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Strategy for Technology and Innovation in Global Perspective

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Abstract

Innovations are significant for economic and social development in an increasingly globalised world. High levels of investment in research and innovation are crucial for economic competitiveness which makes distinctive improvements to quality of life. Competition on innovation is to create environment for improvements in efficiency, quality, and productivity and a growing emerging technologies. The purpose of this paper is to highlight strategies to be adopted for technology and innovation enhancement in global context. An extensive literature review was done to conduct this study. The strategy aims to deliver people and organisations with the initiative to succeed and introduce new resources. There should be continuous rise in the development of the scientific field of technology management corresponding to the practical needs of managing technology as the fundamental source of competitive advantage of organisations and economies. Cooperation among governments, enterprises, and universities is the fundamental of an innovation system.

Keywords: Technology, Innovation, Strategy, IT

Introduction

Science, technology, and innovation play an important role in economic and social development of the nation. It is identified that high levels of investment in research and innovation are important for economic competitiveness as well as to provide innovations in healthcare and environmental technologies which facilitates noticeable improvements to maintain quality of life. Strategy includes policies and actions, and technology comprises tools and resources which are required for effective implementation. Hoekman, Maskus, and Saggi (2005) state that the optimal policy to promote the international transfer of technology should differ across countries at different stages of the technology development. They opine that policies should be adopted for the development of the local economies and increase technological development. Innovation refers to conduct new things with emerging technology, or performing old things in new ways. Innovation can be adapted to all aspects of human effort such as in arts, sciences, and business. No single area of government policy has monopoly on technology and innovation. Thus the technological innovation strategy has a pivotal role. There is a reliable evidence of continuous growth in the development of technology management corresponding to the practical needs of managing technology as the fundamental source of competitive advantage of organisations and economies (Cunningham & Kwakkel, 2011). A high quality of research and experts are at the heart of the national system of innovation. Without scientific and technological expertise, new innovation is impossible. Organisations without this ability are confined to adapting other people's ideas. Incremental innovation is valuable, but it will not reshape economy for the challenges. Technical and commercial uncertainty is one of the common features of innovation procedure in the development of new ideas with the commercial possibilities (Tassey, 2010). Uncertainty of results is linked with the utmost financial risks in the funding of new projects. After the innovation of cloud and mobile technologies, the cost of starting a technology has reduced greatly and marketing opportunities have increased so that the market become more competitive. Globalisation has facilitated the best engineering talent in the world

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(Technology Innovation Survey, 2013).Cooperation with governments, enterprises and universities is significant for innovation system. Interaction among these three players is important factor of knowledge production and dissemination. During this process, active collaboration among these three players enhances the innovation procedure (Rao, Meng, & Piccaluga, 2012). The purpose of this paper is to highlight strategies to be adopted for technology and innovation enhancement in global context. An extensive literature review was performed to conduct the study. Innovation and technology management are inevitable issues in technological and innovative organisations. In the meantime, majority of innovative technologies are located in developed nations such as Japan, USA, and European countries. Developing countries are still lagging behind in innovation and management of technology. But it is also becoming a concern for rapid progress and growth in developing countries. Technological innovation in developing countries has several challenges with low level business model, instability in politics, lack of quality research, and low education level. Moreover, they have poor infrastructure, lack high technology, and qualified man power. The study conducted by Rodriguez-Pose and Crescenzi (2008) shows how regional innovation capacity is shaped in interaction between research and development sector, economic, social, and institutional sector.

Commercialisation of Technology

Same kind of technologies in the market is crucial to prove their functioning capability to introduce customers and investors to commercialise innovative technologies (Christenson, 2014). The value chain is able to generate revenue for new products in the market. As such, new industries are developed through the formation of clusters of companies. The expansion of new technologies that facilitate a wide range of applications enables the creation of new markets. This property has the challenge of confirming new opportunities for national innovation system of nation. Innovation theory shows that not all good ideas come from inside the firm, neither all good ideas emerging within the particular firm should be commercialised by that same organisation (Gabel & Chesbrough, 2011).

