

Innovation Outsourcing & Knowledge Transfer

Mungofa Francis Manzira^a, Willard Munyoka^b

^aDepartment of Business Information Systems, School of Management Sciences, University of Venda, P Bag X5050, 0950, Thohoyandou, South Africa.

francis.manzira@univen.ac.za

^b Department of Business Information Systems, School of Management Sciences, University of Venda, P Bag X5050, 0950, Thohoyandou, South Africa.

willard.munyoka@univen.ac.za

Abstract: It is imperative to exist without innovation. Innovation dynamics are complex to understand because both our internal and external environment changes in a non-predetermined direction. This article discusses open and closed innovations as a way of balancing the contribution of each in the process of innovation. With the closed innovation systems, there is non-transfer of the organisational innovation activities to the external environment. Case studies of multinational companies have been used with results showing that open innovation increases network partners thereby increasing the base of ideas and solutions for problem solving. It is a critical objective of the organisation to balance between costs and returns from the internal R & D activities

This research concludes that innovation in companies is not clear cut but this can be countered through outsourcing the Research and Development (R&D) processes and activities to external players who are experts in areas of internal limitations. Evidence has shown that most innovative companies rely on outsourcing R&D to external players due to limitations that are encountered internally. Success of innovativeness involves interplay between the organisation and partners who are experts in the area of internal limitations. This research was not extended to cover innovation processes of the service industry which remains as an area of concern to be explored.

Keywords: open innovation; closed innovation; network; partners; limitations.

1.0 OPEN INNOVATION

Innovation entails closed and open Innovation with the former involving non transfer of all organisational innovations to the outside environment whilst retaining what has been innovated internally. There are no knowledge outflows from the organisation in the scenario of closed innovation. Below is graphic model of closed innovation model.

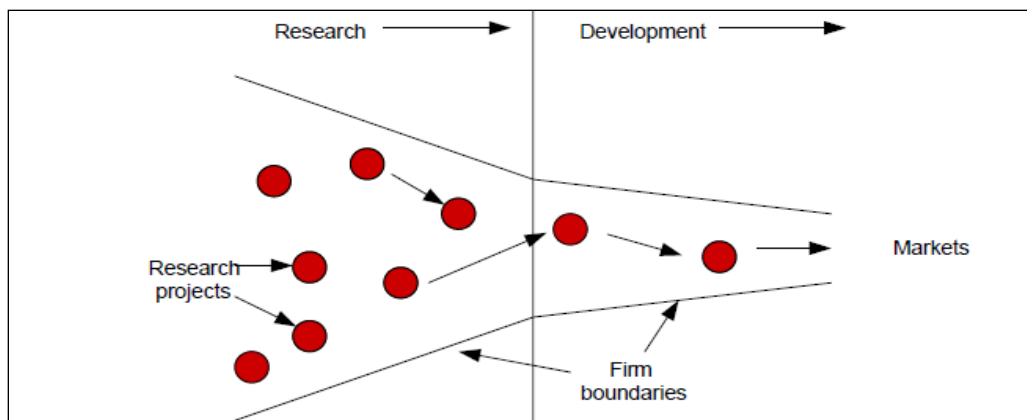
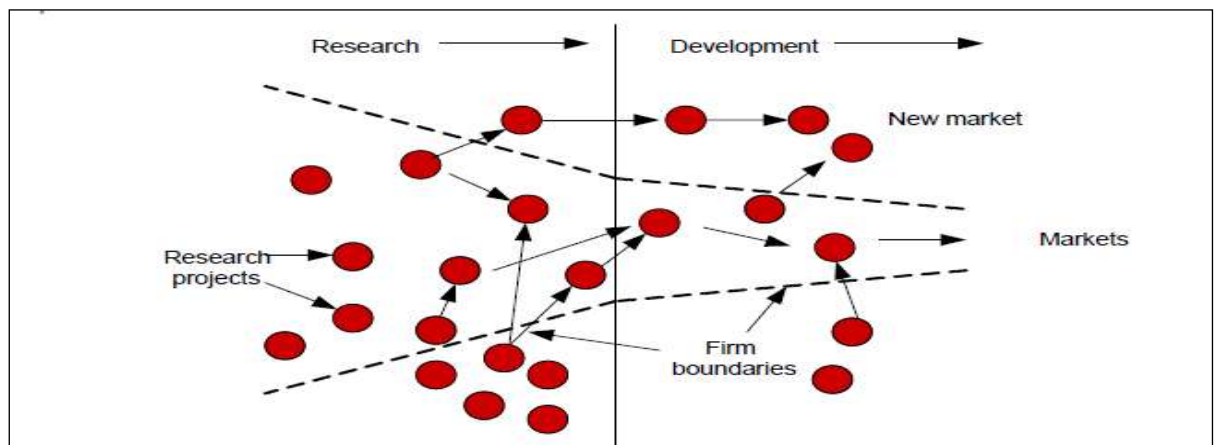


