Reverse Innovation in Developing Countries: The Case of Turkey

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ABSTRACT

Technology enables firms to conceive their core-competences which they need to perform competitive advantage. Innovation is one of the key factors that creates competitive advantage by conceiving new product, process, organization and market and it has a strategic importance in global market conditions. Regarding its own meaning innovation must innovate itself. Reverse innovation an extension of innovation that creates competitive advantage in the 21st Century and a new form of innovation which means innovating in emerging and developing new products, processes in emerging and developing markets then distributing them in developed markets back. The purpose of this paper is to explore the construct of competitive advantages scales of Turkish firms which use the approach of reverse innovation in the global market by underlying the new concept of innovation all over the world.

KEYWORDS: Reverse Innovation, Competitive Advantage, Innovation Resources of Turkey

Mankind has been in a struggle for survival by constantly changing and adapting continuously throughout its history. The changes that have taken place in society and human life since the early ages have revealed the concept of business after a while. Businesses have changed over time, keeping pace with the differentiation process. By the revolution of industry and information technology, 20th century had a spectacular importance which was a period of the most intense experience of change and transformation (Turunc, 2006). The acceleration of the "Industrial Revolution" initiated the process of change; the widespread use of mass media which has caused individuals to interact with others without recognizing language, religion, gender, social status, cultural and ethnic identity differences. The changing physical and political geography of the world, industrialization dynamics and the development of urbanization have changed theories of the economy so new systems have begun to emerge (Yahyagil, 2001).

The metamorphosis and differentiation observed in nature and society within a certain period of time is called "change" (Ozalp, 2000). Change is inevitable and it means to bring something from one level to another (Kocel, 2005). In the changing world, consumer needs that differ every minute also determine the direction of change of enterprises to a large extent. It is one of the main reasons why the demands of today's consumers, combined with the increasing level of consciousness, appreciation and sensitivity (Gursu, 2014), have initiated the efforts of enterprises to innovate. Today, consumers are trying to solve problems and increase the quality of life by using the technology at the highest level, and this alteration, which is reflected in the consumption habits, also forces the enterprises to change. In a rapidly changing competitive market, the necessity and importance of innovation is emphasized in order to gain sustainable competitive advantage. As Kavrikoglu et al. (2000) have noted, creativity and innovation are the basic advantages of enterprises. It is asserted that enterprises can compete by constantly changing and renewing their products, services, production methods and their administrative mentality. In this regard, one of the most outstanding words of science and technology world in recent years is ‘innovation’ (Eraslan et al., 2008). Schumpeter (1939) emphasized that innovation would bring about economic growth and

that private sector profits are based on successful innovation efforts. Many 'innovation' definitions have been made by now. Some of them is gathered in the table below.

Table 1: Definitions of innovation

	Innovation
Schmookler-1966	"When an enterprise produces a good or a service or uses a method or input that is new to it, it makes a technical change. The first enterprise to make a given technical change is an innovator. Its action is innovation."
Knight-1967	"...the adoption of a change which is new to the organization and to the relevant environment."
Freeman-1982	"Innovation is the introduction of change via something new"
Roberts-1987	"Innovation=invention+exploitation... The invention process covers all efforts aimed at creating new ideas and getting them to work."
Porter-1990	"Companies achieve competitive advantage through acts of innovation. They approach innovation in its broadest sense, including both new technologies and new ways of doing things."
Drucker-2007	"…the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced"

Source: Schmookler, 1966; Knight, 1967; Freeman, 1982; Roberts, 1987; Porter, 1990; Kocel, 2005; Drucker, 2007

The term of innovation; is defined as the application of a new product, concept or known principle in a way that will create economic added value again presently (Gursu, 2014). A generally accepted definition of innovation has been documented in the OECD-Eurostat Oslo Manual (2005) as "innovation as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. Countries need to quickly transform new ideas into technical and commercial success in order to sustain economic growth, competitiveness and employment opportunities (Oguzturk & Turkoglu, 2004). A country with superior innovation capabilities and an effective national innovation system; creates a sustainable economic development process and increases competitive power (Isik & Kilic, 2012).

