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Innovation in Silicone Industry by a Developing Country In Case of Iran

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Abstract:
Today's challenging and competitive world, forces companies to come up with innovation. In recent decades also, few brand-new industries emerged which brought profound changes to human life and created potential opportunities for companies. One of these industries is silicone industry. Silicone industry has grown extraordinarily in recent decades in developed countries and on the other hand, customers have become more knowledgeable, sophisticated, and attentive than ever. As a result, the demand for healthier and safer products has boosted accordingly. The main question here is if less developed countries access to enough advanced silicone production technology like the other developed countries or they still have a long way to gain enough knowledge and technology and how they can come up with innovation. The main purpose of this paper is to investigate Silicone industry in developing countries, exclusively Iran, and how they can reach advanced technology and to find out available opportunities in this industry and how to utilize these opportunities by the help of innovation. Silicone material is being used in developed countries for almost a century. Unique and amazing specification's of innovative silicone material improved and influenced human's life from different aspects. But this industry is quite new in many developing countries, including Iran due to lack of advanced technology, knowledge, expertise, and etc. Considering all the above mentioned points, there are a plenty of potential opportunities in this industry which can be exploited by innovation.

Keywords: *Innovation, silicone industry, advanced technology, developing countries*

1. Introduction

Innovation is becoming one of the main prerequisites in company growth and survival due to evolution of the economic environment (Wheelwright and Clark, 1992; Bueno and Ordon ez, 2004). In today's advanced and competitive economic world, innovation has a profound influence on economic growth and human welfare. In addition, customers are more aware of impacts of products and businesses on their lives, environment, and society, as a result, many countries are experiencing transmission phase in their society and they are switching to more organic, safe and environmentally responsible materials. Balachandra and Friar (1997) argue that the successful introduction of new products and technologies is mandatory for the growth and survival of organizations and economic growth and development. The question that arises here is how companies in less developed countries which suffer from lack of technology and infrastructure can grow and become a part of global competitors. In this paper, we aim to explain technology innovation by the help of a case study.

One of the new arrived materials which have improved human life in many ways is silicone. Many western scientists have already researched silicone in detail and have gained a good level of technology and knowledge about its applications, benefits and accordingly few western companies have invested in this industry. Many American and European scholars had enough studies on the structure and mechanism about how to expand and enlarge technical capability in developed countries, but in case of Iran, there is almost no research or study.

2. Literature Review

For more than a century a large number of scholars have done plenty of academic researches about technological innovation and have defined different innovation theories accordingly. An early approach of innovation, argues that innovation is a dependent factor of the firm which is led by entrepreneurs through initiating and importing new technologies. This approach altered moderately in the following decades and many innovation researchers used to believe that innovation is a linear process which starts from in-house R&D and basic researches of the firms and the innovation processes could be supported or accelerated through the increase of basic research (Martin 2010; Godin 2005).

National Innovation System (NIS) was introduced in early 1980th. This new approach does not rely on a single factor, but on various factors such as the country's government and authorities, legal and social conditions, education system and research centers and bring all these independent and interacting variables into a single system (Lundvall 2010; 2-3). NIS has shown that innovation system has different features in developing and emerging economies comparing to industrialized economies. The majority of the firms in developing countries does not access basic knowledge and does not have enough capacities or facilities to conduct their own R&D. For instance, in China, much of the innovation has incremental nature and almost always technological development involves the absorption of foreign technologies (Pietrobelli, Rabellotti 2009; 217). Consequently, the technology flow is often from industrialized countries to less developed economies and cross-

national inter-firm connections are extremely important for technology innovation and industry upgrading. In case of China, this relevance not only belongs to a single region, but also whole regions (Cf. Fu2008; Yang, Hui 2012).

In the last two decades, innovation is studied from different perspective. In this approach, innovation is discussed from the transnational dimension of innovation instead of systematic concept. Transnational approach argues that innovation is not confined to a closed system of a region, but it is a part of a chain which has gone beyond the regional or national borders. This emphasize is due to the importance of trans- and multinational cooperation, foreign invested enterprises, and multinational cooperation (Boutellier, Gassmann, Von Zedtwitz 2009; 3). This approach has been improved over the last years. Scholars explain how firms in developing economies can reach to global markets by transnational innovation (Kaplinsky, Morris 2000; Gereffi, Humphrey, Sturgeon 2006).