Figure 1.0: Closed Innovation (*Source: Chesbrough, 2003*)

Open innovation is the utilisation of specific knowledge inflows and outflows to improve the rate of internal organisational innovation process and identify new markets, (Van der Zee, 2008). In open innovation context, organisations are increasing their focus on acquisition of knowledge, technologies from external sources other than solely relying on their capabilities. It involves use of broad knowledge sources that include customers, rivals, academics and firms in unrelated industries in order for an organisation to meet its innovative and inventive activities, (Gallagher and West, 2006). According to Herzog and Leker (2007), open innovation is based on external technology sourcing and commercialisation of external technology.

The most successful companies have relied on outsourcing their Research and Development (R&D) to external players in the business areas which their R&D activities encounter internal limitations. Another major challenge that can compel the organisation to move into outsourcing of design activities is the imbalance between costs and returns from research activities of the internal R&D activities of an organisation. In Western Europe, most organisations are moving towards an innovation model that utilises global networks of partners from US chipmakers, India software developers, Taiwanese engineers and China factories, (Einhorn and Engardio, 2005).


 Figure 1.1: Open Innovation (*Source: Chesbrough, 2003*)

Open innovation policy has not only been associated with series of a successful business cases but there have been also negative implications which have proved to be a challenge for the management team of an organisation. For instance, some challenges which are encountered by organisations may entail competitive dangers and intellectual property rights.

1.1 Competitive Dangers

Outsourcing innovation poses a serious threat to an organisation's competitive advantage position through diffusion of competitive relevant know how. Most Asian designers in the electronics industry have signed large contracts entered into collaboration, formed strategic alliances with major European and US business corporations and their dominance being in technological devices such as laptops, high definition televisions, MP3 music players, imaging technologies. A notable example according to Einhorn and Engardio (2005) was of Motorola which hire BenQ, a Taiwanese firm to design and manufacture mobile handsets on

its behalf. BenQ breached the trust by designing, manufacturing and then selling the mobile devices in the Chinese market at a low cost price under its own brand.

1.2 Lack of trust

It is a major challenge to integrate specialists from different back grounds and work in organisational settings with their own culture. As Hagel (2005) points out, misunderstanding can develop into mistrust, opposing sides may lose focus on conflict resolution action. Organisations involved in collaboration need to consider positive ways of converting the destructive force into a constructive platform for continuous learning that enhances development of new ideas and innovation

1.3 Broad sources of knowledge

Open innovation increases the participants in a particular area of innovation which implies that more ideas and wide range of problem solving solutions can be available. Different companies have different capabilities, strengths and approaches when tackling a particular problem. A diverse range of specialists bring new innovative solutions towards a particular problem, consequently no organisation can do it alone or can prove to be perfect only by relying on its internal solutions (Hagel 2005).

Broring and Herzog (2008) in their research highlighted that firms with open innovation model are able to commercialize their ideas externally through external channels that are outside the business value, these include licensing and spin-offs. The model enables a firm to acquire external ideas and knowledge which can be harnessed within the internal R&D. External knowledge can be combined with internal capabilities of the organisation to generate innovations for long term sustainability and respond to the changing business environment.

2. MOTIVATION: RISE OF THE NETWORK ORGANIZATION

The Coase Theorem (Coase, 1960) which is a Nobel prize in Economics work broadly states that companies bring in activities in-house if either they can execute those activities better than external providers, or the superior performance they could get elsewhere did not balance the service and transaction cost. Based on this transaction-cost economics companies modelled their businesses. As technology improved and drastically reduced transaction cost outsourcing became an option which companies push for even if the balance was marginally in favour of it.