According to Porter (1991): a nation's competitiveness depends on the capacity of its industry to innovate and upgrade. Companies gain advantage against the world's best competitors because of pressure and challenge and achieve competitive advantage through acts of innovation. They approach innovation in its broadest sense, including both new technologies and new ways of doing things. Innovation can be manifested in a new product design, a new production process, a new marketing approach, or a new way of conducting training. Australia, Denmark, Ireland, Finland, Norway and USA etc. the growth of the overall productivity of labor and capital in countries is associated with significant technological developments. The increase in labor and capital productivity is due to improvements in managerial practices, organizational changes, production of goods and services (Unlukaptan, 2009). Analyzing the economic growth patterns of the 90s in relation to innovation and information technology, the OECD has found that growth is higher in some countries, such as Ireland and South Korea, which continues to use technological innovation as an important means of reaching developed country levels. Innovation contributes greatly to the employment. Innovation-based growth reduces income inequality and provides a higher employment rate for non-qualified workers (Elci, 2006). Studies carried out within the United Nations Millennium Project (UNDP, 2001) show that: science, technology, and innovation is one of the essential conditions for the development of humanity. Developed economies around the world owe their power pursuing technological innovations and implementing skills. As Unlukaptan (2009) stated, the main driving forces of high development performance are technology and innovation. Innovation is the key to economic growth, increased employment and high standard of living (Sati & Isik, 2011). For example the existence of technological developments and the monitoring and support of these developments on government basis have an impact on the growth of the US economy (Schacht, 2000).Another country with high competitiveness in IMF reports is Finland. It has invested in innovation, raising its per capita income from $ 10,470 to $ 29,000

between 1985-2004, more than doubling. As an example, Nokia is a Finnish brand that has a lot of market potential in many countries around the world (Elci, 2006).

According to The Global Competitiveness Report of World Economic Forum (2013–2014) Turkey fell behind in the main components of Innovation: which were Quality of Scientific Research Institutions, R&D Expenditures of Enterprises and University-Industry Cooperation in R&D. Gross Domestic Expenditure on R&D in Turkey is $ 6.581 million in 2012, up 17.1% from the previous year. If a comparison is to be made; only three enterprises of US; Ford Motor ($ 6.78 billion), Pfizer ($ 6.30 billion) and General Motors ($ 5.68 billion) spend on R&D more than Turkey in 2006 (Gursu 2014). It is evident that all of the Turkish R&D expenditures do not reach even the expense of an international company. Although less-advanced countries can still improve their productivity by adopting existing technologies or making incremental improvements in other areas, for those that have reached the innovation stage of development this is no longer sufficient for increasing productivity. Firms in these countries must design and develop cutting-edge products and processes to maintain a competitive edge and move toward even higher value-added activities (The Global Competitiveness Report, 2013-2014). As Uzkurt (2010) stated, the positive results that innovation brings to society and the economies are: positive social welfare, increased living standards, sustainable economic growth, employment increase, efficient use of resources, increase of exports, increase in patent numbers, contribution to regional development, effective use of energy resources, increase of entrepreneurship and decrease of external dependency.

Given the above-mentioned innovation's benefits for the society and the economy, it is imperative that the term of "innovation" be addressed in terms of poor-developing countries, including Turkey. The most important feature that differentiates developed countries from developing countries is "technological development levels" and "technological efficiency skills" (Gursu, 2014). Innovation will be an important opportunity and impetus in the development of poor countries. Moreover, the poor countries are mega-markets with micro-consumers (Govindarajan & Trimble, 2013). This is a striking phenomenon for the rich country's multinational companies which are faced with danger of market saturation. They have to develop the policy of expansion. For example, even China alone, which has 1.3 billion consumers with high growth rate and breadth, is an extremely worthwhile market (Huang & Anderson, 2013).

Table 2: Mainstream theories and reverse innovation

Topic	Mainstream view	Observed aspects of reverse innovation that do not fit with mainstream
Innovation	• Innovations trickle down from rich to poor countries • Innovations begin with lead users and spread to the others	• Innovations may also occur in poor countries and 'trickle up' to rich ones • Reverse innovations may begin with laggards rather than lead users
The Process of Internationalization	• Multinationals originate in rich countries and spread globally, including to poor countries, based on proprietary technologies/brands	• Multinationals also originate in EM; and spread globally, including to developed countries, leveraging home-based innovations
Strategy And Management of Multinational Enterprises In Developed Countries	• DCME, develop global product platforms in triad markets and adapt them for EM; • DCME give global product mandates to subsidiaries in other triad markets	• DCME develop new product platforms in EM; for emerging markets; • DCME give global mandates for some products to subsidiaries in EM;
Foreign Direct Investment Spillovers	• Local firms in emerging markets; capture spillovers from DCME that invest in EM	• DCME capture spillovers from local firms when they invest in EM (i.e., learning is bidirectional)

