Technology Transfer as a Form of Co-creation for Future Market

- Issues, Frames and Concepts

Dr Sudhanshu Rai, Copenhagen Business School

Professor Jean-Paul Van Belle, University of Cape Town

Professor Mogens Kuhn Pedersen, Copenhagen Business School

Abstract

In developing countries the creation of opportunities for improving the livelihood of citizens remains a major preoccupation of governments, non-government organisations, international funding agencies and technologists. In the past, developmental strategists and policy makers have conceptualised development as an instance of capacity building, where technology transfer in particular has been considered primarily as a diffusion process. Technology in this case, is introduced because it is seen to be a benevolent lever for human development. In this paper we develop an alternative argument to the benevolence thesis predicating its success or failure in a local context on the nature of the co-creation process and the facilitation of a parallel market where the outcomes of the co-creation process can be elucidated. The endeavour is to develop the idea of co-creation as an alternative framework to technology transfer. Although we make explicit the purpose of co-creation, which is to enable the formation of future markets, we spend little effort on explicating what the objective of this exercise is. Our preoccupation at this stage is primarily trying to explain co-creation and not so much the objective of that co-creation, which is to enable the formation of future markets. We acknowledge the problem associated with such a line of enquiry but feel confident that once we are able to explicate the dynamics of co-creation as an alternative to technology transfer, we will then be in a better place to frame co-creation within its purpose.

Keywords: co-creation, innovation, market creation, future markets**1. Introduction**

In this paper we forward an alternative thesis to the technology transfer approach and couch our suggestion in the co-creation of future markets conjecture. While we subscribe to the overall objective of enabling and sustaining economic growth in emerging economies, we shift the argument from seeing technology transfer from a market seeking endeavour to a market creating endeavour enabled by co-creation of ICT innovation. Technology can be conceived as a process of combinations of smaller related technologies, which are put together implying each component of technology are in itself a set of technology developed for addressing an observed phenomena or a set of phenomena (Arthur 2009). Transfer of this technology is then to assume the commonness of phenomena across geographies and attempt to use the solution or a specific set of solutions of technologies to address similar phenomena in diverse sets of contexts. The motivation of our research is encapsulated in the following two research questions:

- How can we conceptualise co-creation as an alternative to technology transfer?
- How can co-creation of ICT innovation enable the emergence of future markets?

When researching the impact of ICT in emerging economies, there is a tendency among researchers to subscribe to the developing-developed paradigm (Mere and Stiglitz 2001) as an endeavour for gaining market access for products and services using current technologies. There is an apparent lack of acknowledgment of the knowledge base of the host country. Only recently has the conception of the host knowledge base in helping technology innovation gathered currency in technology transfer through several co-operative strategies such as joint ventures, subsidiaries, alliances, sub-contracting and collaborative initiatives (Hobday 2000; Blindenbach-Driessen and Van Den Ende 2006; Bosch-Sijtsema and M. Postma 2009). Our motivation is not to debunk the growth thesis but to develop an alternative argument to support technology transfer more as an instance of co-creation of the ICT innovation process, shifting the focus of new technologies gaining market access to the conceptualisation of co-creation as a tool for enabling future markets. We argue that co-creation enables local knowledge to purposefully interact with a diverse set of non-local knowledge base and in the process the emerging technology becomes a re-formulation, re-design, re-engineering and re-targeting with new business models all in sync in creating future markets to support the ICT.

The market access conjecture is driven by the economic growth thesis. This thesis conceptualises growth in developing countries among other factors: as strongly influenced by development of technology or the transfer of technology from advanced regions to its own location. This is because developing countries were argued to be suffering from poor and disconnected markets, weak ability to create technology due to, a narrow knowledge base, poor infrastructure, weak demand and poor quality of human capital and fragmented markets (Mere and Stiglitz 2001). In addition (Rogers 1979) pointed out that social variables such as innovative potential and the nature of the knowledge base affect the nature of development.

We build our case from the standpoint of co-creation of innovation as an alternative way to conceive technology transfer and indicate how ICT can play a greater developmental role if co-creation is conceived not as a downstream activity but as an endeavour that aims to integrate different types of skills, interests, abilities and institutions to create a sustainable market for skilled services and technology goods (Sadoi 2008).

To support our co-creation of future market conjecture we have organised the paper in the following way:

In section 2 we provide a very brief definition of technology transfer. Section 3 presents the main theoretical background in discussion of the varied themes of technology transfer and a critical exploration of the limitations in thinking of technology transfer as a downstream activity. We do this from two perspectives. The first angle investigates how homogeneity of the context, the alignment of the knowledge base of the transferring entity to the knowledge base of the receiving entity enables a smooth technology transfer but does not necessarily result in a successful market impact. Secondly, technology transfer within the developing-developed paradigm is predicated on the deficit thesis, i.e. the transferring economies are seen to have advanced technology where as the emerging economies are net recipients. The deficit thesis conceives of technology transfer as an alignment opportunity, where the transferred technology aligns growth and markets of developing countries to the upstream transferring country. In the co-creation mode we will argue that it is not sufficient to achieve market alignment but that market creation is needed, thus utilising the knowledge base to build technology for enabling sustainable economic growth.

This paper also grounds and illustrates the co-creation concept by means of a case study. In section 4 we discuss the methodology and in section 5 we present a single case study to illustrate how co-creation takes shape and has the potential to create future markets. Section 6 presents some analysis of the case and in the next section we refine our definition of co-creation based on the case study. We then use this as a basis for further discussion of co-creation and conclude with some pointers for the future.

2. Defining Technology Transfer

Technology transfer can be defined as a process of transmitting know-how from upstream technology generating countries to downstream technology recipient countries (Bozeman 2000). Hence technology transfer is a deliberate goal oriented activity that aims to link those social entities that do not have the technology but need them with those that develop the technology and want to get market access for their technologies. The process enabling the knowledge flow between these two societies has also been regarded as technology transfer (Autio and Laananen 1995). Thus, technology involves not only the explaining of the knowledge associated with product or technology but also the exploration of new knowledge associated with that technology in a feedback loop (Kremic 2003). Technology transfer often includes a commercialization endeavour where the objective is to convert research results into tangible products for market access. The transferring of results can be manifested in many ways, for instance licensing, creating patents or through promoting start-ups (Harman 2010).

