Unlocking the Channel of Tacit Knowledge Transfer

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Abstract

Purpose – Knowledge and Technology transfer have been a great issue of concern for researchers, companies and policy makers for some time now. These areas of research contribute greatly to economic development, and for these reasons developing countries are hungry for knowledge and technology transfer. Over the years countries of the world have invested millions of pounds to achieving knowledge transfer, especially from R&D project and University to companies. Developing countries are more involve in technology transfer and most times the adoption of technology. The transfer of technology has been very difficult because of tacit knowledge. The purpose of this working paper attempt to unlock the barriers that tacit knowledge possess and to look at the definitional appraisal of knowledge and technology transfer, benefit and challenges of knowledge transfer and technology, and the characteristics and nature of technology transfer in developing countries.

Design/Methodology/Approach An analysis of the recent literature was carried out, focusing on the benefits of knowledge to develop and developing countries. The paper also brings together the diverse experiences from the authors on Technology transfer, knowledge transfer to developing countries.

Findings Tacit knowledge is key to delivery the most competitive advantage to a company. This tacit knowledge although difficult to quantify could only be transfer with appropriate communication between transferor and transferee. Trust is a major factor that determines the transfer of technology.

Originality/Value This paper therefore provides recommendation on how tacit knowledge can be unlocked. The recommendation from this paper should be of interest to authors, policy makers, and professional both in developed and developing countries.

Keywords Technology transfer, Tacit knowledge, Knowledge transfer, Developing countries.

Paper type Working Paper

Introduction

When ever the topic of knowledge and technology transfer are being discussed, most people believe is simply the transfer/movement of knowledge and technology from one country to another. But it takes more than the transfer of these knowledge and technology from one country to another. Many factors have to be in place for the transfer to be implemented. The gains of knowledge and technology transfer to the world economic are so enormous. For these reasons government and companies invest greatly on these projects. This reduces poverty; reduce mass migration of people, and increases world economy wealth.

Knowledge and technology transfer have been a great concern for company, government and institutions. The flow of knowledge from research institutions to company's have been a great concern to the developed economy of the world. This flow of technical knowledge from research institution to company's could be called technical innovation/knowledge diffusion. Knowledge and technology transfer could be divided into two based on geographical location – Internal knowledge and technology transfer and external knowledge and technology transfer. These bases of transfer as to be considered when looking at knowledge and technology transfer to and within a country or company. According to Andrezej (2005), technology transfer could be classified into two: Vertical technology transfer – the flow of knowledge from research institution to companies and Horizontal technology transfer – the flow of knowledge among companies. Whereas, according to Li-Hua R.(2005), knowledge transfers are divided into two components – explicit knowledge and tacit knowledge transfer. Richard argued that tacit knowledge transfer is considered more haphazard and it is in this area that knowledge transfer can falter and technology transfer can be impeded

Technology

Technology means different thing to people and organizations. According to Megantz (2002), to a scientist, technology is the end product of research, inventions and know-how that may be developable into a commercial product, while to an engineer, technology is a tool or process that can be employed to build better products. Technology is defined as a set of tools both hardware (physical) and software (algorithms or procedures) that helps us act and think better (stuhlman, 2007). "Broadly speaking, technology is how people modify the natural word to suit their own purpose, from the word techne, meaning art or artifice or craft, technology literally means the act of making or crafting, but more generally it refers to the diverse collection of processes and knowledge that people use to extend human abilities and to satisfy human needs and wants" (Noacsc).Technology could be viewed as the technique used by human and machine to support daily activities. This technology could be used at work place or at home. Technology could also be seen as the ensemble of theoretical and practical knowledge and skill that are used by firms to develop and produce its goods and services (P.K.De, 2004). Technology facilitates information sharing, thereby making it possible for tacit knowledge to be transferred. Egbu and Lee (2007) argued that tacit knowledge could be converted to explicit knowledge using IT. And this could be done by building a knowledge asset were event diary, debriefing and post project review are stored in the company database system. This information stored in the company's system can be shared among staff with access to the system.

