

Identifying and Ranking Technology Change Priorities Influencing Competency Quality Using Network Analysis Process Model; Case Study: Iran Keiton Polyester Manufacturing Company

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Abstract: In this research, prioritizing the technology changes and compiling the technology strategy in a business cause to establish a competency advantage and also a kind of technology innovation and evaluation in that business by recognizing the opportunities of technology change. In fact this is the subject of technology entrepreneurship. Research obey the mixed exploratory method (quality-quantity) and its main goal is to identify technology change priorities influencing competency quality of IRAN KEITON polyester manufacturing company. Then the network analysis process is used for determining the rank and importance of each of these priorities from the experts' point of view. The levels of performing the research are such as this: at first the dimensions of competency quality in the company are recognized through quality method and the specimens of technology components in each work level are extracted through gathering information via interview with experts and observing the documents and visiting the assembly line. Then through quantity method, technology components are weighted and prioritized in each level based on the maximum effect on the competency quality and the strategy of changing technology shall be compiled according to the level of access to the company resources.

Keywords: Technology, Evaluating Technology, Technology Strategy, Competency Quality, CAPTECH Methodology, Network Analysis Process

1. Introduction

Today world, is the era of changes in all aspects of human life. Industrial enterprises and economic institutions have emerged in the life of human society as effective social organizations and their role is so strong that if their destiny is tied up with the fate of societies. In industrial countries, these organizations have shown their role and effect through having huge turnover, which sometimes is more than the wealth of several countries. In developing countries, industrial enterprises and small and medium enterprises have critical role in the economy of these countries and getting industrialized, and they have critical role in the national economy, as well as employment and environment.

The preferred method of assessing the level of technology in SMEs, is the CAPTECH methodology that has been introduced and recommended by the United Nations Industrial Development Organization (UNIDO). SMEs can

take advantage of this tool to attract technology and also to use it in the investment for the improvement of the technology. In this way, there is a pervasive attitude in the technology category in which all aspects of quality, cost, delivery time and other factors of sensitive production are considered (Vecchiato & Roveda, 2010)..

The seven factors for technology is defined in assessing CAPTECH technology. On the other hand, depending on the nature of the company, its work levels are separated and determined. Criteria such as quality, cost, delivery time and etc., are chosen as the competition factors.

Porter (1991) has considered the quality as determining factor along with the other factors in his book titled "Competency Advantage of nations" and pointed out that the quality has an important role in producing the most important factors of acquiring competency advantage. He

also considered the innovation factor as the most important factor influencing on this advantage. Innovation as one of the most important topics in the field of entrepreneurship, is emerged in different grounds. It is for some time that innovation in knowledge is the case of many studies. Nowadays, the most important form of using knowledge in industry, is changing it into technologic tools. Therefore, combination of knowledge and technology, has made possible to use it in the competency process. Nowadays, competition based on technology is not a selective subject but it is a survival factor in the world market (UNIDO).

Technology is a name that is used for a set of measures and parameters inside the organization that changes the inputs into available product and is included of a set of

Globalization.....Technology.....Development.....Innovation.....Science

The concept of technology in the middle ages of 20th century, was taken from Britain to America in the shape of applied technology in order to increase the power of manufacturing and production and latter it was taken to Japan. The most important technologic transactions were done between these two countries and at first it was used in the industries related to producing the transportation tools, especially automobile and then it was used for war weapons. After that, because of some defects in these industries, it was necessary to have a revision on this product before sale and after that the opinion of using technology as a factor for increasing the level of quality was well received. Therefore, the first policies of using technology with the approach of establishing suitable technology in order to assess the native aims such as desired quality, growing the competency economy and increasing the security of local markets were used (Vecchiato & Roveda, 2010).

Through identifying the technology parameters in each stage of work, each of the parameters are scored and the competency advantage and technology gap of each technology parameter are determined in each stage of work in relation to the competency factors. Based on this table, a prioritized implementation plan will be determined and a

information, tools and techniques that is driven from executive knowledge and science and is used for development, design, production and application of products, processes, systems and services (Dupe, 1990).