Thus, technology transfer has the following three elements. First, it is a technology transmission endeavour associated with the exchange of components of technology. Second, it occurs from upstream locations normally considered as developed or technically advanced regions of the world to less advanced regions of the world. Third, there is a feedback loop that helps improve the technology by informing the developer of the nature of modifications needed and finally it is preoccupied with the transfer of knowledge associated with the technology.

3. Nature and Perspectives of Technology Transfer

In this section we sketch out the current thinking regarding technology transfer. There are several impacts of technology transfer that researchers have endeavoured to explain (Bozeman 2000). At

this stage we provide a more general understanding of the state-of-the-art and not focus ourselves on ICT per say for two reasons. We first deconstruct the technology transfer research to show the gaps in thinking and second to use the literature to reconstruct the idea of co-creation as an alternative form of technology transfer.

Economists have consistently linked technology transfer to economic growth. For example, growth theory has consistently linked technology improvements and long run growth (Aghion and Howitt 1998) and (Klenow and Rodriguez-Clare 1997; Hall and Jones 1999) identified the improvement of total factor productivity to the introduction of improved stock of technology in the country. The improvement of firms balance sheet as a result of the improvement in factor of production was identified by (Griliches 1998; Parisi, Schiantarelli et al. 2006). According to this thesis, firms choose a space along the technology transfer trajectory based on their own strengths and strategies. For example, some create new technology while others adapt technology for localisation (Evenson and Westphal 1995). Both kinds of firms enable economic growth as they add to the improvement of the stock of capital. Economic growth theories see two sets of instruments that are employed to influence the stock of capital. The first is government policy and the institutions it builds to support technology transfer from centres of research to the market for commercialization. Second are those firms that have their own R&D units and are able to bring their research to market along similar transfer trajectories. The preoccupation of technology transfer researchers has been to study which of the mechanisms within each of the instrument are better at technology transfer - government or the firm.

Political economics conceives a strong role for the government in ensuring fair play in the market through policy interventions. In the technology transfer space, governments have played a proactive role by setting up Technology Transfer Offices (TTOs) with an explicit mandate to commercialise research results (Clarysse, Wright et al. 2007). It is now recognized that public sector R&D, especially in developing pre-competitive technologies, (basic research) can be an important complement to R&D carried out in the private sector (Lundvall 1999). The question then arises that which instrument of the market is better at commercialization, the TTO or the firm.

European governments have supported technology transfer endeavours through the provision of public funds (Wright, Clarysse et al. 2006) and according to (Wolf 1988), guard against non-market failures. France and Sweden launched a national incubation program to decrease the knowledge gap and facilitate technology entrepreneurs in starting up businesses. These countries constituted a program to support academic spin-offs with low cost to the entrepreneur for infrastructure support services (Jacob, Lundqvist et al. 2003) and Belgium has supported technology transfer and provided financial support for spin-offs.

China, Japan, South Korea and India have created a market for technology using a mixed strategy of government supported technology transfer institutions and market led commercial firms with varied results. Evidence indicates that it takes a long time, in some cases 14 years, before a technology research institute reaches maturity (Agarwal and Bayus. 2002). Using Management literature inspired by contingency modelling (Stock and Tatikonda 2004; Stock and Tatikonda 2008) show how technology transfer can be best managed. According to these authors, “technology integration will be most successful when the level of interaction between the source of the technology and the recipient of the technology is appropriately matched to, or fit, the characteristics of the technology to be integrated”. Particularly in terms of the organisational structure of both the recipient and the transferring entity, their systems, culture, and work practices need to be aligned to ensure success of the technology transfer process (José, Hervas-Oliver et al. 2009).

While the evidence may be irrefutable, the context may change and thus the ability to generalise the impact of technology transfer may be limited. Government technology transfer initiatives are conceived as being in the business of transferring tangible research results along with the associated knowledge. In this case, transferring becomes a tangible, relatively defined endeavour, with a definable set of outcomes. What if the solution addresses only part of the problem and the knowledge associated needs other knowledge base to fully form itself into a product, as is the case with many ICT inventions? In most ICT innovations the knowledge is distributed and the product needs this distributed knowledge to see the light of day. For example, 3M, IBM and Hewlett Packard attempt to create high levels of community and trust by providing material and non-material expressions of commitment to their employees (Adler 2001). Following the successful development of Linux and other major software innovations have brought to the fore the potential of distributed knowledge in the ICT sector (Benkler 2006). In this article, distributed knowledge is identified along with the conditions for exchange of knowledge, i.e. the commons-based, non-proprietary and non-market production model that we have seen in the development of Linux software. (Tsoukas 1996) pointed out that a firm should be seen as a distributed knowledge system and (Kühn Pedersen and Larsen 2001) apply that the concept of distributed knowledge is applied to new product and service development involving participation of all relevant stakeholders in the network. In effect, what we need to acknowledge that knowledge transfer, requires the combination of a variety of knowledge bases, such as the hardware, the software, the knowledge relating to integration and the awareness of users needs.

It is a challenge for a technology transfer office commercialising ICT associated research results to have all of these skills in-house. Then there is the research itself in the ICT field, where researchers provide solutions to an aspect of the ICT problem and the solution makes up a small component of the product. The question is, how technology transfer should take place when the research result itself is in the form of a component. The complexity of the ICT artefact leads one to re-conceptualise technology transfer as transfer of modules of knowledge, specific to a particular application or artefact. Technology in this domain is as much a problem of structuring and integrating as it is a problem of development and innovation. Thus technology transfer organisations funded by governments may not be the best institutional framework for addressing complexity inherent in the field of ICT. In this case, how should a technology transfer unit of the government engage with technology transfer in the ICT sector?

Free markets and private enterprise could hold the key to addressing the complexity problem. A firm has several options for engaging with complex technology transfer context, such as the ICT environment. Several mechanisms in the literature indicate relative success, for instance globalisation has enabled firms to engage in alliances, partnerships, joint ventures (Sadoi 2008), subsidiaries (Lee and Houde 2000; Maher and Christiansen 2001; Sadoi 2008) and use the Foreign Direct Investment (FDI) route to participate in other markets. FDI is an alternative financial mechanism for engaging with technology transfer. The idea that FDI is driven by a firm's knowledge assets can be traced back to the pioneering work of (Hymer 1976) and the subsequent developments by (Buckley and Gasson 1976).