The innovation behaviour is spreading rapidly providing high and expanded facilities. The individual firms may have number of innovative problems so that they need assistance from large organisations. They have the challenges of infrastructures, long run sustainability and limited financial benefits. The organisational services should be long lasting, effective and should exist in the market for long time. The role of Technology and Innovation Centres (TICs) differs as per the innovation system as well as economic and social framework of the countries. A wide range of fundamental principles exists for developing TICs that fulfill the gap between academic innovation and commercial exploitation. A strong governance structure is needed to provide proper direction and make sure that the good quality of services is provided to the business organisations. Astrom and Arnold (2008) concluded that government ownership was not mandatory to formulate a strong TIC, but sustained government commitment was required. There is the requirement of strong enhancement of the role of TICs in the innovation system in universities as well as in research institutions. The key facts about technology innovation are provided below for further information (Technology Innovation Survey, 2013):

- Cloud and mobile technologies are vital for at least the next three years.
- Social media still has not played out its full capacity.
- A new tendency of innovation is coming.
- Cyber-security and privacy issues continue to obstruct the progress of technology innovation.
- Globalisation is leading to a rapid pace of change.
- Silicon Valley has cemented its lead as the world's technology innovation centre.
- Faster and better outshine 'cheaper' as a top benefit of adopting new technologies.
- Getting into the top corporate innovator league requires coming up with a great factor over and over again.
- Staying private rather than going public is seen as the best growth path today.

Arnold, Barker, and Slipersaeter (2009) argue that there is a trend for TICs to become business oriented and include initiatives to make public awareness. Intellectual property and commercialisation departments within TICs are thus now common. They provide support for business development and marketing with appropriate funding as well as make recommendation and make financial investment. The role of technology and innovation centres as part of the overall innovation system including how they can be best used for the benefit of business and how they relate to other organisations such as research and technology organisations in industry. Cloud and

mobile technologies are emerging in the market providing facilities of sharing information, storage and computing. Commerce, communications, and software applications are of common use. The extensive growth of social media has replaced traditional media and market. Meta data has been playing a major role on existing information age of data segmentation and collection. For the moment, it has been accepted that we live in a digital society (Technology Innovation Survey, 2013).

Motorola, a company popular for its ability to invest in profitable new technologies and manufacturing improvements has a sophisticated skimming system. Its intelligence department monitors the new technology developments introduced at scientific conferences, in journals, and in trade gossip. This information helps it to introduce technology strategy that assess where breakthroughs are likely to occur, when they can be incorporated into new products, cost for new development, and type of the developments is being worked on by the competition (Hill & Yamada, 2012). A way to commercialise a new technology is through primary and in-depth involvement with customer in a process called co-development. The leading companies continued to use the established technology to make the products, meet customer demands, allowing smaller entrepreneurial competitors to develop the new, and challenging technology (Christensen, 2010). A rule of thumb for R&D spending is that a corporation should spend at a normal rate for that particular industry, unless its competitive strategy dictates otherwise (Chussil, 2012). Hitt, Hoskisson, and Harrison *(*2011*)* suggest that organisations are flexible and responsive up to some threshold size. Companies no longer can assume that competitors will allow them the number of years needed to recover the investment. It was mentioned that "10 to 15 years went by before old products were replaced by new ones now; it takes only 4 or 5 years"(Hill & Yamada, 2012).

Demand and supply in a market are repeatedly exogenously given, firms can influence the extent to which competitors can imitate their innovation by employing one or a combination of various appropriation tactics, including patents, particular sales and service efforts, secrecy, lead-time, and achieving a good fit between technology-related innovations and complementary rare assets of the firm (Teece, 1986, 2010). Therefore, choosing an adequate appropriation can assist the firm to gain private profits from innovation. However, the success of these tactics is likely to change across industries and with the type of innovation carried out.

Governance and Networking

A strong governance structure is significant to ensure strategic direction and the quality of services provided to business organisations. It is further important to linking of activities within TICs with wider innovation system and to co-ordinate public sector investment in TICs to ensure the high impact. TICs should operate with a high level of autonomy to provide flexibility to respond to business needs and market opportunities. They have to establish strong relationships with business and academia, and with other institutions. Their governance arrangements should replicate the need to draw on academic and business expertise to provide guidance on all aspects of the work at the TIC. The perception of sustainable development requires an overall approach, encompassing indicators classified by using the Triple Helix (TH) concept. The TH comprises the hybridisation of three elements viz. university, industry, and government in order to generate new institutional and social formats for the production, transfer and application of knowledge (The Triple Helix Concept, 2013).