The existing technologic programs until the end of World War II, was including radar development of MITRAD laboratory, developing technology of nuclear weapon in Manhattan and improving the treatment and prevention technology. The existing technologic achievements are due to the first efforts in the mentioned fields. In 1950 a linear model about the relation of technology with other components was presented as follows, but latter they found that the relation among components in this model is very simple but in reality, the relation is more complex.

report with guidelines for investment to address weaknesses and gaps in technology and promotion of the technology is presented.

Technology strategy deals with different approaches in the field of identifying technology grounds in the enterprise and recognizing the technologic level in the instrumental position for achieving competency advantages. However, developing the performed activities in the field of competency advantage and quality has made easier the access to the necessary information in this field, as one of its factors after presenting different models of competency advantage such as model 5 of power and diamond by Porter. Therefore lack of the scientific and technologic power of Iran industries causes to increase the number of transferred technologies and unfortunately, identifying it precisely is so little because of lack of enough knowledge in the field of technology and its components in the Iran's industries. In case of loss of investment on the technology, the competency place of industries is lost. Some resin manufacturing applications by Keiton companies are represent as follows:

saturated polyester resin (manufacturing stoving coating), unsaturated polyester resins (auto parts - sculpture - button making - skin polish - stones adhesive and ...), urea-formaldehyde resins (manufacturing stoving

coating and half polyester), high melamine-formaldehyde resins (manufacturing stoving coating), high acrylic resins with short length (manufacturing stoving coating and half polyester), high acrylic resins with medium length (Manufacturing car coating), high acrylic resins with long length (Manufacturing constructional coating), high acrylic resins Zhlykd (Manufacturing constructional coating), thermoplastic high acrylic resins (manufacturing poly urethane coating), thermosetting acrylic resins (stoving Coating), High Poly acrylic resins (manufacturing poly urethane coating). It should be noted that Iran Keiton Factories is included among Private companies that enjoy advanced technology and noticeable expertise in the field of production of types of resins. This company started its activity as the first producer of Polyester Resin in Iran in the year 1975, Licensed by Holz Co. of Germany, During these years the Iran Keiton Company extended its Line of activity accordingly Presently, this company is involved in the production of types of Polyester Resin- Alkyd Resin and Amino of the best quality, serving our industry.

One of the reasons that is the cause of not combination, is the theoretic achievement in the field of technology and industry. Therefore, for developing the technology importance in competency surviving of Iran's industries and then emphasizing on implementing the technology strategy, we shall identify the technology components influencing on competency quality of Iran Keiton Group as one of the measures of technology strategy.

The importance of performing this inspection in the field of entrepreneurship

The factors affecting the competency advantage challenges of entrepreneurial issues are:

- Developing the knowledge of the entrepreneurship after competencies of manufacturing industries
- Discovering and developing entrepreneurial opportunities through the assessment of competitiveness and its influencing factors
- Developing fields for innovation in all aspects of technology, especially compiling the technology strategy

The achievement of this research for the mentioned industry:

- ✓ Identifying the technologic status of small and medium businesses of resin Industry
- ✓ Identifying weaknesses and developing technology of businesses in the resin industry
- ✓ Capacity building of resin technology industry, which is one of the competitiveness strategies of this industry
- ✓ resin industry growth by improving the quality and productivity of businesses associated with this industry
- ✓ Identifying the factors affecting the competency factors in the resin industry

Now that Iran is in the sensitive level of developing, identifying the technology, precisely and seeking the suitable methods to assess it in order to be presented in the SMEs in economy and society is getting more important.

2. Research Literature

According to the complexity of the competency industries resistance in the global economy and according to the important role of technology in decreasing the operational costs, easiness in production and increasing the quality level of accessing to the higher technology, have caused countries to enter a new phase of economic development (Nikula et al. 2010).

Nowadays, the industrial market has passed the global limits. Despite the organizational activities and their impacts, more challenges are due to the current trend in the external environment of the organization and based on competition in the global level. Global competition or remaining in the international markets is one of the challenges of the present age that has a direct impact on the process of moving from idea to product. On the other hand, this phenomenon caused to shorten the product life cycle and technology. The ability to deliver products with quality cheaply and quickly, require the use of latest technology that requires constant management on technology changes (Vecchiato & Roveda, 2010).

2.1. Technology

Many definitions of technology are provided that some of these definitions are as follows:

Technology is a valuable improvement, enjoyment of knowledge and value embedded in products and services which include the collection of the knowledge (Ellul, 1964).