Technology Transfer

Technology transfer as being a great issue to must companies and countries. Technology transfer is usually a basis for technical innovation and often is it after-effects in a form of innovation diffusion (Andrzej, 2005). Technology transfer can be defined as inflow of technical knowledge to the market where it is sold and bought (Andrzej, 2005). In Andrzej argument, technology transfer flow from one place to another where it could be bought or sold (product). In another definition by Yu (1990), Technology transfer in the work regulation of the United Nation, as the transfer of systematic knowledge for the

manufacture of a product or provision of services. Yu views technology transfer as the simple movement of knowledge of product and services from one company to another. Lisa et al (1994) looked at technology transfer as adoption of technology by defining it as the prospective adopter's positive or negative feeling about the company's adopting the new technology from a foreign company. In her argument, technology could be transferred base on the people altitude of the transferee. Other scholars looked at technology transfers process in their forms, for example, According to Jasinski (1999), technology transfer exists in the following main forms;

- Sales/purchase of result of the R & D work
- Turnover of licences, patents. Utility models, know-how
- Sales/purchase of production techniques, means of automation etc
- Technological advisory/consulting
- Technical staff training
- Exchange of technological information. Jasinski went further to simplify technology transfer into;
    1. Embodied technology transfer (ie the flow of knowledge embodied in new products, materials, tools, machines and similar equipment), and
    2. Disembodied technology transfer (ie other forms of flow of technical knowledge).

Benefit and Challenges of Technology Transfer

The challenges of technology and knowledge transfer have over the years been a great concern to researchers. Because of the closeness between these two elements, their challenges are almost similar. Samli (1985), model the pattern of technology transfer into six dimensions: geography, culture, economy, business, people and government, while Egbu (2000), looked at knowledge transfer in six dimensional ways; people, content, culture, process, infrastructure and technology. Theses shows that the challenges and benefits of technology and knowledge transfer are similar and that one cannot do without the other.

One of the benefits of technology transfer is globalisation of industries. Technology transfer brings the world together as one large market place. When technology transfer are properly transfer around the world from developed nation to less developed nation, economic vibrancy will be seen and nation will draw closer to one another making the world look like a large global market place.

Internationalisation of domestic market is also a benefit to technology transfer. Product produced by domestic market could compete with large international industry if proper technology is transfer to the domestic market. This will increase production and also economic growth.

Some of the barriers of technology transfer to developing countries are also great. These includes; lost of intellectual property, exploitation of indigenous employees, lack of infrastructure, employees attitudes, government policy/legal protection, geographical location, environment, etc.

Knowledge

The term knowledge has been defined by several people in their own understanding. The common man on the street will define knowledge as what you know, and he also believes that knowledge is power. But researchers and academics have defined knowledge in various forms and ways given different understanding to the meaning of knowledge. According to Ganesh (2000), knowledge is an organized combination of ideas, rule, procedure and information. There is a tin line between knowledge and information, but they are different according to their organization. Koniger and Janowitz (1995), argued that information is disorganized, while knowledge is organized. Knowledge is more meaningful and richer than information. Knowledge could be gained when information is acted upon. Davenport and Prusak defined knowledge as "a fluid of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information".

Knowledge is a firm's most valuable resource because it embodies intangible assets, routines, and creative processes that are difficult to imitate (Grant RM, (1996) & Liebeskind JP (1996)). Experience increases knowledge which might be difficult to transfer. In other words experience is tacit knowledge. That is why tacit knowledge has been the key interest of knowledge management.

Knowledge management is now the common term used to express knowledge in different ways by researchers. Knowledge management is defined by Stuhlman (2007), as a conscious, hopefully consistent, strategy implementation to gather, store and retrieve knowledge and then help distribute the information and knowledge to those who need it in a timely manner. With the shift from industrial based economy to service based economy, knowledge management have become so popular and important to organisation. ICT has made it easier for organisation to recognize the important of knowledge management and accessibility of knowledge. It is now commonly known in knowledge management that knowledge could be divided into explicit and tacit knowledge. Michael et al (2000), defined explicit knowledge as the type of knowledge that can be verbally explained, codified or written down in specific document. While tacit knowledge could be expressed as intangible knowledge which is intuitive and difficult to express in practice, in other words, knowledge that people carry in their mind based on life experience, reading, learning, environment, beliefs, and regions back ground, etc.

