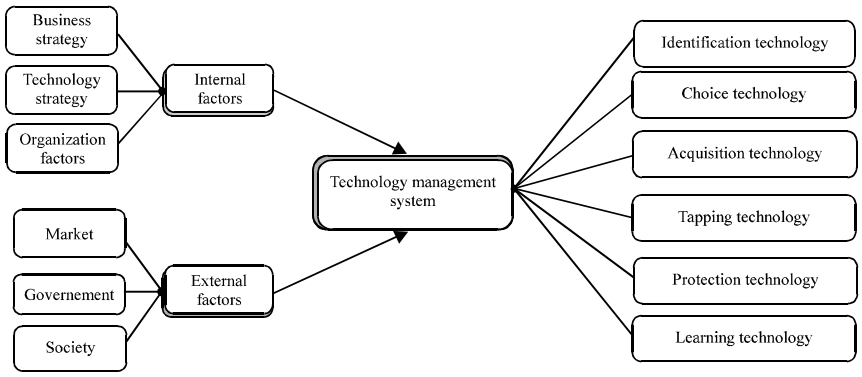

Fig. 2: Conceptual model

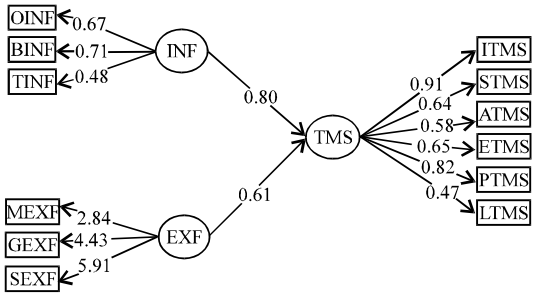

Fig. 3: Estimated conceptual model in the standard estimate

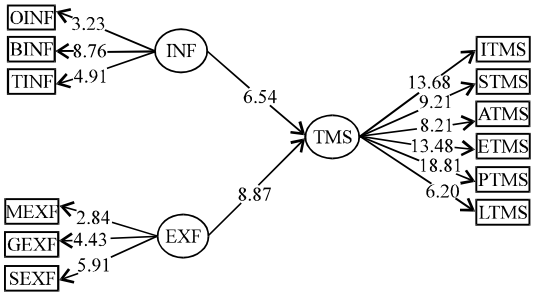

Fig. 4: Significant in the model

Table 3: Results Kolmogorov-Smirnov

Variables	Kolmogorov-Smirnov	Accepted test error
Internal factors	1.145	0.145
External factors	1.132	0.154
Technology management system	0.984	0.288

Table 4: Indicators model

Fitting indicators	Obtained value (%)	Acceptable value (%)
Chi.squar/df	2.5	<3
RMSEA	0.071	<0.08
p-value	0.00003	<0.05
IF	I97	top 90
GF	I98	top 90
NNF	I98	top 90
NF	I96	top 90

Aggregated data analysis: This article attempts to examine the research questions to be answered. As was observed in this study theoretical basis and the results of internal and external review as well as experts and experts through interviews factors affecting the implementation of technology management system and technology management processes and measures that were identified. After collecting data from questionnaires to analyze these data with structural equation modeling approach.

According to the analysis on the establishment of technology management in Pars petrochemical process technology management system, including the identification process technology, technology selection, technology acquisition, exploitation technology, protection of technology and learning technology and internal factors on the organizational factors (leadership, human resources, corporate culture, infrastructure, investment), business strategy and technology strategy and external factors, ie the factors businesses, governments and society has an impact on the level of 5%.

CONCLUSION

For successful implementation of management systems for the petrochemical industry process technology for the identification, selection, acquisition, exploitation and deploy the necessary resources available to implement these processes are producers. To implement this system is also better chart for organizations implement technology executive. Positive view of senior management to focus on technology and industry performance. Learning and innovation by encouraging employees to senior management. Selected technology capabilities and compatibility with the company's strategic products.

IMPLEMENTATIONS

Implementation of technical training on the job for employees. Defining the objectives of the leading companies in the industry and technology standards and technology. Given the company's strategy in dealing with rivals in technology management company to external factors. The importance and the need to give serious and devote resources. In terms of public policy and law, economic and environmental administration in technology management processe.s According to the current position of technological capabilities and the ability of potential competitors in the central and technology management processes. According to the conditions of society and the environment, Inc

REFERENCES

Ahmadi, H., 2006. Management of technology. Iran Industrial Research and Training Center for Printing, Tehran, Iran.

Betz, F., 1987. Managing Technology: Competing through New Ventures Innovation and Corporation Research. Prentice-Hall, Upper Saddle River, New Jersey,.

Brown, A., 2000. Technology, the Use of Evaluation for Managers. Industrial Management Institute Publisher, Tehran, Iran,.

Gregory, M.J., 1995. Technology management: A process approach. Proc. Inst. Mech. Eng. B. J. Eng. Manuf., 209: 347-356.

Khalil, T., 2002. Technology Management. Centre for Energy Technology, Adelaide, South Australia, Australia,.

Lee, J.H., H.I. Kim and R. Phaal, 2012. An analysis of factors improving technology roadmap credibility: A communications theory assessment of roadmapping processes. Technol. Forecasting Soc. Change, 79: 263-280.

Lefebvre, L.A., A. Langley, J. Harvey and E. Lefebvre, 1992. Exploring the strategy-technology connection in small manufacturing firms. Prod. Oper. Manage., 1: 269-285.

Phaal, R., C.J. Farrukh and D.R. Probert, 2004. Technology roadmapping-a planning framework for evolution and revolution. Technol. Forecasting Soc. Change, 71: 5-26.

Porter, M., 1989. Competitive strategy techniques for analyzing industries and competitors. Strategic Manage. J., 4: 12-24.

Richard, L.D., 1998. Theory and Organization Design. 1st Edn., Press and Cultural Research Bureau, Tehran, Iran,.

Sallami, Q and D. Shafipour, 2007. Inter-organizational factors affecting the effectiveness of research and development (R & D): A case study biotechnology research center research organization for science and technology. Georgia World Congress Center, Atlanta, Georgia.

Schumacker, R.E. and R.G. Lomax, 2004. A Beginner's Guide to Structural Equation Modeling. Psychology Press, Maldon, England, ISBN:0-8058-407-6, Pages: 481.

Shirazi, M.A.S. and F.J. Yadollahi, 1996. The criteria for selecting appropriate technology in the production. Mag. Programs Budgets, 8: 5-25.

Spital, F.C. and D.J. Bickford, 1992. Successful competitive and technology strategies in dynamic and stable product technology environments. J. Eng. Technol. Manage., 9: 29-60.

UNIDO., 1989. Technology management in developing country report, Vienna. United Nations Industrial Development Organization, Vienna, Austria.

Zahra, S.A., 1996. Technology strategy and new venture performance: A study of corporate-sponsored and independent biotechnology ventures. J. Bus. Venturing, 11: 289-321.

Zheng, M. and G. Bao, 2005. The impact of a company's technology strategy on its technology competence, technology acquisition and firm performance in Chinese SMEs. Proceedings of the IEEE International Conference on Engineering Management Conference, Vol. 1, September 13, 2005, IEEE, China, ISBN:0-7803-9139-X, pp: 175-179.