Source: Govindarajan & Ramammurti, 2011 (DCME: Developed-country multinational enterprises EM: Emerging markets)

The term of "reverse innovation" which is a very new phenomenon, precisely emerges at this point. Govindarajan & Trimble (2012) simply define reverse innovation as "any innovation that is adopted first in the developing world. Reverse innovation is a special category of innovation (Govindarajan

& Trimble, 2013). Particularly noteworthy is the fact that "innovation" is not contrary to the basic theories, but instead introduces a new action framework based on the same theories. Table 2 presents threats and opportunities in terms of mainstream theories in four key areas which are reverse innovation, the process of internationalization of innovation, strategy and management of multinational enterprises in developed countries and diffusion of foreign direct investment spillovers. The 2nd column lists the mainstream views and the 3rd column lists the observed aspects of reverse innovation that do not fit with mainstream for each topic listed in the 1st column.

As mentioned above, the dynamics of "change", whose innovation is obliged, have begun to require the change of innovation itself. The development of the innovation process has begun to create a kind of saturation in the transfer of technology, process and product and innovation to the developing countries from the developed countries, and it has started to follow the opposite course as it is found in many examples in the world. In other words, reverse innovation is to innovate for low-income consumers in developing countries and then distribute these products to the whole world that everyone can buy (www.capital.com.tr). Nowadays innovation is displaying a new - and contrary - situation that is starting to show a leap from developed and poor countries to developed countries (Figure 1), which is getting much more interesting for researchers day by day. Only 7% of each patent application made in Turkey today belongs to Turkish enterprises and entrepreneurs (Gursu, 2014). This means that foreign capital has already discovered the potential in and has begun to realize some of its research activities within the borders of Turkey. For example, IBM invested $ 1 million to build the Istanbul Innovation Center in its headquarters. IBM spends more than $ 6 billion a year on R&D. This is much more than the total income of many giant businesses. IBM, which has more than 200 engineers, scientists and technical staff, has received over 40,000 patents and has been awarded a patent champion. It has 8 research centers in different places of the world. Likewise, P&G, which has 27 R&D centers around the world, has more than 36,000 active patents and more than 60,000 registered trademarks (Altun, 2009).

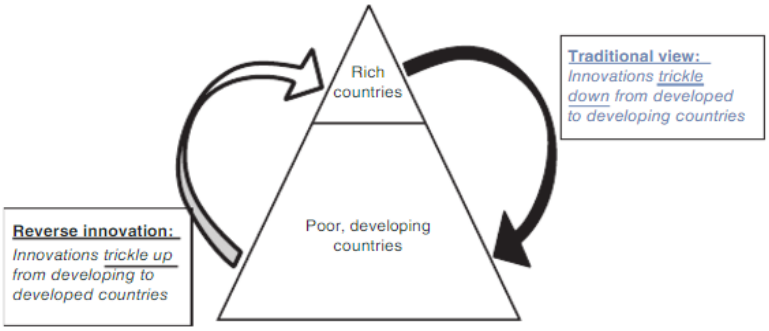


Figure 1. Reverse innovation
Source: Govindarajan & Ramammurti, 2011

At present, many companies in the pharmaceutical industry and electronics industry and so on are increasing in number, abandoning traditional approaches and establishing the global network. Canon with 8 laboratories in 5 countries, Motorola with 14 laboratories in 7 countries and Bristol Myers Squibb in 12 laboratories in 6 countries, maintain R&D (Bulbul et al., 2006) Multinationals are on the path of setting up R&D centers by spending much lower money in emerging markets instead of their own by force of the reverse innovation. These centers can focus on the top ten emerging markets which are Brazil, China, Indonesia, South Africa, India, Mexico, Nigeria, Russia, Turkey and Vietnam, that account for more than 60% of the GDP of the world population and countries (Govindarajan & Trimble, 2013). Innovation and distribution of world supply in the global economy have begun to change with the rise of emerging economies like China and India.