Knowledge Transfer

Knowledge transfer is a key tool of technology transfer, technology cannot be transfer if there are no knowledge of what to be transferred. Therefore, knowledge transfer and technology transfer most work together at the same rate of development to achieve transfer. There most be knowledge for technology to be transfer. Dougherty (1999), argued that knowledge transfer is about connection not collection. The collection of knowledge will be considered when talking about adoption of knowledge. This process does not allow the continuous flow of knowledge from transferor to transferee. For technology transfer to be implemented, there most be continual flow of knowledge transfer between involved parties. In this current competitive environment, knowledge is

recognised as a fundamental asset for organization (Teece, 1998). Therefore, knowledge transfer is very important when considering economic strength of a country or company. Knowledge transfer can be defined as the process through which an organization unit is affected by the experience of another (Argote and Ingram, 2000). The Encyclopaedia defined knowledge transfer in the fields of organization development and organizational learning as the practical problem of getting a packet of knowledge from one part of the organization to another (or all other) part of the organization. According to RCUK (2006), knowledge transfer means the two-way transfer of ideas, research results, expertise or skills between one party and another that enables the creation of new knowledge and its use in: => The development of innovative new products, processes and/or services.

=> The development and implementation of public policy.

Sveiby (1997), argues that two main perspective are adopted in modelling knowledge transfer: knowledge can be viewed either as an object, which can be directly observed, stored and successively reuses and transferred, or as a process ie a flow of interacting changes taking place in people who learn.

It is true that knowledge could be divided into tacit and explicit knowledge and that explicit knowledge could be easily transferred than tacit knowledge. But if tacit knowledge are properly enhance from people or group of people who have these tacit knowledge, it could then be easily transferred. Understanding is a key point to tacit knowledge transfer. If transferee and transferor both understand themselves, taking into consideration location, values, and belief, then tacit knowledge could be transferred. For knowledge to be transferred, both tacit and explicit knowledge have to be comprehended by transferee and transferor.

Knowledge transfer mean different things to different people. Many authors have defined knowledge transfer in different ways, but one thing is very clear about all the definitions, knowledge transfer is a continual flow of knowledge that led to innovation for economic development.

Benefit and Challenges of Knowledge Transfer

The benefit of knowledge transfer is enormous; this is why developed countries continue to invest a lot of resource in their universities and R & D centres. Developed countries have over the years encouraged the transfer of knowledge from the university to companies by creating partnership policy. This policy will encourage how knowledge transfer could be translated into practice. In the developing countries of the world, this aspect of transfer is lacking greatly, simply because of lack of funding from the government. For knowledge transfer to take place in developing countries there should be liaise between higher educational institution and companies. A strong partnership between higher educational institutions will strengthen knowledge transfers. Because of the nature and standard of development and education in developing countries, for knowledge to be transfer from university to companies easily middlemen have to be involved. These middlemen must have the experience of the industrial world and also experience of the academic world. This person will work in both sectors, bringing problems from the industries to the university to solve and passing the solution back to

the companies. This will benefit both sides, since there is an understanding between them. Other benefit of knowledge transfer is the community in which this university and company operate. The community benefit from knowledge gained from the university and employment from the company. Also countries benefit from knowledge transfer as well, for example international student have contributed greatly to the UK economy bringing funds to the economy just to gain knowledge. In my opinion, this type of knowledge transfer could be classified as theoretical knowledge transfer (ie knowledge based on class rooms and lab).
The challenge of knowledge transfer in developing countries is funding. Although, developing countries recognise the important of knowledge transfer to their local industries but lack of research funding and bad policy have been a major problem to them. Developing countries like Nigeria spends a lot of money sponsoring her citizens to study in the UK and US, but the citizens are not able to transfer these knowledge's gained back to their country because of lack of employment opportunities back home, so they end up working in the country were they have gained these knowledge. Lack of time can also be seen as a challenge to transfer knowledge. Most academics do not have the time to research into problem from companies because of their work load. This has contributed to the lack of interest by companies collaborate with universities. Intellectual property right have also been a great concern especially to the academic, this as cursed a great challenge in the transfer of knowledge. Another challenge of knowledge transfer is the attitude of the business world, they believe that academic do not know much about the business world and they lack target, so their problems cannot be solved by them. This believe by the business world have made companies not to collaborate with university because they see it as a waste of time and resources. Also, the area of hidden knowledge has been a great challenge to knowledge transfer. The developed countries hide some of their knowledge from other developed countries and developing countries; this has been a barrier of technology and knowledge transfer companies and countries. Lacks of incentives of knowledge transfer from universities to companies is also a barrier. Academic are not paid proportionate to the work done in solving problems. The benefit they gain is even less when research is done for publication.

