

Technology Advances and Innovation: Their Effects on Improving Productivity in Various Industries

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Abstract: Technology advancement has affected today's world in various aspects including how businesses conducted their activities. This is a conceptual paper which has been developed through current literature, journals, report and news on the effects of technology advancement and innovation in the improvement of productivity in various industries. Among the findings are technology advancement and innovation does have the positive impact in improving productivity in several industries such as manufacturing, agriculture, and services. Even though technology advances have the positive correlation with productivity, however, there are also other factors that should not to be singled out such as labor and system in an organization. In ensuring the success of organizations, they should consider the other factors as well and the technological and innovation aspects will definitely contribute in achieving their objectives.

Keywords: Technology, Innovation, Productivity

Introduction

When we look and evaluate on what happened to human's life nowadays, it's clearly revealed how technology has become more and more important to us. Therefore, we can say that the advance in technology has tremendous changes on today's world. Over the years, man has struggled to make life simpler, create more comfort and to make products cheaper and of better quality. In order to achieve this, man has done a lot of research, finding a new way of doing things all the time. This has led to the creation and continual improvement of machines and equipment for nearly all sectors of the economy. The continuous acts of making, modifying, using and studying about machines, tools as well as crafts and techniques related to different spheres of the economy, can be referred to a general term: Technology. For economists, the changes in technology or technology innovation are impacting the economy at unprecedented rates and it is almost practically impossible to separate technology from the economy. Generally, technology is positively impact us in many ways. It's simply makes life more convenient and easier. With the help of technology, many tasks can be done without human involvement and it is definitely save time since the machines will help to complete task efficiently.

Besides, from the industrial perspective, advanced technology can replace man's works which are sometimes dangerous for human in most of the industries. History had proven that advance in technology during the Industrial Revolution between 1760 to 1840 had changed on how people in industry at that time going from hand production methods to machines that increased efficiency and productivity enormously. Technology by means is the purposeful of application of information in the design, production, and utilization of goods and services and in the organizations of human activities (Business Dictionary). Based on Economic Glossary, technology also can be defined as the sum total of knowledge and information that society has acquired concerning the use of resources to produce goods and services. An improvement in technology is thus an increase in the technical efficiency of production which means more output with given inputs or fewer inputs for a given output.

On the other hand, productivity is one of the most common measures of an organization's competitiveness. It is considered as one of the basic variables governing economic production activities (Tangen, 2002). Oeij et al. (2012), had stated that a key variable in relation to economic growth is productivity. They also agreed that it is one of the most vital factors affecting company's competitiveness. The concept of productivity, generally defined as the relationship between output and

input, has been available for over two centuries and applied in many different circumstances using various levels of aggregation in the economic system (Jorgenson and Griliches, 1967). Hence we can clearly see how productivity has become one of the critical key elements to determine company's successful within its industries and technology advances and innovation as a main contributor towards achieving optimum level of productivity gains. Thus, in order for any organization to increase its productivity, whether small or big, it needs to enhance its efficiency. Technological advances and innovation can provide an organization with valuable time and resources that previously were very difficult to obtain. This is beneficial because with the current economic environment, organizations would be able to adequately identify lean and efficient business models. Technological advances create an opportunity for the modernization of organizational activities, structure and culture. Thus, it will enhance the effectiveness of the organization productivity. The increase of productivity is a result of the ability of the organization to comprehend, appreciate and absorb current technological advances into their structure, formation and culture; without any exception of organization type, be it manufacturing and productions, service providers, telecommunications, agriculture and many others. Therefore, most of previous researchers believed that technology has been considered as one of the most crucial factors affecting productivity of an organization (Azadeh, 2000; Azadeh and Ebrahimipour, 2002, 2004).

Technology and Productivity

Based on Mendonca et al. (2008), many empirical studies failed to find a positive correlation between IT adoption and productivity. Two decades ago, the correlation between IT adoption and firm productivity was not so clear and produced intense debates. In the 1980s and during the first half of the 1990s, empirical studies generally did show that investment in IT was positively related to increases in production capacity. It was surprising to find that some studies even reported a negative correlation between IT and productivity (Berndt and Morrison, 1965). It was not until after the mid-1990s, with the development of new estimation techniques and the availability of new sets of firm-level data, that studies were able to produce results consistent with the expectation that the correlation between IT and productivity is positive. Due to this, Mendonca et al. (2008) performed a study to test either IT adoption can improve productivity for Brazilian Industry and from the results obtained, it shows the firms that use IT have workers almost 13.24% more productive than those that do not adopt IT which was very significant and to confirms the hypothesis of the study where the adoption of IT positively affects labor productivity. This was also supported by Greenan et al. (2001), where strong evidence was found on the adoption of IT that positively correlated with labor productivity. Bartel et al. (2005) examine IT adoption in the production of valves in the U.S. The authors determine that the adoption of new IT equipment modifies business strategies, moving workers from the production of commodities to customized production, improving the efficiency in all stages of the production process, and increasing worker's skills through the promotion of new human resource practices.