The knowledge base of alliance partners can be useful in enabling the emergence of competitive capabilities (Hamel 1991). In addition (Ghani, Jayabalan et al. 2002) demonstrate a positive co-relation between the firm’s ability to introduce new technology in their subsidiaries and a high level of productivity. (Dohse 2000; Cooke, Davies et al. 2002) demonstrate a positive impact of technology transfer on regional development. Licensing and intellectual property rights are yet another channel that modern firms use to enter into

partnerships or joint ventures across borders (Jensen and Thursby 2001; Zucker, Darby et al. 2002). Consequently a formal technology transfer process might consist of either a patent transfer manifested in a spin-off in a partnership or the establishment of an exclusive or a non-exclusive license agreement aimed at sustaining alliances between firms (Clarysse, Wright et al. 2007).

In retrospect, market mechanisms for technology transfer such as alliances, joint ventures and creation of subsidiaries have obvious advantages but they have serious limitations that inhibit them to engage in technology transfer in a manner that enriches the knowledge base of the host economy. For example, alliances, partnerships and joint ventures are often market seeking instruments. The argument is that firms engage in such arrangements because they are motivated to increase their profitability and to do that, they seek new markets to increase their sales share. Most firms engage in emerging economies sales in mind and research and development is an afterthought. Only after the product has matured sufficiently in that market do firms invest in localised R&D. Technology transfer in this case is a classical downstream activity of the firm designed to seek new markets.

The problem with such technology transfer instruments is that they have a very narrow understanding of technology and knowledge. For them, the technology that matters is their own and the knowledge that matters is associated with their own technology. In these cases, local knowledge is simply no knowledge, as it does not fit their knowledge portfolio and is consequently unusable and has little relevance to the technology they introduce. This kind of thinking is out of place when one considers ICT. This is because an ICT product is an artefact in a constant state of transition and development. ICT providers are under constant pressure to improve and innovate, to make the old product better and to provide improved features etc. Subsidiaries, alliances and joint ventures thus need to transform themselves into dynamic, living, knowledge acquiring, thinking organisms. In this case what kind of market organisation will most efficiently address the need to transfer technology demanded by the ICT artefact?

Increasingly, the host countries are now seen as sources of knowledge and technology as well as markets (Dunning 1994). The extension of this thinking is manifesting itself in how global firms organise their subsidiaries. Subsidiaries of global firms have increasingly taken upon the role of market scanners away from merely a market seeking unit (Porter 1990; Dunning 1994). Those subsidiaries that have shifted their focus from transferring technology as a market access strategy to resource identification and utilisation units have tended to focus on exploiting the host in terms of R&D talent (Bartlett and Ghoshal 1989; Kogut and Chang 1991). With the shift in the awareness of the potential for host regions to add value to the firms product and knowledge base, there exists a slight challenge in how these localisation efforts are instituted.

While companies are increasingly using local knowledge, they are also confining the local knowledge onto a pre-determined platform that they introduce. They rarely use their knowledge and technology to engage the locals to build a platform that creates a new product away from their existing product line. The argument being constructed is very simple: involving the local knowledge base is not sufficient in utilising the host knowledge for creating value, if the firms limit the know-how of the host community to conform to the principles of a pre-existing platform developed by the investing firm. Hence the outcome is an incremental improvement of the existing platform but does not seek to create new or alternative platforms designed to create a new market or a separate set of localised products. The issue then is how and for what should firms use the host as well as their own know-how in the local markets to add value to their own customers and create new customers in new markets?

Theories of innovation could provide some insight to how we might structure a firm's innovative thinking to take full advantage of the hosts knowledge base for developing disruptive products

(Schumpeter 1934; Schumpeter 1942). The term 'innovation' means creation of something new or novel, but in discussions about science and technology policy the term has increasingly meant creative effort in converting research outputs into objects of commercial value (Yencken and Hinde 2005). The term disruptive means an instance of alternative non-obvious solutions, which call into doubt the existing consumption patterns, production platforms, goods or services. Innovation thus is a constellation of activities , needing scientists, managers, production engineers, coordinators, administrators and marketers, at every stage of the process. Hence innovation is a team activity, requiring co-operation and coordination from a number of individuals (Thursby, Fuller et al. 2009). Investigating innovative teams (Cooke, Davies et al. 2002) found that a balanced team has a greater chance of success, i.e. a team that is balanced having a cross section of divorcé knowledge domains. More recently innovation researchers have identified different innovation systems as a heuristic framework that provides additional insight into local factors (Lundvall 2002). This framework has proven to be successful for policy purposes and it has been adopted as an analytical framework and guideline for science and innovation (Negro and Hekkert 2008). Some other authors like (Jacobsson and Johnson. 2000) claim that several system functions are considered important for an innovation system so as to develop and thus increase the success chances of the emerging technology and its transfer.

In summary, the literature review provides four insights that are worth remembering as we go further on into the case study. First, government intervention in the technology transfer space may not be the most efficient way to engage with ensuring firm productivity in the ICT sector. Second, ICT technology is far more complex for a market mechanism to deliver localised value. Third, firms need to engage with disruptive innovation if they want to really use the knowledge base of the host region. And finally, firms and governments need to be aware of the local innovation systems (Asheim and Isaksen 2002) in planning their innovation strategy.

The implication of these insights are three fold: first, that most technology transfer literature is preoccupied with market seeking strategies and does not consider local knowledge (Ciborra and Hanseth 1998) in the context of their technology relevant. Second, market mechanisms are not well developed to enable market creation technology transfer. Third, innovation researchers limit themselves to incremental innovation as opposed to being bold regarding the potential for ICT to be disruptive.

4. Methodology

We use a single case study, the e-Choupal story, to bring out the idea of co-creation of ICT innovation. A case study is a history of past or current phenomenon, drawn from multiple sources of evidence (Leonard-Barton, 1990). Each case story becomes a case study when description is followed by analysis. Each set of analysis then supports either a set of research questions, as it does in this case or addresses a working hypothesis. The single case study illustrated below will tell the story as is, without getting into analysis in the first instance.