Husted and Michailova (2002) outline six reasons for knowledge transfer hostility;

1. Potential loss of value, bargaining power, and protection of individual competitive advantage due to a strong feeling of personal ownership of the accumulated, "hard won" knowledge.
2. Reluctance to spend time on knowledge sharing. Knowledge senders may not be interested in knowledge sharing since the time and resources spent on it could be invested in activities that are more productive for the individual.
3. Fear of hosting "knowledge parasites". Knowledge senders may be reluctant to share their knowledge with someone who has invested less or no effort in his/her own development.
4. Avoidance of exposure. By not sharing knowledge, individuals protect themselves against external assessment of the quality of their knowledge.
5. Strategy against uncertainty. Due to the uncertainty regarding how the knowledge receiver will perceive and interpret shared knowledge, knowledge senders may be highly cautious about revealing the relevant knowledge.

6. High respect for hierarchy and formal power. Knowledge senders may be reluctant to share crucial knowledge for fear of losing a position of privilege and superiority.

Nature of Technology/Knowledge Transfer in Developing Countries

The technology and knowledge transfer has being a great challenge in developing countries because of lack of infrastructure and educational development of the people. For developing countries to achieve technology transfer certain factors as to be in place, such as good investment policy, basic infrastructures, attitude of people, good communication networks, etc.

Over the years, developing nations have tried to encourage foreign investment participation in their countries, but these have been very difficult especially because of the political un-settlement in these countries. Developing countries that have succeeded in attracting few foreign investments still lack the successful transfer of technology from foreign companies to indigenous companies, mainly because of competitive advantage.

The lack of government participation and partnership with universities and research & development project (R&D) has been a great draw-back to the progress in knowledge transfer. University and R&D project are not well funded by government of the developing countries. There are no close relationship between companies and universities in developing countries. This has caused lack of knowledge transfer in these countries. Also, when the issue of knowledge and technology transfer are being discussed, most developing countries believe in adoption of technology instead of the transfer. This is because, developing countries want a quicker way of gaining technology instead of going through the process of transfer which takes longer time to achieve.

Knowledge transfer is an important issue when taking about technology transfer. Technology transfer will only be achievable in developing countries if academic, policy makers and companies are involved in the process of knowledge transfer. Although, it has been proven difficult to measure the level of knowledge/technology transfer from foreign company's to local company's, but the measurement of transfer between foreign companies and local companies involves the observation of human communication/interactions, attitude, interest and motivation of all participant of transfer.

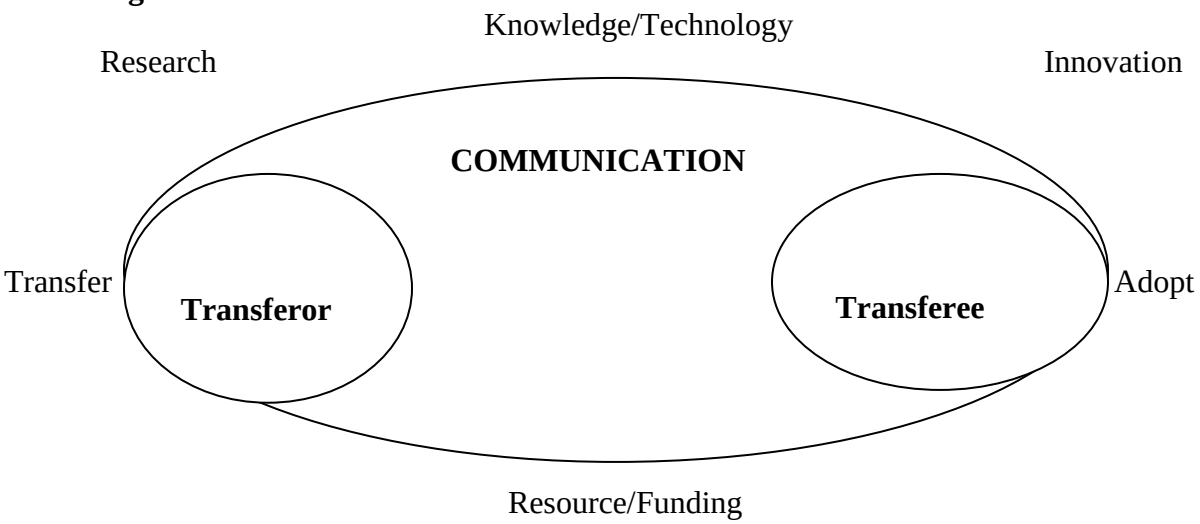
Developing countries universities have always being involve in the tradition way of lecturing/teaching without more involvement with companies for research and innovations. Developing countries should be involve in the development of knowledge-based economy and increase demand for innovation which has brought about new challenges for universities to move beyond their traditional role of educational institution and develop more outreach activities in partnership with company's (Etzkowitz and Leydesdorff, 1997; Etzkowitz and Leydesdorff, 2001; Etzkowitz and De Mello, 2003).