Technology is a method and mean of doing things by which we achieve our goals. Technology is the practical application of knowledge and a tool to help human effort (Sultan, 2007).

Technology is the information that teaches us the way of doing things. A collection that is consisted of information, tools and techniques that are originated from practical knowledge and experience and were used in the development, design, production and using products, processes, systems and services.

Through evaluating the technology factors, we can use the High-tech equipments as a source of industry to evaluate the technology transfer performance and to improve and promote the technology transfer at the time of purchase. The results of this information assessment provide equipments for the suppliers to understand that consumers are focusing on what matters when buying and also it provides a comprehensive framework that helps the company to evaluate the performance of the suppliers for future purchases of equipments (Sultan, 2007).

Assessing the technology is playing an important role increasingly in light of the fact that technology is the ultimate source of competency advantage for the companies and social development in the country (Vecchiato & Roveda, 2010).

Customers' needs make the companies determine the criteria and competency factors to be separated from their rivals. One of these competency factors in the resin industry is the most important competency factor. However, technology is a factor influencing the quality in this industry that has a special place in the resin industry. However, due to changing needs of the customers and entering the rivals' products, it is needed to improve the technology levels. For this promotion, there is limitation in sources such as time and financial limitations especially in SMEs. Thus, for this promotion, strategy is needed and to compile this strategy the tool is

needed. One of the tools to compile the technology strategy, is CAPTECH that has been introduced and recommended by the United Nations Industrial Development Organization (UNIDO). By which technology gaps and needs that impact on the competency factors are determined. The process of technological innovation is a complex of activities that changes the scientific ideas and knowledge to real-world applications and physical reality. Process that converts knowledge into useful goods and services that have economic and social effects (Sultan, 2007).

In fact, it can be said that in this research, compiling technological appropriate strategy that causes to create the competency advantage has caused to create a kind of technological innovation. Thus the main issue that we are going to answer it, is declared as this "what are the effective technological components influencing on the competency quality of Iran Keiton polyester manufacturing company?"

Using modern technology or investment on innovative activities with the existing technology is a way for developing countries. Therefore, the organization that relies on new products and processes in order to increase its share in the market and higher interest rates, at first should seek a way to fill the gap of opportunity costs. The first step is predicting technology. Therefore, in order to remain competency, an estimate of the technological needs of an organization, is such an assessment of the capability of that organization. (Sikka, 1999). It should be mentioned that identifying the organization parameters and then its technological evaluation need the expertise and skills of technological managers that its absence is one of the challenges facing manufacturing industries (Savioz & Blum, 2002).

2.2. Competency factors

Each factor that is a measure for the customer to influence his/her making decision is called competency factor. It is clear that competency indexes are market-oriented and external factors are company-oriented. Some of the competency factors are as follows:

1. Quality competitiveness
2. Competency price
3. Competency delivery

4. Competency after sale services
5. Competition through flexibility for the customer
6. Friendly relationships with customers through flexibility
7. Competition through making the product artistic and ergonomic (adjusted with human needs)
8. Consideration of nature lovers
9. Flexibility
10. Diversity
11. Vertical Alliance
12. Automation
13. Downsizing
14. Sale limitation

To identify the competency factors affecting the competency advantage several models have been proposed that the two models See Conner (1991) with the origin of foreign components are the creators of competency advantage and the model with the origin of external components is the creator of competency advantage and the Porter's model (1980) is concerned with the origin of internal factors. According to the first theory, competency advantage depends on the market emphasizes and commodity prices, the environment, threats and opportunities in this theory is justified whereas according to Porter's theory, competency advantage for an organization is achieved through determining the internal aim of the organization and also trying to achieve it that based on the asset components, the processes, capabilities and characteristics of the company are classified (Nikola et al., 2010).