The case represents the data collected from an ICT initiative called e-Choupal. The data collected uses multiple data collection modes such as interviews, observations, document analysis and media reports from one company, Imperial Tobacco Company (ITC). We chose ITC as a possible case story as first, it seemed to indicate the features that interested us as researchers of ICT innovation. Second, the scale of the endeavour was very large hence methodologically easier to study and finally the target objective of the innovation was market oriented that fit our conception of co-creation as a market creating phenomena.

A critical element of any case study is that they are rooted in the context they want to understand. Examples of such case studies that are embedded in a context have been previously captured by research published by Philip Selznick (1949b), description of TVA and (Pettigrew, 1987) research on decision making at a British retailer (Philip Selznick, 1949b; Pettigrew, 1987).

Our data collection method was designed around two sets of activities the first of which was the interview stage. The design called for three sets of semi-structured interviews with each person at four levels of the e-Choupal organisation. The first set of people was farmers, who had used the system for over a year. We chose to distinguish the farmers as we wanted to interview those farmers who have used the system at least three times, i.e. used three crop cycles or more. We interviewed five farmers. At the second level we interviewed the head man or the lead user of the technology that interfaced between the farmers and the firm. We interviewed five individuals from this group. These individuals came from two different regions in India. The third group we interviewed were the agricultural technicians. These were people who were responsible for implementing the model of e-Choupal. We also interviewed five of these individuals in two regions of India and finally we interviewed five district managers who were responsible for the overall performance of the initiative at the district level. This study took place between March 2009 and November 2009.

The second stage of our methodological design was concerned with data recording, reporting to overcoming analytical problems linked to interview data. We endeavour to minimise the data ambiguity by developing a two step process for data recording and reporting. Interview data, if not handled properly is notorious for providing a very broad and shallow material for analysis. To overcome this problem we kept the interview itself informal and unstructured but developed a very structured mechanism for reporting and recording data. We developed an interview recording template. The purpose of this template was to record on a sheet of paper the key outcomes of the interview. The interviewer's notes and his reflections were also used in our coding endeavour. We also developed the interview reporting template that streamlined how data was to be reported. We then used ATLIS ti v6, a qualitative analytical software program to generate several levels of coding inspired by principles of grounded theory. Note: we do not claim that we used grounded theory method in our design in its entirety but used its principles to engage while analysing the data.

5. A Case of e-Choupal for Rural Marketing in India[1]

e-Choupal (*choupal* is the Hindi term for a meeting place) is an initiative started by the Agri-Business vertical of one of India's leading private sector companies, ITC, with a turnover of over US $ 5 billion[2] and is listed on Forbes 2000. ITC was incorporated in 1910 under the name Imperial Tobacco Company of India Limited. As the management of the company passed on to Indians the name of the company was changed to India Tobacco Company in 1970 and then to I.T.C. Limited in 1974. In recognition of the company's business portfolio expanding beyond cigarettes & tobacco to include hotels, information technology, education & stationery, packaging, paperboards & speciality papers, agri-business, personal care, foods and lifestyle retail, the company was once again rechristened in 2001 as ITC Limited.

1 This case study was prepared and written by Mr Subrew Dey of CSDMS, under the instructive guidance of Dr Sudhanshu Rai

2 http://www.itcportal.com/sets/itc_frameset.htm

In 1990, ITC set up its Agri-Business Division (ITC-IBD) for exporting agricultural commodities, which today contributes to over 60% of the ITC Group's total foreign exchange earnings[3]. ITC-IBD has had a focused approach on strengthening its core competencies in select commodities and today delivers agri-commodities like **Feed ingredients** – Soyameal, Rapeseed Meal; **Foodgrains** – Rice, Wheat and Wheat products, Pulses; Coffee, Black Pepper; **Edible Nuts** – Sesame Seeds, Groundnuts, Castor Oil; **Processed Fruits** – Mango, Papaya and Guava Products and **Marine products** like Shrimps and Prawns.

ITC-IBD's largest item for exports is soybean meal (a rich source of protein) that is exported to animal feed mills around the world. But in the year 1998, the performance of this division was far behind ITC's other divisions. This realization prompted ITC to find new ways of helping IBD and the agriculture sector.

Though ITC was successful in processing and selling soybean products, they were not satisfied with the business performance. Both the farmers and soybean processors were stuck in an unproductive cycle. The process of getting crops to the market began with farmers harvesting their farm and loading the soybeans on tractors and bullock cart to bring them to the closest local market (*mandi*) where they waited for the crop to be auctioned. The auction begins when the Government-appointed bidder values their produce and sets the initial bid. From then on, Government-licensed buyers called Commission Agents (CAs) bid upwards until the crop is sold. Due to this system, ITC could not bid directly but was forced to deal through a specified CA at every *mandi*. The whole process was very inefficient due to of the following reasons:

- Trading though the *mandi* system was the only available and legal way for both farmers and soybean processors and this system gave CAs monopoly
- CAs could manipulate the auction price to reduce farmers' earnings and processors' profits
- Farmers had to spend a lot of time to sell their produce in the marketplace
- Farmers did not have a reliable source of information about the prevailing market price of their produce, in this case the soybean

In May 1999, Mr Sivakumar, Chief Executive, ITC anchored a brainstorming session of the ITC management team where they had to come up with a solution that reduced the costs and inefficiencies incurred due to the above process. The idea of integrating digital technologies was agreed upon and the team worked together to develop a business model that incorporated 'e' into the tradition of the village *Choupal* to facilitate a reorganization of the system. The volume and quality of knowledge that can be captured and shared in the *Choupal* could be very useful to the farmer if it could be documented and be accessible to a wider geographic area as compared to the way it traditionally is, i.e. verbal and only available to those who are present at the meeting place at that time. Farmers being unaware of the market prices ahead of the harvest are usually unable to plan their finances and instead have an existence based on day-to-day survival. ITC-IBD knew that soybean price trends can be forecast because the prices usually follow the agriculture futures market on the Chicago Board of Trade and the Kuala Lumpur Commodity Exchange. If the farmers had access to this information on a daily basis, it could possibly improve their livelihood as then they could take informed financial decisions about their life and their farm since they will also be informed about drops in prices/demand of soybean in advance. They can then start to prepare

3 http://www.itcibd.com/aboutitc.asp

themselves for a season when soybean will bring in less money than usual and they can plan to grow other crops that could cover for the losses in soybean cultivation.