The government role should be effective and ensure the significance of activity, across the network of TICs to monitor progress and maintain funding on technologies offering the long term growth opportunities. In order to identify the core role in the innovation system the government should consider the value of a brand for national TICs. The government in association with the Technology Strategy Board should establish a web-based database of TICs and related institutions providing business services. This information should be provided available through websites of public sector organisations. The company could afford and guided by how much the competition was spending, they perceived R&D as a line expense item instead of as an investment in the future (Ferland, 2010). Foreign-owned subsidiaries rely mostly on the direct transfer of technology from their parents and that firms that import intermediate inputs are more likely to acquire new technology from their machinery suppliers. Online and offline innovations only disclose small differences in estimated coefficients. In other words, whether firms use the Internet or not to innovate is less important than whether they innovate at all. The differences between process and product innovations are greater than the differences between online and offline innovations. Strategic advantages of conducting process innovations are feasible if direct rivals have not imitated the innovation (Reinganum, 1981; Götz, 1999). The adoption of standard technologies suggested by process re-engineering consultants and standard business software packages,

generates temporary excess returns lasting as long as competitors do not copy the same technology successfully.

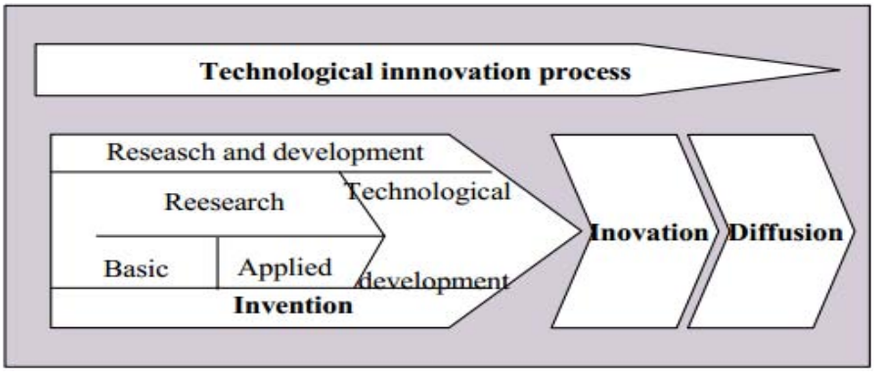
IT Strategy

IT strategy should be developed by the IT department of the particular organisation. IT objectives need to bring into line to the high level business objectives. The strategic IT projects need to be carefully chosen to align to the high level business needs and the project resources required need to be aligned to the available resources (McKean, 2012). Business sponsors need to know how many of their resources are required for each innovation so that it is evident what can be done with existing resources and which need additional ones. Majority of business stakeholders assume that the resource limitations only exist in IT. According to Zott, Amit, and Massa (2011), IT business models "have yet to develop a common and widely accepted language that would allow researchers who examine the business model construct through different lenses to draw effectively on the work of others" as it seems to be a different model of business and a dissimilar set of classification approaches. Teece (2010) and Baden-Fuller and Morgan (2012) observe the concept of the IT business model and found that business model innovation have core strategy and technology concerns. Ches brough (2010) mentions that an emerging technology requires a novel business model combining with new technology and a new business model for competitive advantage.

Developing the Right Technology

To engage customer involvement the business model should be simple and clear (Haefliger, Monteiro, Foray, & von Krogh, 2011). In buying and selling intellectual property that should be reached at the product stage, open innovation is significant to acknowledge the value for firms. Openness is needed for recognition but process technology may not be patented and challenging to protect. It is important for users and competitors to share technology. Sharing technology may provide to learning and establishment of communities with similar and professional interests. High level customer engagement facilitates to increased value creation for users and providers (Franke, Schreier, & Kaiser, 2010). Organisations contributing to online communities as clients and developers of software products share adaptations of the product with suppliers and competitors (Henkel, 2009). Consequently, we can perceive that there is an interaction between business model choice and the direction of technology expansion. A number of studies suggest that one of the most important drivers of global innovation is the search for global expertise (EIU, 2004). Innovation is an activity that produces improved products or services. It may be processes, marketing methods or business organisation. According to OECD (2009) technological innovations involve new or significantly modified technological products and processes, where technological uniqueness emerges, unlike improvements, from their performance characteristics.