The networks and the partnerships a company creates, and its own strategy should reflect each other. So depending on the strategy, a company need to use external or internal capabilities or balanced mix of the two. There are two schools of strategies a company follows to leverage these internal and external capabilities. In the book "Competing for the Future" (Hamel and Prahalad, 1994) describe a strategy for a firm or business to concentrate on its core competencies. Emerged soon after this was the publication of Co-opetition (Brandenburger and Nalebuff, 1996) and The Death of Competition (Moore, 1996) describe a strategy focused less on capabilities within the firm and more on opportunities to achieve competitive leverage by mobilizing resources outside the firm. Hagel (2005) calls these schools of strategy as core competency school of strategy and the leverage school of strategy. A combination of these two schools of strategies is to be combined, by using internal capabilities for its core competencies and external capabilities for leveraging the peripheral competencies (Brown and Hagel, 2005).

The rise of China, India and many emerging economies, and the combined policies and acceptance of globalization have forced companies to rethink their models of doing business. They have finally realized that it's not possible "to do everything" competitively. As more

versatile pull platforms (a supply chain management concept, where companies are reactive to the customer demand, which contrasts the push platform, where companies force their product to the customer demand. Details of the push/pull platforms are described later in this article since it is interesting to understand that as customer orientation in the pull platform becomes available, companies will no longer need to participate in all the businesses peripherals, (Brown and Hagel, 2005). They will be able to focus on becoming world-class within one business and rely on other companies to supply the elements of the other two types of business. Outsourcing, off-shoring, contracting, sub-contracting is a reality they have to deal with.

Another major motivation was 'Open innovation'. As defined by its promoter "Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. This paradigm assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology" (Chesbrough, 2003). Open source which is based on the idea of open innovation. This encourages companies to coordinate and cooperate with partners, competitors, suppliers to innovate, share and grow mutually for combined benefits. Co-opetition which is discussed in this article springs from this concept.

2.1 Co-opetition

Traditional inter-firm dynamics were described as relationships that are either competitive or cooperative. However, firms can compete and cooperate with each other at the same time. The term used to refer to a relationship between two firms that simultaneously involves both competition and cooperation is "Co-opetition" (Walley, 2007). Where cooperation and competition occur, it can be to the advantage to both the firms and the consumer. For instance, firms can pool research and development activities with external competitors and complementary partners to obtain the rewards of new product developments to the customers, that they could not bring individually and at the same price. Co-opetitive relationships are not successful when not strategically undertaken and customer oriented. Grangsjö (2003) suggests that it should be customer requirements that determine the nature of inter-firm relationships and inform the decision as to when to terminate a cooperative relationship. However, in practice, co-opetitive relationships end for many reasons that are not always customer related. These reasons may include one party not getting enough of a return, leakage of confidential information, different objectives and intentions, general distrust, and even the tendency for competition to take precedence over cooperation (Meyer 1998; Park and Russo 1996).

2.3 Loosely Coupled Collaboration

Diverse and highly specialized companies collaboration must be loosely coupled (Hagel, 2005). Each player is to be assigned relatively independent modules of activity and made accountable to reach performance targets for the assigned activity. Thereby these players are to be left relatively free by this form of loose coupling so as to improvise within their areas of activity.

Companies need to specialize in their core functionalities (Hamel and Prahalad, 1994) and collaborate with specialized outside player for peripheral activities (Brandenburger and Nalebuff, 1999; Moore, 1996). Once companies have chosen to focus on core capabilities on a particular function, and strive to be the best—and to keep getting better at a faster rate than the competition. This is not in isolation but through productive friction with other specialized players (Hagel, 2005). Dell is a perfect example along these lines, by its approach to relationships with Taiwanese original design manufacturers (ODM's). When Dell uses ODM's, it works closely with them, sharing knowledge in formal meetings that occur

throughout the product life cycle. These interactions are structured so that Dell can systematically integrate its expertise with that of its suppliers and, in the process, build new capabilities. To extend this logic even further: Imagine that Dell is best at what it does. Every other specialized company out there wants its part of its process network. However, an organisations capacity to engage with others in problem solving and innovation is limited (Hagel, 2005).