During a May 1999 meeting, Sivakumar and his team conceived the e-Choupal initiative that was an extension of the traditional *Choupal* where villagers meet informally to share knowledge, seek opinions, and generally chitchat with each other. ITC's e-Choupal took this concept one step further by introducing a few technological interventions, i.e. the computer and the Internet. ITC supplied a computer kit to each village with the following components:

- A PC with a Windows/Intel platform, multimedia kit and connectivity interface
- Connectivity to the Internet through either a telephone or more commonly through VSAT
- Power backup consisting of UPS (Uninterruptible Power Supply) and solar-powered battery backup
- A dot-matrix printer

ITC's total cost for equipment set up was $3,762 per *choupal* and an additional $2,213 was spent on people, travel, communication, software and training. A dedicated ITC website, www.soyachoupal.com was created and made accessible to the farmers introducing them to the Internet. This site, maintained by ITC Infotech India Ltd, an ITC subsidiary, had eight links to critical information. e-Choupal was based on the belief that the farmers needed an alternative to the *mandi* system. By participating in the e-Choupal network, farmers were offered new channels through which they could sell directly to ITC, thus eliminating the cost inflation and cheating that occurred through the middleman.

ITC chose a lead farmer called *Sanchalak* in each village and their home was the *Choupal* to house the equipment. The *Sanchalak* was given basic IT training by ITC and also instruction in effective communication. As per the information on ITC's website, farmers brought samples of their soybean crop to the *Sanchalak*'s house, which was equipped with moisture metres and other tools provided by ITC, enabling the *Sanchalak* to assess the quality of the produce. The *Sanchalak* gave a reference price to farmers based on the degree of variance from the 'best quality' sample as provided by the ITC website. If satisfied with the price that the *Sanchalak* quoted, the farmers could decide to ship their soybeans to the ITC hubs immediately or wait for a better price according to the information from the futures market. The physical architecture of the e-Choupal model called for a web kiosk within walking distance and a hub within driving distance of every targeted farmer. When a farmer's soybeans arrived at one of ITC's hubs, the produce was weighed and the farmer was paid according to the published prices on ITC's website. Additionally, farmers could also purchase herbicides, seeds and soybean oil through e-Choupal.

Initially e-Choupal came up, as an experimental business model, as such a model had not been implemented in India by anyone. It was thus imperative that the company itself created knowledge about it in the rural areas. The implementation is characterized by 'rational experimentation', internally called 'Roll Out, Fix It and Scale Up'. Such an approach was adopted because many lessons could be learnt only by implementation, as there were no precedents and rulebooks. As envisaged, the platform allowed scalability and distributed operations.

6. Analysis of the Case Study

The case of e-Choupal is unique for two reasons. First, the firm ITC underwent a number of stages in refining their model to create a successful business for integrating rural markets with global markets. Second, the transformation of the company's awareness that local knowledge is as valuable as their own knowledge, encouraged them to establish the e-Choupal mechanism.

From an agricultural point of view, local knowledge can be of several types: first, this knowledge can be institutional, i.e. an understanding of its sets of technology and business model could best fit in a local institutional context depends on local knowledge. This kind of knowledge manifests itself in forms of norms, conventions and social customs. Second, local knowledge could be geographical, i.e. knowledge about localised weather patterns, the lay of the land and yield rates based on experience. Third, the understanding of the existing market conditions, its advantages and disadvantages, all of these need local knowledge for any intervention such as the ITC e-Choupal to succeed.

In what follows we analyse the case, pointing out a three-stage process where the first set of initiatives was in line with the world view of a global enterprise "we know our product and know how to sell it, the problem is of market access and not re-invention of our product". We point out in the three-stage explanation how this initial world view of the rural Indian market changed to first looking for solutions in using market mechanisms, like integrated value chain, and later shifting the operation to subsidiaries. Finally, in stage three, final realisations occurred, moving the firm in a co-creation mode where working with the knowledge base of the locals was the key to the success of the product. Here the product was not the agricultural produce but the innovation in the business model.

6.1 The World View: "take all you can get"

ITC is no different in thinking of markets as opportunities and the challenge then is to devise strategies to enter the market to ensure large market shares, irrespective of the nature of the product. In this case the ITC ventured out into the Indian rural market, with the hope of capturing the agricultural market for itself. Their initial reaction was to use their own knowledge in logistics, integrating value chain to create market access for the agricultural goods. Its approach was to create a separate entity which then enters the market for agricultural goods. This strategy was an obvious one as precedents indicated a pre-determined path to how a firm might take advantage of new opportunities. Technology transfer to them was one of market seeking and their knowledge of logistics was considered critical in their understanding of how to take advantage of the opportunity. Technology associated with other aspects of the production process was not held critical to the relevant knowledge needed to engage in market access.

After launching their initiative they soon realised that there were hurdles to their market access thinking, partly due to the current nature of the market and partly due to government policies, which made the commission agent an important market actor. Their first response was to use their national logistic knowledge to suppress the commission agents using their self-conceived superior knowledge. When that did not work they went back to the drawing board for solutions.

6.2 The Problem Mode: "things are not working"

Once the managers realised that things are not working on the ground to their expectations, they went back to the drawing board and started asking some basic questions. The key theme the

solution set consisted of was to think of de-linking the market from the production unit and using the power of the internet to create a virtual market where the producer of the commodity will find a market for his produce using a virtual market supported by the ITC. The initial idea was simply to integrate several production centres and create an institutional framework where decision makers, this time appointed by ITC, would be gate keepers of the market. Technology and training was imparted to these gatekeepers called "*Sanchalaks"*. Equipments were provided that would enable training to the gatekeepers, who it was thought inturn will help disseminate the technology through word of mouth and better prices for their commodity.