Fig. 1: Technological Innovation Process



Innovation includes use of acquired knowledge, technological development and combinations of existing technology as shown in Fig. 1. The technological model does not describe all possible connections between the steps of innovation process and reconsidering the earliest. The enterprise is able to formulate new innovations which are useful in grasping innovation process of each stage.

Technology and Innovation in Developing Countries

Majority of the innovations are limited to developed countries. Developing countries are still dependant on developed countries' technology. Developing countries

have strong capability for innovation and technology management from the experience of nations such as China, India, and Mexico. But the challenge is how to approach the issues faced by developing countries. The actuality of chief technology management component, developed infrastructure, coordination and linkages development between educational institutions and business world, upgradation of knowledge and skills in the context of country's specific technical, cultural and social environment are part of indicators of innovation and technology management.

Chief Technology Officer of the organisation playsa vital role in organisation innovation and technology management (Smith, 2010).They should have strong background of management, technology, engineering as well as IT. The government should take necessary steps for improvement of infrastructure and enhancement of new technologies. Innovation is created from the unification of new knowledge with technological and organisational inputs from developed countries (Aubert, 2004). The issue is to provide the accurate utilisation of indigenous knowledge in innovation process of nations. The technical human resources in the developing countries should be well trained. Companies failed to develop technological infrastructure and environment for incorporation of imported technology due to the inaccessibility of technology executives and managers (Salimuddin, 2004).

Education levels in the developing countries are very low. This is one of the significant barriers to the management and development of innovation and technology. It is possible to establish a clear relation between educational requirements and different stages of industrialisation (Aubert, 2004). The educational requirements demand basic literacy while in post-industrial phase technical, professional skills are needed. Educational institutions are the source of new technology of concept generation. The world top universities are located in developed countries. In the world ranking of top 100 universities, only 3% universities belong to developing countries and remaining 97% world top ranking universities belong to developed countries (North America: 44%, Europe: 34%, Asia: 19%). The top ranked universities have strong affiliations with business firms and most of the academic institutions are entrepreneurs by themselves.

Most of the technical manpower of developing countries graduate from the U.S, Canada, or European universities. They are responsible to transfer the technology and investigate what they have learned in foreign environment. The professionals have no awareness to approach in their country's technical, social and cultural environment. The world's top most popular 50 innovative companies are situated at developed countries (Business Week, 2008). 72%, 16%, and 10% companies belong to North America, Europe, and Asia respectively. There is not a single company belonging to developing countries. However, some companies in the developing countries such as China's Haier (Home Appliances), Mexican's CEMEX (Cement maker), and Brazil's Natura (Cosmetics) are growing rapidly in the innovation and technology management. But still these companies are not in the world innovation's rank. South Korea and Singapore proved that the government's role in supporting business environment and developing new technology is very significant (Salimuddin, 2004).

Business innovators have new concept, method or tools that meet the needs of a targeted customer-base that is accessible having financial value to the organisation (Smith, 2010). Innovations are based on existing form,structure, process, and idea while some are based on fundamental. It's the management of technology which makes profit to the companies. Technology is categorised as core technology(e.g. manufacturing process), high technology (e.g. computer based technology as microelectronics, fiber optic, satellite communication, robotics and multimedia) and service technology (e.g. consumed and intangible) (Hatch & Cunliffe, 2006). The collaborations with partners from different regions and countries contribute not only to the extension of their own networks, but also support the provision of conditions for international collaboration for economic development. This has proven to be an effective mechanism for improving the innovative application of research outcomes and for business development support to start-ups and existing SMEs (Kniejski, 2013).

Conclusion

The role of invention is vital in economic and social sectors which results from the effective innovation, novelty as well as human activities. The economy of the nation will lag behind in the absence of innovation processes. As such innovation is crucial for sustainable economic development. Technology transfer is a key process for successfully commercializing innovative technologies. The effective formulation of government policy and other public sectors play a major role to adopt emerging technologies. It was investigated that international collaborations reinforce the quality of research undertaken in technology. New and innovative

technologies facilitate a number of opportunities for business growth but also have the challenges of risks on security as well as on privacy. Organisations should focus to evaluate the risks and the opportunities to determine the best framework of accomplishment.

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