2.3. Company strategies towards competency advantage

Any organization in the related industry, faces three public strategies in front of the managers that are:

- Offering the cheapest product on the market or cost-leadership
- Offering different products to the market or differentiation
- Focusing on part of the market with the approach of price or differentiation

The aim of two strategies of differentiation and cost leadership, is capturing the whole market and the aim of the focus strategy is capturing small segments of the market. Among

the three proposed strategies the strategy of price leadership, is the most familiar strategy. This strategy aims to reach the status of the cheapest product or service in the market. Adopting such a strategy is very beneficial when the enterprise has appropriate access to raw materials or advanced production technology. The enterprise that is active with this strategy in the industry will cover the entire market and even in the related industries as well. This enterprise not only uses all existing capacity to produce the cheapest product, but is constantly improving its performance and efficiency and innovates modern methods and presenting the cheapest product. Such enterprises produce standardized product with high quality and with no special specifications to the market. . In this case, the enterprise can dictate its price to the market and thereby they narrow the field for their rivals, so that the economic justification for rivals is disappeared. Receiving less profit beside more sale leads such companies to market leadership. Differentiation strategy in this approach tries to achieve a different position in relation to the other rivals in the industry. To achieve such a situation, the enterprise responds to one or more specifications which is important from the buyers' point of view and thus offers a higher price to the market. The origin of this difference may be in the product itself, the method of its delivery, methods of marketing, after-sales service and etc. The most crucial decision of the enterprise in this strategy, is choosing the right specification that in the most buyers' idea, it justifies the value to pay the higher cost (Nasierowski, 1991).

Focus strategy, is the third public strategy. Two prior strategies have looked at the whole market, while this strategy pays attention to the part or parts of the market. The enterprise selects a part of the market with the focus approach and even uses methods different from routine industry methods. As noted earlier, the focus strategy is available in two modes: focus on costs and focus on differentiation. In the first part, the aim of the enterprise is providing the service to the part of the market that has high sensitivity about the price and in the second case, there are customers with special needs on the other producers who have not received a

response to your needs. The most important factor in this strategy is choosing the right parts of the market that are significantly different from the whole market, in addition to it, the selected part should have enough attraction to supply the product and to be economically profitable (Nasierowski, 1991).

2.3.1. The effect of technology on competency advantage

Change from the current level of technology needs to identify the aims of the changes, having definite strategies and correct management of the changes to reach the desired level. Access to new technologies is possible in a company through managing the technology that finally causes to promote the technology level. The technology changes and promoting its level have no intrinsic value, the value of technology changes is due to these changes that causes to increase the competency advantages of the companies (Moors, 2005).

2.3.2. The necessity to identify the prioritized technologies for SMEs

As mentioned above, the technology is the factor to create competency advantage. Typically, each company has unique technology that creates a competency advantage in the company. But usually limited resources of the companies do not allow investment in all kinds of technologies. So there is a need to identify some points. The main point is determining the aim or important and key technologies that the company is trying to achieve them. CAPTECH methodology in the UNIDO model helps it (Moors, 2005).

2.4. Technology strategies

Nowadays, technology plays a key role in competitiveness of the enterprises. So it should be based on the strategic management. The first and most important step in the technology strategic management is developing a long-term program that the enterprise investment priorities shall be determined in it. This strategy is called technology strategy. The main questions to be answered by technology strategy are as follows (Moors, 2005):

Therefore, the ultimate model of this research is based on the CAPTECH model as follows:

Which technologies are the sustainable competency advantage based on?

Are all these technologies available?

What are the best ways to achieve these technologies?

How can we gain the most profits out of technological assets and capabilities?

2.5. Competency quality

Competency quality is one of the factors to gain the competency advantage and it is influenced by internal and external factors to describe the economic power of a country, organization or group that compares it with its rivals in the economic comparison (Porter, 2009).

3. Methodology

The existing paradigm in this research is applied and it benefits the mixed methods (qualitative - quantitative). In the first phase that is the research quality phase, the researcher collects the information through interviewing with the experts based on the CAPTECH model and also through deeds and documents based on heuristic approach then the processes, systems and components influencing on competency quality and also the technology components influencing on it are identified and the next phase that is the research quantity phase, uses network analysis process to determine each priorities.