Poor, emerging markets are no longer taking innovations from developed countries, but from time to time they contribute to the rest of the world in terms of innovation, including developed countries (Govindarajan & Ramammurti, 2011). Examples of recent innovations that are well known in emerging markets include Tata Nano, Grameen Bank (microfinance), General Electric's ultrasound, Embraer's regional jets, the famous Chinese brand BYD's electric car, Bharti Airtel's the cheapest wireless phone and Nokia's cheap mobile phones. A few of these innovations occur in poor countries and 'trickle up' to rich ones. However, innovation in poor countries seems to be much deeper and wider than these examples, and many of them will be international in the future.

Innovations in emerging economies do not tend to be technological inventions as in developed countries. They even combine existing knowledge and technology with unusual and innovative combinations in solving local problems and in using new process and business models. Companies that lead this innovation effort can also be local or foreign multinationals, operating in emerging markets. For example, GE's ultra-low-cost ultrasound and ECG machines were initially managed for use in China and India, but with the funding of local and foreign affiliates and leadership of development teams in these countries. The invention of Tata Nano was the same (Govindarajan & Ramammurti, 2011). Because poorly funded rural clinics couldn't afford the company's sophisticated ultrasound machines, GE has not been able to sell medical equipment in China and India. So the it has entered these markets by developing portable ultrasound out of a laptop equipped with special peripherals and software. It not only became a hit in China and India but jump-started growth in the developed world by pioneering applications for situations where portability is critical, such as at accident sites. The same innovations have trickle up again in the US market today, and many places like emergency services, small clinics, ambulances have begun to be used as alternative medical devices (Immelt et. al., 2009). Just 6 years after launch, compact ultrasounds accounted for $278 million in global sales with an annual 50-60 percent growth in revenues (Govindarajan & Ramamurti, 2011).

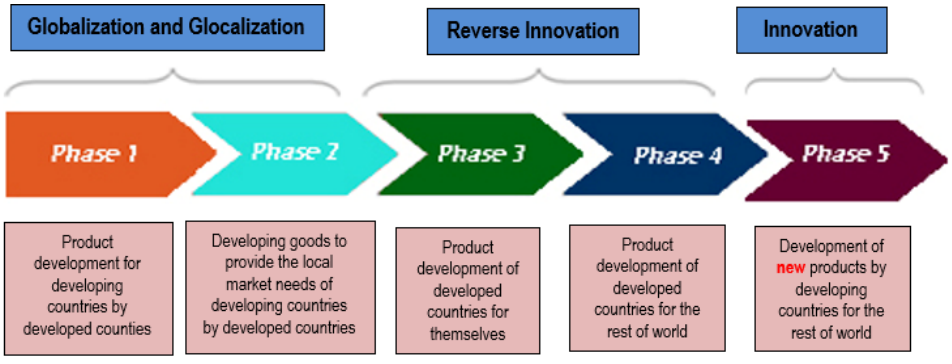


Figure 2: Global innovation development process
Source: ALTAY, 2011; Govindarajan & Trimble, 2013

As seen in Fig.2, reverse innovation reaches the phase of innovation for the whole world after a while. Today, 70% of the world's economic growth takes place in developing markets and it is estimated that 40% of this growth is only in China and India. According to the UN World Investment Report (2015), there are currently 21,500 international businesses operating in the developing world. The belief that new ideas developed in the laboratories of the western world are exported to the developing world is changing now. The world's largest international companies have begun to shift R&D departments to the developing world. Thus non-western businesses are becoming new centers of power for many new innovations, from telecommunications to computers. 98 of the Fortune 500 listed companies have R&D in China and 63 in India. Some of them have more than one R&D department in these countries. While globalization is thought to be governed

by the western world, today the companies which are not western such as ArcelorMittal (Steel-India), BYD (Battery-China), Cemex (Cement-Mexico), Jet Aircraft (Aerospace Industry-Brazil), Infosys (IT-India) are leading the world in different sectors and also leads to a change in this view. The number of enterprises in Brazil, India, China and Russia's on the Financial Times 500 list increased from 15 to 62 in 2006-2008, thereby doubling the number to four. Most local businesses operating in emerging economies are exploring new production and distribution channels; by these new business models, they produce cars at a price of $ 3,000, computers at a price of $ 300, and mobile phones at a price of $ 30 (KSSD, 2010).