2.2 Productive Friction

“Creative abrasion”—developed initially by Hirshberg (1999) and by Dorothy (1995) shows that, in pairing designers with different priorities and work styles on a project provided a clash that makes creative sparks fly and gave both designers the freedom to go with their own strengths as the other would provide balance. Expanding this concept of knowledge building and innovation within or between work groups to between enterprises is also possible. Different enterprises bring different perspectives and competencies to tackling a problem, especially relating to the ever changing customer needs and demands. Thus enterprises can replicate the potential for innovative solutions which rises when people from diverse specializations interact.

To explain this theory Dorothy (1995) gives us an example of the development of Flat Screen Displays (FSD) reflects this model. Sharp, one of the leading manufacturers of flat panel displays, to simplify its manufacturing process to lower costs for producing larger panels, modified its product design. Sharp kept these changes secret and did not collaborate with its expert and main suppliers, Corning Glass. Unfortunately, Sharp’s panels on that line failed completely. Leading to this failure, Sharp and Corning decided to work together to find a solution to the problem. The close collaboration of the companies’ engineers led to the development of a new acid treatment process for one of Corning’s glass products. This was used in Sharp’s new generation of panels, and the treated glass yielded even higher performance than had been expected from the original product. The new friction caused a collaboration of the two companies for a new production line and the designs for the panels provided tangible goal or objects for the two sides to work on. The time constraint to bring the production line was a blessing in disguise as each of two companies was forced to focus on their domain of expertise. Corning, with highly specialized knowledge of “glass chemistry”, and Sharp, in “panel manufacturing processes”, produced a breakthrough in product and process design. The glass treatment is being used more broadly and is the foundation for panel design innovations. Thus from this example, it is seen that the innovation occurred not because the interactions between the companies were seamless or frictionless but because the activity at the seams or edges had friction and thereby catalytic for innovation.

This friction created is potentially a destructive. To harness this friction to generate innovation and capabilities one needs to look closely at the above example. Sharp and Corning Glass had a shared vision or goal as to what must be achieved. Hagel et al. (2005) propose that in product development, positive productive friction is created when teams have clear and aggressive performance targets and low constraints to meet these targets. When there are more constraints or restrictions to obtain these performance targets, there is less room there is for innovative problem solving and thus causing a greater the potential for friction becoming a destructive force.

To make performance requirements tangible and immediate, Hagel et al. (2005) propose the usage of the well know work designed by Lemmey (2001) called “action points”. It states that a specific product must be introduced and its performance shortfall should be addressed or operations breakdown and resolved in concrete actions immediately. It is important to note that the converse, easier and pointless way to have abstract solutions and perspectives gives

the appearance of resolution but creates wide room for disagreements and misunderstandings. The example of the “Toyota Production System” has been used to explain “action points”.

The Toyota Production System has been successful in practice and process innovations, is that it freezes any current process to the extent of stopping entire production line, when problems arises. They rapidly mobilize appropriate resources and capabilities from different domains to address the problem as soon as they occur. By stopping the entire line makes all teams to focus together on the immediate and tangible problem at hand until the issue has been diagnosed and resolved. Thereby Toyota creates automatically explicit action points, which all appropriate teams focus on together causing the desired productive friction and thus resulting in rapid resolution. Sharp’s example with the FPD mentioned above also reflects the practice of “action points” in which Sharp stopped the entire production line, and its teams along with Cornwell Glass, focused entirely on the single problem.

As seen in both the cases with Toyota and Sharp, “productive friction” ultimately revolves around the people and the teams involved. As we have seen in the above examples people and teams with relevant specializations and diverse perspectives are needed for productive friction in their problem solving. Local Ecosystems are usually the ideal place for productive friction as resources with relevant specialization and diverse perspectives are abundant Porter (1998). It is important also note that this productive friction can lead to be a destructive force as different skill sets and experiences can create misunderstanding and undermine trust. Hence it has to be managed properly with the above mentioned “action points” formula as an effective tool. To put all these capabilities together, specialized “knowledge brokers” are required, who also creates the action points and takes leadership of the entire initiative. (Porter, 1998).