However, the form of providing an alternate channel of market access simply replicated the existing market and took it to a new platform. The innovation was one of logistic innovation and still considered technology and knowledge associated to operational complexity as opposed to knowledge complexity. The preoccupation was still on low cost market integration mechanism and not so much on exploiting the local knowledge base for designing long-term prosperity and sustainability. Technology transfer in this case was viewed as training and the dissemination of actual units. Training was conceived as downstream knowledge broadcasting, where a trainer would walk through the 'how to use the system', and not focus on 'how to change the system' questions. The problem of weak results plagued the firm once again sending them to the drawing board, only this time round the drawing board of ideas were the producers of commodity and the locations were the villages in the rural areas.

6.3 The Co-creation Mode: "let's create a win-win situation"

There were several problems with involving the rural producers. They would often talk of the product as their own. The view was so local and the knowledge so contextual that it was hard to develop a common theme for the e-Choupal. Initially they went back to the same people who they were in touch with previously and found that they simply articulated what they were told in previous interactions. Soon they decided to take a new district where e-Choupal was not launched as they wanted a fresh start. They involved all farmers, middlemen, service providers and local government partners to develop what is now known as the e-Choupal system. The evolution of this system was characteristic of a changed world view and the focus shifted to doing business and using the local knowledge instead of integrating the market and gaining access. The new emerging conception was that producers needed a host of services besides the one-time transaction of selling their commodity to ITC. The Internet remained the platform but the focus shifted from acquiring products to servicing the farmers and the commodity as a product was the outcome of that service.

For example, ITC started servicing the local producers with precise weather information and forecasts that enabled them to plan their crop rotations, their schedule for fertilizing and mechanised watering after studying the monsoon patterns. An additional service was to support the producers in addressing the quality of fertilizers. The realisation here was that the producers knew a lot about their own region and the additional service needed to link that knowledge in an integrative form to provide value to other producers in the same region. The result of this endeavour was to innovate on the side of the business model and think of producers as service consumers and not producers as it was first conceived. In effect, what started off as a market integrating initiative for market access, primarily become a service enterprise where the sale of produce is a small but useful value addition to the bottom line of ITC.

How did this transformation take place? From our lenses we conjecture that the transformation took place through a step-by-step failure and learning from their failures. The real innovation occurred when they re-conceptualised the farmer as a producer of commodity to a consumer of

services and started addressing their needs with specially designed products. The point is that the production focus did not disappear but got included in a larger business model where there were multiple channels of revenue besides the purchase of commodity. While commodity still remains an important activity, ITC has been successful in shifting the focus from that as the key output to a portfolio of services, changing the company from being just a purchaser of commodity to a provider of services to the farmers.

In our opinion, engaging a diverse set of stakeholders who need not share the knowledge base of the initiating entity was the key to shifting the focus from a procurement company to a service company. The innovation was in the business model, in the manner of the interlink ages of services to the farm produce by engaging with the local stakeholders. Diversity of knowledge base was no longer considered irrelevant but was actively sought and engaged with to develop the business model. The outcome of this co-creation activity was a new platform and a new market for agricultural services. Today the e-Choupal in India is considered to be an alternative market to the existing "*mandi*" system supported by the government. The success in our opinion was not limited to an innovation in the business model but it was linked to the creation of new markets. In effect three key features in the evolution of e-Choupal can be identified. First, the shift from the company's focus from a procurer of commodities to seeing ITC as a service provider was critical in the evolution of e-Choupal. Second, the innovation was the business model, which drew on the local knowledge as a key input to re-formulating, re-designing and re-discovering the rural knowledge for creating a sustainable business enterprise. Third, the innovation created a new market, which to this day is growing rapidly.

7. Defining Co-creation

Based on the above theoretical discussion and the illustrative case study, we propose the following definition of co-creation: *"Co-creation is a process of interaction between ideas, opportunities and aspirations of market actors in an interactive re-invention mode, where the technology is reshaped, and applications re-contextualised, services re-formulated and business model redesigned to ensure local uptake of the enterprise, leading to sustainable business venture."*

8. Discussion: Conceptualising Co-creation

Co-creation, based on our definition above points to creating an interactive environment that enables re-innovation or re-invention of a set of technologies for extending to address local needs. However, the conventional technology transfer understanding is embedded in the pro-innovation bias, implying that if a technology has been developed in one region and has proven to be useful, then it should be beneficial to the downstream community. We hypothesise such a conceptualisation to be dated when it comes to the transfer of ICT, for two reasons: first, we acknowledge that all societies have some degree of understanding of their own needs and carry a wisdom that can determine the interests of that society. The implication of this is that technologies need not be adopted as intended by the up-stream community. Second, both down-stream and up-stream societies have their unique knowledge base, which needs to be taken advantage of when technology is being re-innovated or re-invented. The implication being both knowledge bases need acknowledging and working within an interactive co-creation mode.

Hence the co-creation of future markets is an alternative way to think and instantiate technology transfer. Another important aspect of the co-creation idea is how that market creates, disseminates and uses information. We think information dissemination and knowledge coordination are as critical as the ideas associated with the efficient market thesis. Information is defined as a facilitating descriptor of a space that communicates to all the existing inhabitants of the space to the existence of goods and services that are demanded and links them to suppliers. In effect, we are arguing for a deliberate role of communication and broadcasting techniques to play a supportive role to assist the co-creation of future markets. We acknowledge the potential of the broadcasting medium to help in our co-creation of future markets.

Another feature of our future market would be predicated on the observation from the case that ICT has a generative, constructive as well as an instructive feature. ICT has the potential to infuse new and novel ideas in a market and in their operators, who are presumably looking for opportunities. ICT is that set of technology that is able to connect ideas with seekers of ideas. ICT plays an important role in linking seekers of opportunities to the place where that opportunity can best be taken advantage of.

We provide four arguments in support of the co-creation process.

First, we acknowledge that developing countries have a rich knowledge tradition and we need to take advantage of this tradition in the way we design the uptake and diffusion of technology. In effect, we conceptualise co-creation not as an imposition of a firm's knowledge base on to the knowledge base of a rural society or developing country but more as contextualising and extending the technology in a co-create mode to help develop novel goods and services that will be needed and demanded by the local community as has been shown to be the case from our case study.