From the technology point of view, innovation is classified in two main groups: imitation innovation and independent innovation. Imitation innovation is a pattern of innovation which comes from the external world, on contrary, independent innovation is a pattern of innovation that is gained from interior enterprise and through R&D process within the organization.

In most of the developing countries independent innovation is most common, but in developing countries, in order to develop an industry which suffers from lack of technology, imitative innovation may be an excellent and leading innovation method. Firms in emerging economies tend to catch up with the technology frontier in advanced economies through formal and informal knowledge and technology transfer channels (Forbes & Wield, 2008). For developed economies with supreme technology infrastructure, independent innovation is applicable, but not for a country like Iran.

The below graph depicts innovation through both imitation and independent innovation. The more capability a company has the more independent, innovative the company will be.

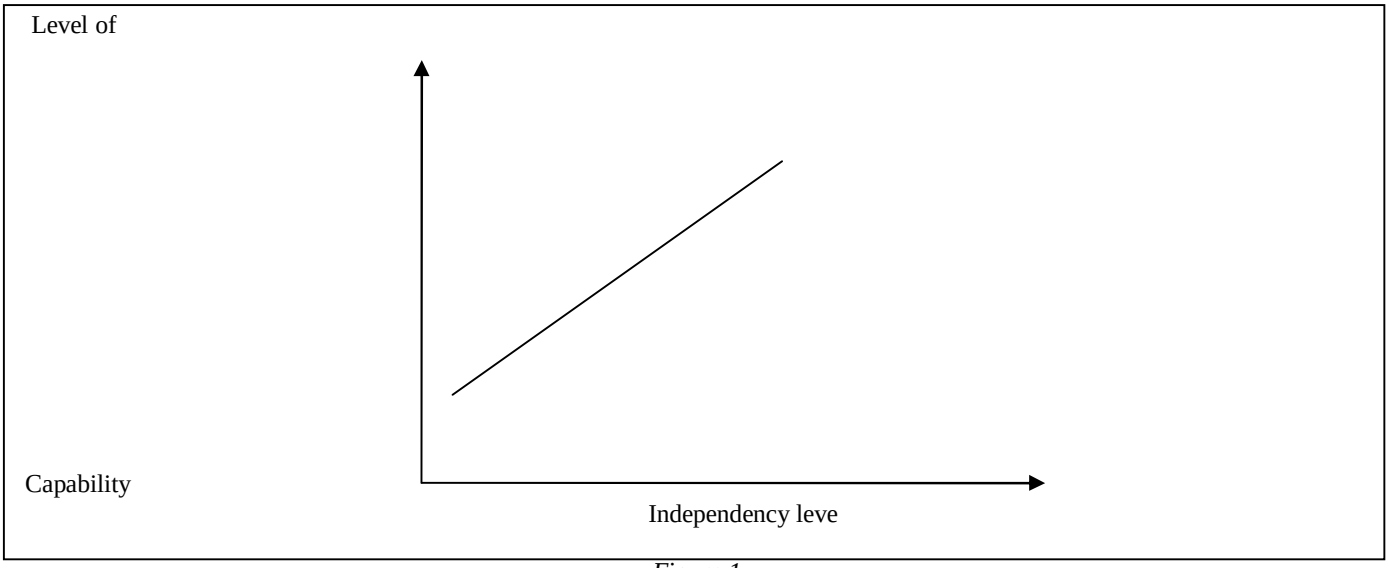

Figure 1

3. What is Silicone?

Silicone is a man-made polymer made of silica, one of the most available materials on the earth. Silicone is considered as a kind of plastic and has many plastic-liked properties such as: flexibility, malleability, clarity, temperature resistance, water resistance but it has many unique properties which make it superior to other plastics such as:

- Heat resistance
- Water resistance
- Chemical stability
- Electrical insulating
- Weather ability and ozone resistance
- Wide temperature range (-100 to 315 C`)
- Sustainability and long life resistance

And while water resistant, it is also highly gas permeable, making it useful for medical or industrial applications where air flow is required. It's also easy-to-clean, non-stick, and non-staining, making it popular for cookware and kitchen utensils. Silicone is often used for baby nipples, cookware, bake ware, utensils, and toys. Silicones are also used for insulation, sealants, adhesives, lubricants, gaskets, filters, medical applications (e.g., tubing), casing for electrical components. As silicone is made of silica which is available in the nature in a huge quantity, so it reduces dependence on petroleum-based organic materials. Also it decreases raw material usage and energy and water consumption in manufacturing processes and enables us to use clean, recyclable, and renewable energy resources.