3.1. Research Model

According to the available studies, articles and resources, the main components of technology were identified. From the Scup's point of view, technology has 4 sides:

Techno-ware, Info-ware, Orga-ware and Human-ware; but from the CAPTECH point of view it is a combination of the following cases:

- basic operational infrastructures
- product technology
- process technology
- skill and scientific bases
- systems and procedures
- informational support
- optimization and support level
- management approach

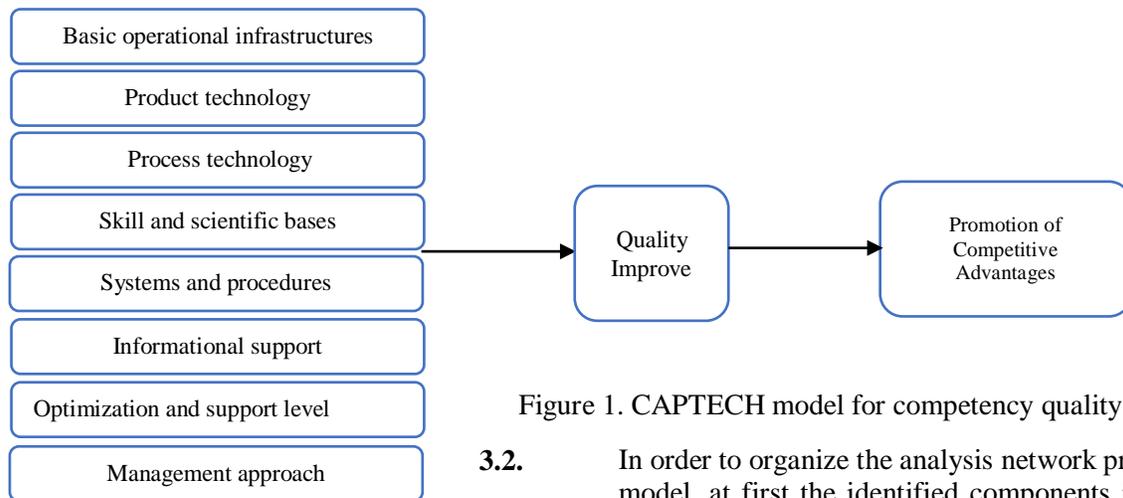


Figure 1. CAPTECH model for competency quality

3.2. In order to organize the analysis network process model, at first the identified components in the CAPTECH model were named.

Analysis Network Process Model (ANP)

Basic operational infrastructures	A ₁
Skill and scientific bases	A ₂
Management approach	A ₃
Optimization and support level	A ₄
Product technology	A ₅
Process technology	A ₆
Informational support	A ₇
Systems and procedures	A ₈

Table 1. The technology components identified by CAPTECH model

The final model is designed as follows to be evaluated by the experts.

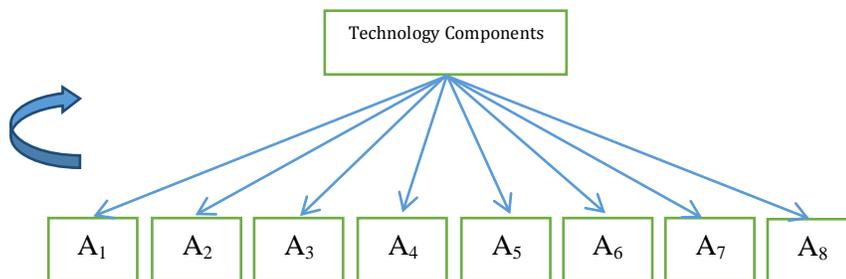


Figure 2. ANP model for ranking the technology components

4. Research Findings

After distributing the paired-comparison questionnaires and collecting them, the data

were entered into the software and at the end, their weight was obtained. The obtained results were shown in the following table:

Components	Final Weights	Final Rank
Basic operational infrastructures	0.2653	1
Skill and scientific bases	0.1702	3
Management approach	0.0849	6
Optimization and support level	0.0353	8

Product technology	0.0925	5
Process technology	0.1953	2
Informational support	0.0401	7
Systems and procedures	0.1164	4

Table 2: The final weights and the rank of each components

After obtaining the weights and the final rank of each of the technology components we'll go to the discussions and conclusions.

5. Discussions and conclusions

The obtained results introduce a list of the most important priorities of technology that the in charges and decision makers of Iran Keiton Polyester Factory can make the best decisions based on them. Because prioritizing the technology components is performed through specialists' opinion, the managers can take advantage of it to prioritize their decisions.

In this list, the main operational infrastructure with top rank from the experts' point of view, has the greatest importance. Decision-makers shall improve operational infrastructure to promote the competency quality of their products. With the development of these fields, the way is opened for increasing the competency quality. The process technology and skills bases and the effective knowledge are in the next importance. Developing the educational concepts through the development of organizational learning can contribute to develop the effective knowledge and skill bases.

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