Second, we think that the base technology in terms of telecommunication already exists in almost all developing countries. Hence any technology transfer should not rely on the introduction of new infrastructure but the augmentation, through a co-creation mode should focus on the extension and modification of existing locally used technology and infrastructure to fit the needs of the future markets for provision and support of applications and services.

Third, technology transfer need not be seen as just infrastructure, but as a sharing of knowledge base through the interplay of technology, knowledge and infrastructure, given that the base telecommunication technology already exists. This means co-creation strategies should target the entrepreneurial energy to deliver goods, services and business models that would help the entrepreneur to service the market. The key point we make here is that we believe that co-creation provides a competitive platform for the entrepreneurs to conceive of a need, engage in its development and develop support systems to sustain their endeavour using the community resources which in the long run can be made sustainable with little intervention. In doing this the entrepreneur is not only able to address the need but is also able to continuously innovate based on the demand of his clients. This is evident from the case study when ITC reformulated a more local co-creation mode as opposed to the market access mode it was operating from previously.

Fourth, we envisage the co-creation process to be supported by some kind of mass media, which helps inform and support the market for goods and services. Often business strategies overlook the market supporting instruments. Information dissemination is a critical part of the co-creation process as it supports and sustains the market by providing information on how the market is functioning. This is a critical component of our co-creation conceptualisation. “Mass media channels are usually the most rapid and efficient means of informing an audience of potential adopters about the existence of an innovation, i.e. to create awareness-knowledge. Mass media channels are all those means of transmitting messages that involve a mass medium, such as radio, television, newspapers and so on, which enable one or a few individuals to reach an audience of many” (Rogers 2008). In our case, ITC had this component in place at an early stage but did not know how to maximise its utility. Through a co-creation process later on, they realised how critical information dissemination was to their business model innovation.

9. Conclusion

The purpose of this paper is to demonstrate that technology transfer can be conceived not just as a downstream activity but also, and perhaps better, as a co-creation process. To that end, two questions were posed. First, how can one conceptualise co-creation as an alternative to technology transfer? And second, how can co-creation of ICT innovation enable the emergence of future markets? A survey of the technology transfer literature identified several gaps in the current state of the art. Four key gaps currently stand out when we consider ICT perspective on technology transfer.

First, traditional technology transfer often conceives of technology as a set of defined pieces of research results needing commercialisation. However, the ICT research results are more complex and typically only available in the form of components. Several components need to be put together to make up the product. Hence technology transfer in the ICT field lends itself to sharing because it is often a component-wise development as opposed to full products.

Second, since the innovation is at a component level, there is a constant need for upgrading the technology and it needs to be done at a low cost. This is different from research results that subscribe to a complete product. In the field of ICT innovation, ICT products are never complete and need constant innovation for improvement.

Third, alliances, joint ventures or subsidiaries tend to see their role as market access but as the case indicates, such approach to market access might be a problem and finally technology transfer shies away from disruptive innovation. The traditional view of technology transfer is to efficiently get the technology from point A to point B along the path of least resistance and disruptive thinking is not entertained.

From these perspectives, how can co-creation be conceptualised? Co-creation needs to be considered as a process that visualises technology transfer as a social activity, engaged in generative, constructive and instructive interactions between divorcé cross domain stakeholders. Further, the focus of co-creation is to create new markets for new goods that are different from the purpose of traditional technology transfer endeavours. Co-creation is, in effect, a cross-domain innovative activity that aims to create disruptive technologies.

How can co-creation help in the emergence of future markets? As we have seen from the case study, future markets can be created by being rooted to the customer base and engaging both customers

and non-customer *stakeholders* in a process of business generation. The case study indicates that co-creation must be grounded in the realisation that *local knowledge* and local needs are the ones that should be driving the co-creation process and not a predetermined notion based on market access calculations. Furthermore, *entrepreneurship* is an important aspect of co-creation of markets. In the absence of local entrepreneurs the process of co-creation can suffer as we witnessed from the case. ITC identified a key stakeholder to facilitate the market but the success of that person was not as dramatic as expected because the person was not locally embedded.

Four components, all working together, help to create future markets:

first, the use of *local knowledge*

second, the engagement of *entrepreneurs*

third, the constant use of *broadcasters* to inform the market of the possibilities

fourth, *accepting disruptive innovation* as the way of working with market creation.

References

Adler, P. S. (2001). "Market, Hierarchy, and Trust: The Knowledge Economy and The Future of Capitalism." Organization Science **12**(2): 215-234.

Agarwal, R. and B. Bayus. (2002). "The market evolution and take-off of product innovations." Management Science **48**: 1024–1041.

Aghion, P. and P. Howitt (1998). Endogenous Growth Theory. Cambridge, MA, MIT Press**:** ().

Arthur, W. B. (2009). The Nature of Technology, What it is and how it evolves London, Allen Lane an inprint of Penguine Books

Asheim, B. T. and A. Isaksen (2002). "Regional Innovation Systems: The Integration of Local 'Sticky' and Global 'Ubiquitous' Knowledge." Journal of Technology Transfer **27**: 77-86.

Autio, E. and T. Laananen (1995). " Measurement and evaluation of technology transfer: Review of technology transfer mechanisms and indicators." International Journal of technology Management **10**(7-8): 643

Benkler, Y. (2006). The Wealth of Networks: How Social Production transforms markets and freedom. New Haven, CT, Yale University Press.

Blindenbach-Driessen, F. and J. Van Den Ende (2006). " Innovation in Project-Based Firms: The Context Dependency of Success Factors." Research Policy **35**: 545561.

Bosch-Sijtsema, P. M. and T. J. B. M. Postma, . (2009). "Cooperative Innovation Projects: Capabilities and Governance Mechanisms." The Journal of Product Innovation Management **26**: 58-70.

Bozeman, B. (2000). "Technology transfer and public policy: A review of research and theory." Research Policy **29**: 627–655.

Bozeman, B. (2000). "Technology transfer and public policy: a review of research and theory." Research Policy **29**: 627–655.

Buckley, P. and M. Gasson (1976). The Future of the Multinational Enterprise. London, Macmillan.

Ciborra, C. U. and O. Hanseth (1998). "From tool to Gestell: Agendas for managing the information infrastructure." Information Technology & People **11**(4): 305-327.