3.0 PUSH VS. PULL

Pioneered by Brown and Hagel (2005), a new approach to organize resources has been proposed. It is about moving from a push approach to a pull approach. In the first one, “resources [are ‘pushed’] in advance to areas of highest anticipated need”. On the other hand, the push approach is about “creating platforms that help people to reach out, find and access appropriate resources when the need arises”. Push approach has the disadvantage of deploying resources in a more tightly coupled fashion. Pull approach is more flexible, it is about organizing resources in a way that can be dynamically exchanged between providers and consumers. However, these two approaches are not orthogonal; they are normally complemented according to the properties of particular segments of a process. The transition from push to pull was driven by changing aspects in global markets. Some of them mentioned by Brown and Hagel (2005) are: *“increasing uncertainty, growing abundance, intensifying competition, growing power of customers, greater emphasis on learning and improvisation”*.

3.1 Contrasting pull and push approaches

The properties of pull and push approaches determine the differences in the underlying platforms. Basically, in a push platform, two-way interfaces would be defined between every two participants that interact. In this case a specific, highly coupled communication is carried out. On the other hand, in a pull platform, like for instance service oriented architectures, participants interact dynamically in platform independent interfaces. These interfaces aim to provide a contract such that new providers can participate and consumers can switch between providers in a compatible fashion.

4.0 OPEN DISTRIBUTION INNOVATION - THE TATA NANO CASE

The author Kripalani (2005) in an Business Week article "Asking the Right Questions", discuss about innovation and highlights interesting cases about Indian companies like Cummins, ICICI Bank, Indian Tobacco Company (ITC) and Tata Motors. While discussing about innovation across various sectors of Indian industries, there is a pattern rising - it is called "Open Distribution" Innovation.

4.1 Why Open Distribution?

There are various factors which determine the importance of *open distribution* in emerging economies like India. Countries like India have a mass domestic market and companies have an enormous challenge in reaching them. Their target customers are distributed in rural areas with very limited physical infrastructures and the customers are far less affluent than the typical customers in Western economies. The companies need to deliver more value at lower cost than they could with the traditional business approaches of Western companies. Thus, the above companies are extraordinarily innovative in re-developing the economics of distribution (John Hagel et al. 2008).

4.2 Challenges of Open Distribution

Hagel et al. (2008) mentioned this issue and how Indian companies have tackled these challenges. Thus the companies have innovated both in terms of products and processes and these innovations cover a number of dimensions such as:

- Increased modularity both in products as well as processes
- Aggressive leveraging of existing third party institutions in rural areas to more effectively reach target customers
- Creative use of Information Technology carefully integrated with social institutions to encourage usage and deliver even greater value.

4.3 Tata Motors - Nano Case

Tata Motors Inc., one of the largest passenger automobile and commercial vehicle manufacturing company in India, announced in January 2008 about the new launch of their much expected low cost family car - the Nano. Aimed primarily at the Indian market, the Nano when manufactured would be the least expensive car in the world - selling at about \$2,500. The introduction of the Nano received media attention due to its targeted low price, but the authors Brown and Hagel (2008) in a Business Week article talk about how Western executives doubt the innovations of the Nano. This is due to the fact that, when Western executives think of innovation, they focus on product innovation using breakthrough technologies; often, specifically, on patents. Thus the authors portray that measuring progress solely by patent creation will miss a key dimension of innovation as some of the most valuable innovations will involve taking existing, patented components and remixing them in ways which more effectively serves the needs of large numbers of customer base such as India (Hagel et al. 2008).

4.3.1 Nano's Modular Design

Tata Motors Inc. developed an innovative aspect to the Nano, which was its modular design. Thus, the Nano is constructed of components that can be built and shipped separately to be assembled in a variety of locations. In effect, the Nano is being sold in kits that are distributed, assembled, and serviced by local entrepreneurs. In fact, Tata envisions going even further, providing the tools for local mechanics to assemble the car in existing auto shops or even in new garages created to cater to remote rural customers (Kripalani, 2005).