4. Brief History of Silicone Industry

Silicone industry is almost a new emerged industry in the world and due to its unique specifications; it has brought great value to societies. At Stone Age, the evolution of silicon-based technology began, when the ancient Romans learned how to turn sand into glass. At 18th century,

Dr. Frederick S. Kipping, for the first time commercialized the sticky messes which he named Silicone. In 1940s, Dow Corning Cooperation was established especially to explore and develop the fabulous potential of silicones for the first time. After few years of exploration, Dr. Earl Warrick of Dow Corning Cooperation invented the first commercially viable silicone rubber (1940s). Accordingly, some other companies emerged in this industry, mainly in America, Europe and East Asia such as Momentive Co headquartered in New York, HRS Co headquartered in Korea and joint venture with Dow Corning, KCC, ShinEtsu, Rhodia. With less than a century of history and around seven decades of industrial and consumer use and thousands of laboratory studies which confirmed silicones are safer for people, manufacturing processes, and environment and it makes human's life and environment safer and more sustainable.

Chemistry has added substantial value, comfort, convenience, and economic opportunities to our society. Developed countries have gained technological innovation and economic growth through the R&D; as a result, they have created safer environment and healthier life by the help of silicone. But scenario is absolutely reverse for most of the developing and less developed countries. Unlike USA, Europe and East Asia that there are plenty of the silicone manufacturers with a great level of technology, there is almost no silicone manufacturer in West Asia and Middle East. In case of Iran also, there was not any silicone manufacturer. Only a few companies imported raw material from Europe and produced few ordinary products. Consequently, there are considerable economic opportunities in a country like Iran. The literature in developing economies introduces different innovation strategies and different evolutionary methods for technical innovation (Kale & Little, 2007). Like many East Asian companies where small and local companies move from learning to improvement of products and specification, and creating an intermediate level of technological capability and consequently advanced level of technology either alone by themselves or in partnership with a foreign company.

5. Case Study of Silicone Nab Baspar Co.

Silicone Nab Baspar Co. is the biggest silicone product manufacturer in Iran and Middle East. This company started its activity in 2008 as a local and small company with few personnel in a small plant and developed to the largest silicone company in Iran. For the first few years, this company only produced simple silicone products such as tube, profile, and home appliance.

The development of this company can be divided into two phases. At the beginning SNB was established as a local company and worked a few years in this way in a small factory and did not have enough technology to produce the raw material so imported from other countries mostly Korea and China. One of the biggest Korean suppliers is HRS Co. which supplies raw material to SNB. After few years of mutual cooperation and business relationship, HRS Co, dedicated its exclusive agency to SNB and this is considered as the second phase and milestone in the history of this company. HRS Co. not only supplies raw material, but also support the technological information which enables SNB to expand its business and market. Also creates good opportunities for this company in foreign markets.

5.1. Swot Analysis; Strengths, Limitations

Silicone industry has many benefits for developing countries, exclusively Iran, for various reasons. There are few companies that produce silicone raw material in the world and there was not any in Iran just till few years ago. Silicone Nab Baspar Co. (SNB) as exclusive agent of HRS Co. (Korean silicone manufacturer and exclusive agent of Dow Corning, USA) as the only manufacturer in the silicone industry in Iran emerged and grew from a small enterprise to the biggest silicone product manufacturer in Iran and Middle East.

This company, as a leader in silicone industry in Iran and Middle East, enjoys various opportunities and strengths.