Clarysse, B., M. Wright, et al. (2007). "Academic spin-offs, formal technology transfer and capital raising." Industrial and Corporate Change **16**(4): 609–640.

Cooke, P., C. Davies, et al. (2002). "Innovation Advantages of Cities: From Knowledge to Equity in Five Basic Steps." European planning studies **10**(2): 233-250. .

Dohse, D. (2000). "Technology policy and the regions: The case of the BioRegio contest." Research Policy **29**(9): 1111-1133.

Dunning, J. (1994). "Multinational enterprises and the globalization of innovatory capacity." Research Policy **23**: 67-89.

Evenson, R. and L. Westphal (1995). Technological change and technology strategy. Handbook of Development Economics. T. N. S. a. J. Behrman. Amsterdam, North Holland. **3**.

Ghani, K. A., V. Jayabalan, et al. (2002). "Impact of advanced manufacturing technology on organizational structure." Journal of High Technology Management Research **13**(2): 157–175.

Griliches, Z. (1998). R&D and productivity: econometric results and measurement issues. Handbook of the Economics of Innovation and Technological Change. P. Stoneman. Oxford, Blackwel**:** 52–89

Hall, R. and C. Jones (1999). "Why do some countries produce so much more output per worker than others?" Quarterly Journal of Economics **114**(1): 83–116.

Hamel, G. (1991). "Competition for Competence and Interpartner Learning within International Strategic Alliances." Strategic Man-agement Journal **12**: 83–103.

Harman, G. (2010). "Australian university research commercialisation: perceptions of technology transfer specialists and science and technology academics." Journal of Higher Education Policy and Management **32**(1): 69 - 83.

Hobday, M. (2000). "The Project-Based Organization: An Ideal Form for Managing Complex Products and Systems." Research Policy **29**: 871–893.

Hymer, S. (1976). The International Operations of National Firms: A Study of Direct Foreign Investment. Cambridge, MA, MIT Press.

Jacob, M., M. Lundqvist, et al. (2003). "Entrepreneurial transformations in the Swedish university system: the case of Chalmers University of Technology." Research Policy **32**(9): 1555–1568.

Jacobsson, S. and A. Johnson. (2000). "The diffusion of renewable energy technology: an analytical framework and key issues for research." Energy Policy **28**(9): 625–640.

Jensen, R. and M. C. Thursby (2001). "Proofs and prototypes for sale: The licensing of university inventions." The American Eco¬nomic Review **91**: 240–259.

José, A.-G., J. L. Hervas-Oliver, et al. (2009). "Analysing high technology adoption and impact within public supported high tech programs: An empirical case." Journal of High Technology Management Research **20**(1): 53-168.

Klenow, P. and A. Rodriguez-Clare (1997). The neoclassical revival in growth economics: has it gone too far? NBER Macroeconomics Annual B. B. a. J. Rotemberg. Cambridge MIT Press**:** 73–102.

Kremic, T. (2003). "Technology transfer: A contextual approach." Journal of Technology Transfer **28**: 149–158.

Kühn Pedersen, M. and M. H. Larsen (2001). "Distributed knowledge management based on product state models; the case of decision support in health care administration." Decision Support Systems **31**(1): 139-158.

Lee, H. L. and M. F. Houde (2000). Recent trends and main characteristics of foreign direct investment in China. Financial Market Trends, Paris, OECD.

Lundvall, B.-A. (1999). Technology policy in the learning economy. Innovation Policy in a Global Economy. J. H. a. J. M. D. Archibugi. Cambridge, England, Cambridge University Press**:** 19–34.

Lundvall, B.-A. (2002). "Editorial." Research Policy **31**: 185–190.

Maher, M. and H. Christiansen (2001). Growth, technology transfer and foreign direct investment. Paper presented at the OECD Global Forum on International Investment, Mexico City.

Mere, G. M. and J. E. Stiglitz (2001). Frontiers of Development Economics; The future in perspective Oxford University Press

Negro, S. O. and M. P. Hekkert, . (2008). "Explaining the success of emerging technologies by innovation syste functioning: the case of biomass digestion in Germany." Technology Analysis & Strategic Management **20**(4): 465-482.

Parisi, M., F. Schiantarelli, et al. (2006). "Productivity, innovation and R&D: micro evidence for Italy." European Economic Review **50**(8): 2037–2061.

Porter, M. (1990). The Competitive Advantage of Nations. New York, Free Press:.

Rogers, E. M. (1979). "Communication and Development; The Passing of the Dominant Paradigm." Communication Research **3**(2): 213-240.

Rogers, E. M. (2008). Diffusion of Innovations, The Free Press, New York.

Sadoi, Y. (2008). "Technology Transfer in Automotive Parts Firms in China." Asia Pacific Business Review **14**(1): 147-163.

Schumpeter, J. A. (1934). Theory of Economic Development. . Cambridge, MA, Harvard University Press, .

Schumpeter, J. A. (1942). Capitalism, Socialism, and Democracy, Harper, New York.

Stock, G. N. and M. V. Tatikonda (2008). "The joint influence of technology uncertainty and interorganizational interaction on external technology integration success." Journal of Operations Management **26**(1): 65–80.

Stock, G. N. and M. V. Tatikonda, . (2004). "External technology integration product and process development." International Journal of Operations & Production Management **24**(7): 642–665.

Thursby, M. C., A. Fuller, et al. (2009). "An Integrated Approach to Educating Professionals for Careers in Innovation." Academy of Management Learning & Education **8**(3): 389-405.

Tsoukas, H. (1996). "The Firm as a distributed knowledge system: A constructionist approach." Strategic Management Journal **17 (Winter Special Issue)** (11-25.).

Wolf, C. (1988). Markets or Governments: Choosing between Imperfect Alternatives. Cambridge, MA, The MIT Press.

Wright, M., B. Clarysse, et al. (2006). "Venture capital and university spinouts." Research Policy **35**: 481–501.

Yencken, J. and K. Hinde (2005). "Finding and filling the gaps in the Australian government's innovation and entrepreneurship support spectra." AGSE Entrepreneurship Research Exchange.

Zucker, L. G., M. R. Darby, et al. (2002). "Commercializing knowledge: University science, knowledge capture, and firm performance in biotechnology." Management Science **48**: 138-153.