The process of technology transfer/acquisition by developing countries is one of learning and improving their technological capability (Barbosa and Vaidya, 1997). This is a

complex, long-term process with various levels of technological competence such as the ability to use the technology, adopt it, stretch it, and eventually to become more independent by developing, designing and selling it.

The Flow of Technology/Knowledge Transfer
Below is the circular flow of knowledge and technology transfer from the Transferor to the Transferee and back to the Transferor.

Fig 1



The flow of Technology and Knowledge transfer is in a circular nature. Resources/Funds have been the driving force to Technology and Knowledge transfer especially in the developing countries. With the availability of funds, the transfer of Technology and Knowledge becomes a two way thing. In Fig 1, the transferor transfers Knowledge/Technology to the Transferee based on the Resources/Funding provided by the Transferee. With the availabilities of fund, the Transferor are willing to research and transfer technology and knowledge to the transferee, this could only be achieved if there is a continual communication between the two.

For technology to be transferred, policy maker/government has to provide implemental policy that will enable joint ventures, FDI, co-production, company acquisition and transfer of ownership by multinational companies. If a country/company is thinking about adopting or borrowing technology, they have to provide good policy for the buying and selling of technology, licensing and franchising.

If technology has to be transferred the level of communication must be high, the altitude of both the transferor and transferee has to be positive. The transferee must be willing to learn new ideas and the transferor must also be willing to teach or give out the idea that they have. Technology transfer is achievable if it is genuine, practicable, acceptable, high knowledge base of the transferee and infrastructure availability.

Knowledge transfer could be achievable if academics, policy maker and industries are involved in the process.

Method of Technology Transfer:

Foreign Direct Investment (FDI)
FDI have been a channel for technology transfer approved by many authors because of its direct impact on economy development and low cost of transfer. But the choice of choosing what method to channel technology depends on the countries market size, market growth, the threat of imitation, and the IPR.

For developing countries to acquire technology through foreign direct investment there should be abundance of skilled and semi-skilled workers and also a strong IPR protection to attract investors, these will increase the level of tacit knowledge (know-how) absorption. The multinational cooperation (MNC) is media for the transfer of knowledge and technology. Expatriates' are used for the transfer of knowledge and technology by the MNC. According to Dana & Snejina (2004), the more MNC uses expatriate for temporary assignments (Assignment less than a year), the greater the expatriates' ability to transfer knowledge while the more the MNC uses expatriate for long-term assignment s, the greater the willingness to transfer knowledge.

Haris (2002) argued that, expatriates' with long-term assignment remain critical for skill transfer, management control and management developments while expatriate with temporary assignment are used mainly for skill transfer.

Joint Venture
Joint Venture typically involves less risk than strategic alliances, acquisitions or financing subsidiaries, they tend to be more common, as skills, attributes and resources are sought through mutual business objectives (Czinkota et al, 1994). With joint ventures companies can pursue common business-related purposes, use harmonising technology or research techniques, increase capital and bargaining power, extend the risk of scale; and surmount entry barriers gaining market share and therefore power (Boyett and Boyett, 2001; Linklater and Paines, 1990).