Although the term of reverse innovation has been put forward to point out that innovation is now reversing from the West (Europe-America) to the East (China-India), it also has other sub-meanings within itself. In the past, innovation has been taking a direction towards customers from companies. They developed new products/services by their R&D/P&D teams to the liking of Western customers and were trying to achieve success. Today, through developing technology and communication possibilities, customers (both in the West and in the East) demand and eventually obtain the products/services they desire in parallel with their increasing purchasing power. In summary, the course of innovation has now reversed in every respect, now there is a flow from east to west and from business to customer (Rakici, 2014). The MAC400 ECG device, GE's first reverse innovation product developed for China, is now sold in 194 countries (in Europe and especially in France) (Govindarajan & Trimble, 2013). As one of G. Korea's giant companies, Samsung has spread its activities to 58 countries, with annual average exports of innovative products reaching $ 150 billion (Elci, 2006).

It is precisely at this point that reverse innovation does not only change the flow direction of innovation, but also the needs of consumers in poor and developing countries' markets should also be taken into consideration. Today's consumers prefer technological products at the highest level when determining their needs or looking for their solutions. This is not only true for consumers living in poor, developing countries, also for consumers living in developed countries. The only difference is that there are fewer people in rich countries who spend a lot of money, while in poor and developing countries there are many people who spend a lot of money (Govindarajan and Trimble, 2013). In addition, the fact that there are also poor people in rich countries should also be considered. This necessitates a redesign of high-priced products through innovative processes in terms of price, ease of use, portability, maintenance, etc. for consumers in the remaining 60% of the world. Many businesses that reach the saturation point in developed markets are finding themselves looking for new markets and entering the remaining 60% of the world's poor and developing markets. Adopting rules-based reverse innovation will do much more than support multinationals in developed countries; will stimulate the global product segmentation of such businesses, provide for the continued vitality of traditional markets for years to come.

Examples of Reverse Innovation in Turkey

The examples of reverse innovation in Turkey are remarkable. The Turkish Exporters Assembly (TIM) emphasizes and supports the importance of innovation-supported export increase at every opportunity. Innovation is one of the most important points to reach the goal of Turkey becoming one of the world's top 10 economies in 2023 (ATKearney, 2014) Turkey's Innovation Strategy 2023 is one of the most important steps taken in this manner. (Sertkaya, 2012) In Turkey, the market of smartphones is widespread among the communication technology products that are widely used in the world. The number of Turkish smartphone brands is increasing day by day. The negative impact of nearly 15 million mobile phones imported from Turkey each year on the current account deficit has reached $ 5 billion.

Table 3: Examples of reverse innovation in the field of communication in Turkey

Casper	Casper is one of the most experienced brands in domestic mobile phone production. Having sold more than 1 million smartphones in 3 years, the company's goal is to become one of the top three smartphone brands in Turkey, growing 3-5 times every year until 2020. Casper, whose current market share is between 2.2-2.5%, aims for 15% market share in 2020.
Vestel Venus	The domestic mobile phone Venus, which has been started to be exported, is trying to reduce the current account deficit by reducing foreign branded phone imports. Vestel Venus is also seen as an important opportunity to increase Turkey's export capacity.
Reeder	Since its penetration of the domestic tablet and domestic mobile phone markets, Reeder, which has sold 1 million units targets to produce 1500 units in 2017.
Kaan N1	The invention of Kaan N1 continues to develop new models.
AirTies	AirTies develops products that connect electronic devices and people each other by internet and wireless in Turkey. Selling more than 10 million devices worldwide, AirTies designs its own products as opposed to competitors who are dependent on R&D teams and chip producers. AirTies, which is mighty in the European market, especially in the UK, allocates 10% of its products to R&D every year.

Source: Milliyet, 2016; Turkishtime, 2015

The remarkable examples of reverse innovation in Turkey are in the health field like the ones in the world. The number of such and similar reverse innovation examples in the country is increasing day by day.