4.3.2 *Distributing Nano to the Mass*

The authors Brown and Hagel (2008) call the distribution of Nano to the Indian mass as "Open Distribution" because it mobilizes large numbers of third parties to reach remote rural consumers, tailor the products and services to more effectively serve their needs, and add value to the core product or service through ancillary services. Moreover, the authors conclude that companies such as Tata and Cummins are going far beyond "customer co-creation" in the narrow sense of soliciting isolated ideas from customers. Instead, they are building long-term personal relationships with customers, enriched by the specialized capabilities of broad networks of third parties (Hagel et al. 2008).

4.3.3 *Closed Architecture Distribution Vs. Open Architecture Distribution*

The "Open Architecture Distribution" pioneered by Indian companies is quite different from the "Closed Architecture Distribution" developed by those in the retail distribution systems such as Dell and Wal-Mart. These U.S. companies developed completely self-contained and highly standardized customer-facing facilities and services. The open architecture approach pioneered by Indian companies may offer much greater opportunity to deliver more tailored value to customers than the closed architecture U.S. approach. In this respect, the techniques initially developed to reach poor and rural customers may have even greater potential when used to reach highly demanding affluent and urban customers in Western economies (Hagel et al. 2008).

4.3.4 *Lean Process Management- The case of Indian IT Companies*

The authors Hagel et al. (2008) coins the term 'Lean Process Management' for companies exporting software to Western countries and who are applying Toyota's rapid process improvement methodology to their business process outsourcing businesses. These companies have become so sophisticated in their use of process innovation techniques that they are now offering consulting services to help their clients in Western companies and also apply similar techniques in their own operations.

4.4 **Orchestrating Loosely-Coupled Business Process**

In the present scenario, for enterprises to be successful, flexibility, collaboration and leverage are becoming important business objectives. Enterprises can realise the effect of collaboration, only when a firm anchorage of specific business process is realised across various enterprises. There is an argument that companies should start the transition towards collaboration from an early stage rather than to wait for new generations of information technology, as the lead-times in the transition to collaboration are quite lengthy, Hagel et al. (2008). The traditional business processes tend to be defined by the boundaries of an enterprise, managing activities within the enterprise with the help of detailed, real-time information. In contrast, loosely coupled business processes tend to span multiple enterprises, for example, supply-chain management extending across several layers of an industry or customer-relationship management. Moreover, due to various changes in the structure of the business process for an enterprise adopting the loosely coupled business processes, there are some specific terms which are to be considered such as:

1. *Entities* - Which companies will participate and what roles will they play?
2. *Milestone-driven deliverables* - What are the specific outcomes that must be delivered and when?

These business processes operate with much more selective information access to provide early warnings regarding performance shortfalls. Thus, the authors Hagel et al. (2008) argue that given these characteristics, loosely coupled business processes require different roles, rules, rewards and renewal approaches relative to traditional ones.

4.5 Roles

As the scope of business processes broadens to encompass not only more enterprises, but also more types of enterprises, effective coordination demands a specialized role. Thus, in collaborating with an enterprise, all the other enterprises become service providers, offering specialized business capabilities to support different elements of the supply chain (Hagel et al. 2008).

4.6 Rules

According to authors Hagel et al. (2008), enterprises traditionally have managed processes by precisely specifying activities and making them as transparent as possible. This closed nature of business processes ensures efficiency, security and predictability, but this system is ineffective for flexibility and collaboration. On the other hand, with loosely coupled business process, instead of detailing the activities within the business process, orchestrators specify the end products at various stages of the workflow, qualifying service providers and creating appropriate economic incentives to ensure performance. Loosely coupled business processes thus do not need a full transparency. They rely instead on selective visibility designed to provide early warning of potential problems (Hagel et al. 2008).

4.6.1 Rules in a Loosely Coupled Business Process: The Dell Case

Dell has mastered the loosely coupled business process approach in managing its supply-chain partners, including specialized third-party logistics providers and component suppliers. The company's build-to-order operations depend on the timing and quality of deliveries to its assembly plants. To ensure dependability, Dell has implemented an innovative, Web services-based event management system that defines process milestones and then systematically queries service providers throughout the supply chain to confirm whether those goals have been met. In this way, Dell has quickly and cost-effectively implemented an approach that doesn't require integration of diverse databases and yet provides the necessary visibility to determine whether deliveries will be on time (Hagel et al. 2008).