The expansion of joint venture in any economy leads to Multinational Corporation; therefore encourage technology and knowledge transfer. Mowery et al (1996) argued that joint venture is superior means to enhance a firm's positioning through capability learning and knowledge transfer.

Licensing Agreement
A License is a contract which authorizes the use or exploitation of the subject matter of the licence for a specified purpose and period of time with all other right maintained by the owner of the technology (Thomas, 1998). He also argued that companies wishing to expand into the international arena are finding that licensing or transferring their

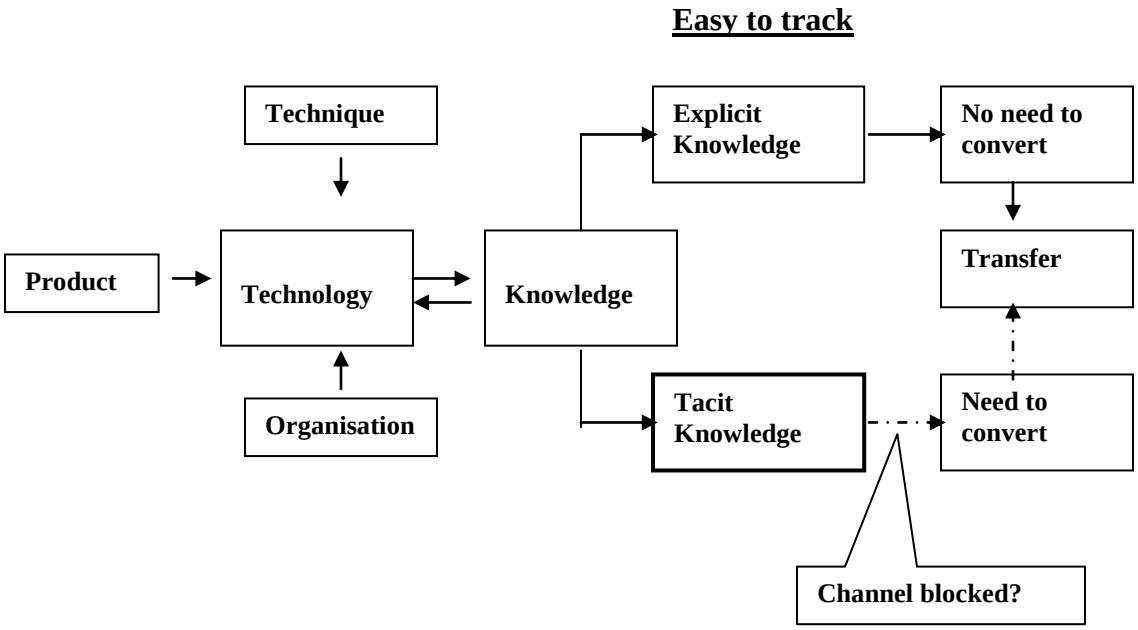
technology provides a low risk and highly profitable alternative to direct export, establishing a foreign branch, subsidiary or joint venture. These arguments by Thomas can only benefit the transferor and not the transferee at the long run. The reason for technology transfer is to benefit both parties and at the long run, the transferee should be independent of the technology gained.

The motivation for licensing of technology and product could be for the penetration of the international market. Companies are willing to license their technology to countries where they do not have penetration through export or direct investment and also selling of their product. Countries willing to embank on technology transfer through licensing must be sure of the credibility of the licensors and their willingness to transfer technology.

Unlocking Tacit Knowledge

Tacit knowledge is the brain behind knowledge and technology transfer. According Richard (2006) tacit knowledge is a key element that delivers the most sustainable advantages, when looking at knowledge transfer between parties. He also argued that this tacit knowledge is blocked between transferor and transferee in terms of knowledge transfer. The figure below shows the framework for effective knowledge transfer by Richard (2006);

Figure 2



From the figure above, it shows that knowledge could be transfer except tacit knowledge. This knowledge could seen as long life experience of the transferor. Experience could be transfer when all parameters are put in place for transferor to transfer knowledge to transferee. Experience could only be achieved with willingness of the transferee to learn on site (practical work) and also for the transferor to be willing to teach what is known.