Table 4: Examples of reverse innovation in the field of health in Turkey

Chitin and Chitosan	The Turkish chemistry engineers concentrated their efforts on the blood-stopping properties of the chitin and chitosan derived from shrimp and crab shells. They began to work to manufacture bandages that coagulate blood which would be used in the Turkish Army (TSK). Scientists who started to work on R&D with the support of the Ministry of Turkish Science, Industry and Technology with 1 million 300 thousand Turkish Liras have achieved an important success
Prextroline	Developed by Turkish scientists, Prextroline is a very important alternative to Hematoxylin as a new "natural source" molecule synthesized by using advanced technology from Papaver rhoeas (poppy) plant which grows easily in the middle climatic zone. Hematoxylin, which is used in the diagnosis of many diseases, especially cancer, is the most used substance in the world and the only one that could not be developed any natural or synthetic alternative instead up to now. Despite the intense need for this important consumable material from different industries, production is not possible to meet global demand due to the fact that the source of the raw material is tropical rain forests. Prextrolin was studied out by Nanobiomed, one of the Turkish companies, and approved by the American Chemical Society and announced as an innovative product from Turkey to the whole world. Nanobiomed Inc.–Prextrolin is awarded for "2016-Sustainability Product of the Year-Healthcare" and "2017-BIG Innovation Awards" by The Business Intelligence Group Sustainability Awards Program in the USA.
Paper-based Chip for Early Diagnosis of Cervical Cancer	Turkish doctor Melike Karakaya has developed a chip that can be purchased from the pharmacy and implemented at home, just like the pregnancy test in the diagnosis of salivary gland cancer, showing a similar reverse innovation example. The result can be obtained in 4.6 minutes with the prototype that is still in production. The unit cost of the device is about $ 1.

Source: DHA, 2017; Milliyet, 2017; ODTU, 2017

Reverse innovation can also be described as the sale of innovative products in high-income countries that produced in low-income countries. For example, the role of innovation in the economy and development of South Korea, which is among the G20 countries, is quite remarkable. S. Korea, recognizing the importance of innovation; has completely built up its economic development on innovation and evolution processes. The country had a very weak economy and an inadequate industrial structure between 1945-53. The most important feature that appears in the S. Korean economy during this period was; the export of primary products and the import of

manufacturing products. S. Korea can be perceived as the most remarkable practice in "catching up with world technology". In S. Korea, which is one of the 8 Asian countries that the World Bank has shown "miraculous" growth between 1965-90, the electronics industry has made great progress in 25 years. Having the total number of patents, the 5th country in the world also acquire 5% of all patents in the world. S. Korea, which had been lower from Turkey for income and expenditure per capita until the 1980s, totally reversed this situation; in addition to significant growth and development, it has also achieved rapid technological development. The country has been successful due to the importance it gives to the innovative initiatives, training, skill development and human resources, workforce. S. Korea has taken important steps towards reaching a level to compete with the developed countries and has experienced various change processes. The most important factor in the process of these changes is the development of innovation and its transformation into a policy (Oguzturk, 2011). South Korea has started to export new technologies to the developed countries and become a good example of reverse innovation.

CONCLUSION

Within the framework of the examples discussed above, Turkey needs to produce effective and accurate policies on how to take place in the "new" innovation process in the world. At this point, there is a need for a precise formulation of the "public innovation policy" and a good analysis of examples of public innovation activities in the world. For example, IDA (Industrial Development Agency), founded in Ireland in 1969, identified the country as a base, specified sectors that could compete in global markets, and created a business alliance between multinational businesses, universities, and research centers. It aimed to attract foreign investment and innovation opportunities to its territory by establishing 11 offices in different regions of Ireland, 3 in Europe, 5 in Asia Pacific, and 5 in America. Also, China has a very similar innovation policy. For example, the country has obliged all investors to invest some of their profits in China (to develop their own technological infrastructure) (Elci, 2006). The Turkish Ministry of Economy has improved its own brand development program: TURQUALITY®, recognizing the strategic advantage of reverse innovation (http://www.turquality.com.) It is an ambitious project associated with bringing "Turkey" and "Quality" concepts together. The project is initiated by the Turkish Government, Ministry of Economy, Turkish Exporters' Assembly (TIM), and Istanbul Textile and Apparel Exporters' Association (ITKIB). TURQUALITY is basically an accreditation system, which is designed not only for elevating the beneficiary companies to the level of international benchmarks, but also creating awareness on the internationally accepted values like quality and novelty that are actually carried by these brands. As a "national brand-building program", its goal is to facilitate and support the success of Turkish brands in the international arena.

As a result, as a developing country, Turkey should be identified its own potential of reverse innovation and make proposals developed on the basis of scientific data that would be revealed by scientific research results in order to produce correct policies as like its competitors. Turkish academicians and researchers should conduct new fieldwork in consideration of new term "reverse innovation". It is suggested to add new scientific studies to the literature by supporting the theoretical infrastructure with empirical data in the field.

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