For the manufacturing industry, Li (2013) conducted a study on modern manufacturing industries that are using high technology and advanced science to process and reprocess raw materials, to produce and assemble the production equipment and spare parts of all the industries in national economy, or the weapons-making industry with modern science and technology. The author suggested that modern manufacturing should have advanced production technology and high labor productivity and the results revealed that advanced technology is positively changing the technical environment and operating conditions of the industrial development and the foundation of the industrial competition and business model. According to Sarwar et al. (2011), findings from their researches on Pakistan automotive industry revealed that effective utilization of technology can enhance the productivity of Pakistan manufacturing firms significantly. Burgess (1990) in his paper, A Review of Productivity also stated that in manufacturing industry, productivity improvements can be achieved at via number of avenues and one of that is to invest in newer and more productive machinery.

Previous studies in agriculture industry also resulted with the same findings. Xuedong (2006) in his paper agreed that from investigation and analysis performed, it showed that the transformation of

scientific and technological achievements in agriculture plays a crucial role in increasing the benefits of agriculture and farmers' income, fostering the adjustment of agricultural structure and speeding up the construction of comparatively wealthy villages. It stated that the technical level of agricultural product processing has been upgraded. In addition, favorable effects have been exerted on the efficient utilization of agricultural resources in China, in particular, water resources, and the construction of the ecological environment. The transformation and transfers of modern agricultural hi-tech achievements have greatly fostered the change of Chinese agriculture from traditional to modern agriculture. Kumar et al. (2008), in their study of food processing industries in India which provide throughput between farm and industry and accelerating agricultural development stated that the structure of Indian food processing industry reflects that food production is mainly constrained due to lack of productivity augmenting technologies as the major quantity of food products are being produced in the unorganized sector, where resource utilization is very limited. From the study, revealed that low rate of growth in productivity is mainly a result of either technological regress or a loss in pure technical efficiency or both.

Mahadevan (2002), through his study saying that service industry also did enjoy technological progress, which increased over time. This means that the industry is able to benefit from the embodied technology in the new and more advanced capital which they are investing over time. He also suggested an empirical investigation of the determinants of technological progress and technical efficiency to sustain total factor productivity growth for services industry in the long run. Rubio et al (2006) conduct a research to estimate productivity changes experienced by supermarket chains operating in Spain between 1995 and 2003. The productivity change is broken down into two terms which are efficiency change and technical change. The first reflects the ability of a firm to obtain the maximum level of output from a fixed level of input, given the available technology, while the second reflects movement on the competent frontier that could be attributed to innovation or technological change. The results obtained reveal that technological change and advance is one of the most important elements of current and especially of future competition in retailing, in that the right use of new technologies will gives substantial competitive advantages to firms leading the innovation process.

Discussion

Based on previous studies performed above, we can see that all organizations despite in which industries operate through a mix of technology, systems and people. Sometimes the technology is simple and cheap and sometimes it is complex and expensive, but it exists in all organizations. There is a tendency, in some areas, to feel that high technology is essential and that organizations that do not employ it are necessarily less productive. This is particularly true for example in the computing field where organizations who manage to exist with computers that are more than two or three years old or worse still without any computers at all, are regarded as backward, old-fashioned and possibly dying. Most of the people in the industry are concerned either directly or indirectly with productivity improvement where technological change and innovation is one of the methods for investigation, a channel that must be followed as part of any review program and productivity improvement. However, technology must also be appropriate and cost effective, high powered and have full-featured computers in order to achieve an optimum level of productivity gains.

Technological adoption or whether an organization makes use of new technology once it has identified a potential application is determined by the ability of an organization to make that adoption. Technology relates to the systems and people that surround it. Some technologies are not appropriate for some organizations because the technologies are not mature and robust enough to be adopted without a degree of support from within the organization, or at a cost from an external support agency. Therefore, each and every organizations need to identify the appropriate new technology that will truly benefit them especially to increase the productivity level and remain competitive in the industry. When examining the effects of technology on productivity, it is important that labor productivity is not singled out for consideration.

Much modern technology reduces the labor input to a process yet a full multi-factor productivity measurement process may indicate that overall productivity does not necessarily rise. It is important that this overall productivity is assessed and evaluated. Most of the investigations and research conducted agreed that the advance technology and innovation do help organizations in productivity improvement or in other words give positive implications to the organizations themselves. Productivity improvement should be an ongoing process of continual review and change and that review and change must include the technological environment. (Daniels, 1991).

Conclusion

Overall, we can conclude that even the level of contribution from technological advances and innovation to the productivity improvements differ from industry to industry, but it is agreed that there is a strong positive relationship between both elements that will lead to the organizational success, more competitive and reflect the economic growth. Ning Li (2009) confirms that there is a significant positive relationship found between inflows of technology advance and international competitiveness as a whole. The author also said that cross-border diffusion of technology significantly promotes indigenous productivity and international competitiveness, and on the other hand, domestic knowledge base is crucial for successfully making full use of imported technology, national governments should keep a balance between policies for enhancing domestic R&D capacity and policies aiming at imports of foreign technologies. Branscomb et al (1997) strongly agree that industry is different; and all organizations as well as the government agencies must be sensitive to these differences, which may require the use of different policy tools and a mix of various science, technology, and systems research. Every organization in the industry is looking at measurement and productivity improvement internally as an effort to improve efficiency and competitiveness and clearly demonstrate that technological advances and innovation will contribute to achieve the goals.

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