Tacit knowledge is unlocked when experience on the job is totally transferred to the transferee. This could only be done through the following ways;

- Direct key transfer; Experience is transferable on the job training. This method of transfer is very effective. The trainer/transferor will train the trainees/transferees on the job; by teaching them what is knows at the same time providing practical work for them while he shows to make corrections. Trainee are given project tasking for them to practice what they have leant.
- Tea-break; Tea-break is an informal way of transferring experience. This method provides a forum were transferors and transferee can discus over tea or at break period in a common room. This method develops social relationship between transferor and transferee thereby building trust. As we know trust is a major component of knowledge transfer.
- Discussion forum; this is a formal way of transferring knowledge. Formal discussion forum should be created were both transferees and transferor discus relevant issues relating to the jobs and their problems at the job. This type of forum provides room were question will be asked directly to the transferor. This could also the termed as questions and answers forum.
- Intellectual Property; we all know that strong IPR attract investment. With strong IPR, the trust of investment is increased which attracts know-how. With this binding trust between transferor and transferee and with propel agreement and negotiation, the culture of know-how will be transformed to show-how.

Implementation of IP Strategy

Intellectual property (IP) is a factor that affects technology transfer apart from infrastructures, trade, location, investment in-flow, policy, culture, etc. to developing countries. Developing countries should strengthen their IP policy to attract foreign investment. Developed countries will be willing to set up manufacturing and R&D facilities in countries with strong IPR. In contrary to this, some author believes that weaker patent protection maybe desirable for technology transfer in developing countries. These allow indigenous companies to produce and compete with foreign companies. The treatment of intellectual property among other policy instrument is an important factor on a county's ability to attract R&D investment from multinational enterprises (MNEs) prabuddha (2004).

A transferor can limit certain type of technology to be transferred to transferee, simply because they want to take advantage of competitiveness. Some authors believe that, for technology to be transferred taking IPRs into consideration, patent protection should be tightening and cost of imitation should be raised on the part of the local company, while others believe that technology could be transferred easily if the country's IP policy is not tough on the indigenous companies. IPR encourage innovation by granting inventors monopoly power over their innovations. With strong IPR, technology transfer will be difficult in developing countries, thereby reducing the rate of technology diffusion. According to Rod and Neil (2006), a stronger IPR protection can help reward creativity and risk-taking even in developing economies, while weak IPR protection can make developing countries remain dependent on dynamically inefficient firms that rely on counterfeiting and imitations. Countries with strong R&D will benefit from stronger IPR,

while countries with weak R&D will not benefit directly from stronger IPR because of lack of innovation.

Company's internal R&D capacity determines the extent of technology transfer. According to Yanying & Yijun (2007), technology outsourcing to some extent is the extension of a firm's internal R&D capacity. They argued that, for technology outsourcing (transfer) to be successful in a firm, the firm needs to have a strong R&D base. Yanying and Yijun also argued that internal R&D capacity is the key for a firm to retain competitive advantage in the long run. For technology transfer to be effective, both internal R&D and technology transferred must coexist.

Summary and Conclusion

The issue of knowledge and technology transfer have been a great interest area for academics, policy maker, and industries in both developed and developing countries of the world. Technology Transfer has been an area of controversy over the years with the introduction of TRIP Agreement. This has benefited the developed countries more than the developing countries.

To reduce poverty and increase the world economic strength, knowledge and technology transfer to developing countries should be focused upon. This will reduce the gap between developed and developing countries. Developing countries should be willing to encourage knowledge and technology transfer as well as local R&D. The transfer of knowledge is not the only economical solution to developing countries but transfer of R&D. This will empower the local R&D for more innovation.

Although infrastructure and policy has been a barrier for knowledge and technology transfer in developing countries, but one of the main barriers is the IPR (TRIP Agreement) which as hindered the diffusion of technology in the developing countries. There are two school of though on IPR, one believes IPR in developing countries should be strong for countries attract investors while the other school of though believes IPR should be weak for technology to diffused to local industries. If the world economy is truly interested in the development of developing countries therefore, the IPR argument should be properly addressed to ease knowledge and technology diffusion and transfer in developing countries.

Developing counties like Nigeria should collaborate with other developing countries like China and India for technology transfer because these countries were ones in their situation and will be willing to negotiate for appropriate knowledge and technology transfer. And finally, with all this issues, knowledge can only be transferred if and only if tacit knowledge is appropriately transferred.

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