First of all, SNB has gained know-how and technology in this industry as an exclusive agent of a foreign company which have gained a good reputation and trust among their customers and suppliers and also made this company pioneer in this industry in Iran. SNB as the only silicone product manufacturer in Iran and Middle East, who has production knowledge and technology, faces no competition at least in near future and this can be considered as one the most significant strengths of this company.

Second, production cost has great importance in business and production process which can lead a new born company to success or failure. Unlike most of the developed countries, production cost is low in Iran due to low labor cost and low energy cost. These two costs have substantial impact on production cost which reduces the final production cost crucially.

Apart from the above mentioned explanations, companies are directly or indirectly influenced by international and external factors. One of the factors which determine the future of an international company is exchange rate. In last few years, international society put many sanctions against Iran which caused value reduction of Iran's currency by more than three times. Even though these sanctions had irreversible destructive impact on Iran's economy and restricted the import in many industries, but low exchange rate can accelerate the export in general.

Finally, geographical location is another critical element in success of a company and can be considered as an opportunity for SNB. Iran as one of the leading countries in Middle East in silicone industry, can access many foreign markets with high demand and great potentials and its proximity to developing countries, can reduce transportation cost considerably. Not only Iran is close to the other developing and Middle East countries, but also it is close to East Europe as well. A big amount of silicone raw material is supplied to Europe yearly by China, which requires higher transportation cost duo to the long distance between China and Europe. Considering these points, Europe also can be a good opportunity for Iran, which is closer to Europe and consequently the transportation cost will lessen.

But SBN faces some limitations and threats also. One of the most important and threatening issues pertain to political instability in Iran. Many authors highlight the negative impacts of political instability. Alesina et al. (1996) believes that economic growth in a country is much lower in times of political instability. Siegel and Roe (2008) show that political instability prevents financial market developments. So this instability may tarnish business relationship between Iran and other partners and damage their cooperation.

5.2. Lessons for Developing Countries

Any developing economy requires a condition under which it can develop and grow. One of these prerequisites is technology innovation. The main point here is if developing countries have adequate knowledge and infrastructures to establish a good R&D center in order to research and achieve novel technology or if they can be pioneer in an industry. If not always but most of the time the answer for this question is negative. Consequently, technology transfer can be a good option for developing economies. The empirical literature indicates that there is a

positive relationship between economic growth in developing economies with interfere of developed economies in various ways, such as Foreign Direct Investment, Joint Venture of two companies, Partnership, Transnational Production and Innovation Network, and etc.
India is a good example, which experienced high economic growth and development due to high entrance of foreign investment to this country. China is also another example. Chinese high tech industries are substantially less involved in R&D activities than those in advanced countries (Yang, Hui 2012; 1). As a result, foreign-invested R&D has a positive influence on China's innovation landscape and interaction with foreign high-tech foreign companies is a primary source of knowledge for many Chinese firms. Taiwan, Hong Kong, Indonesia, and Malaysia are good examples in this regard.
As evident from the literature, developing countries which suffer from lack of technology can experience higher economic growth and development with interference of foreign advanced economies. The other developing countries which have prerequisites for accepting the entrance of foreign companies to the country can enjoy the economic growth like Iran.

6. Conclusion

In today's challenging and competitive business world, companies need to be innovative in order to survive and grow. On the other hand, customers are more educated and sophisticated than before and they prefer to switch to more reliable, environmental friendly and safe products and improve the quality of their life. From this paper, it can be concluded that small companies in less developed countries can't grow unless they resort innovation and they can move from learning to advanced technological capability either by independent innovation and alone or by imitation innovation and in partnership with a foreign company. A new established company like Silicone Nab Co. in Iran is a good example, which developed from a small business to a leading company in Iran and Middle East. In addition, because this industry is almost new in these countries, so there is no competition and Silicone Nab Co. can enjoy this monopoly for years. In next few years, by expanding its market, can access foreign markets in the neighbor countries. Not only lack of technology in the surrounding countries have created many opportunities for Silicone Nab Co. but also due to geographical location has enabled Iran to access East Europe's market and lower production cost in Iran also has added extra advantage. Considering all these points, we come to conclusion that Iran has considerable potential opportunities in silicone industry and in this paper we choose silicone industry because this industry is still new and has a long way to reach market saturation.

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