4.7.1 Renewals in a Loosely Coupled Business Process: The Toyota Case

Toyota has pioneered innovative collaborative business processes with major suppliers in the automotive industry. In its assembly plants, it has set aside a room where it brings together its suppliers and posts weekly the performance of each against specific milestones. This open tracking and assessment method helps to create rapid feedback on performance gaps and as result on the enormous social pressure for suppliers to act to close these gaps (Hagel et al. 2008).

5.0 CONCLUSION

It is evident that innovation in companies is not clear cut but this can be countered through outsourcing the Research and Development (R&D) processes and activities to external players in the business areas which their R&D activities encounter internal limitations. A balance need to be weighed between costs and returns from the internal R & D activities of an organisation. Success of innovativeness involves interplay between the organisation and

partners who are experts in the area of internal limitations. This research was not extended to cover innovation process of the service industry which remains as an area of concern to be explored.

6.0 REFERENCES

- Adam, M. B and Barry, J. N. (1996). Co-opetition - New York: Doubleday.
- Broring, S. and Herzog P. (2008). Organising new business development: open innovation at Degussa. *European Journal of Innovation Management*; Vol. 11 No. 3, pp. 330-348.
- Brown, S.J. and Hagel III J. (2005). How Difficult Business Partnerships Can Accelerate Innovation. *Harvard Business Review*, pp 82-91.
- Chesbrough, B. (2003). Open innovation: the new imperative for creating and profiting from technology. *Harvard Business Review*.
- Coase, R. H. (1960). The problem of social cost. *The Journal of Law and Economics*, Vol. III, pp. 1-44.
- Einhorn, B. and Engardio, P. (2005). Outsourcing Innovation. *Business Week*; European Edition, pp 49.
- Friedrichs, G. Y. (2003). "Destination Networking—Co-opetition in Peripheral Surroundings" *International Journal of Physical Distribution and Logistics Management* 33 (5): 427–448.
- Gallagher, S. and West, J. (2006). Challenges of open innovation: the paradox of firm investment in Open-source software. *R&D Management*, Vol 36, No. 3, pp 319-331.
- Gary, H., and Prahalad, P (1994). *Competing for the Future*, Harvard Business School Press.
- Hagel J. and Brown, J. S. (2005). The Only Sustainable Edge: Why Business Strategy Depends on Productive Friction and Dynamic Specialization, Harvard Business School Press.
- Hagel J. and Brown, J. S. (2005). From Push to Pull- Emerging Models for Mobilizing Resources. Working Paper - Edge Perspectives.
- Hagel J. and Brown, J. S. (2005). From push to pull: The next frontier of innovation. *The McKinsey Quarterly*.
- Hagel J. and Brown, J. S. (2008). Learning from Tata's Nano, *BusinessWeek*. Available via [www.businessweek.com]. Accessed on 18 February 2013.
- Hagel, J. (2005). Patterns of Business Innovation in India and China. *Edge Perspectives with John Hagel*, Available via [http://edgeperspectives.typepad.com/]. Accessed on 12 February, 2013.
- Hagel J., Durschlag S and Brown, J.S. (2002). Orchestrating Loosely Coupled Business Processes: The Secret to Successful Collaboration. Available via [www.johnhagel.com]. Accessed on 12 February 2013.
- Han Van de Zee. (2008). *Business Transformation Edition*. Atos Origin Consulting, pp 15.
- Hirshberg, J. (1999). *The Creative Priority: Putting Innovation to Work in Your Business*, Collins.
- James, F. M (1996). *The Death of Competition - Leadership and Strategy in the Age of Business Ecosystems*, HarperBusiness, New York.
- Keith, W. (2007). *Coopetition International Studies of Management and Organization*, Special Issue on Coopetition. 37, 2, 11-31.
- Kripalani, M. (2008). Breakthroughs in Nano Innovation. *The BusinessWeek*. Available via [www.businessweek.com]. Accessed on February 15, 2013.
- Lemmy, T. (2001). *Untethered Data*. Harvard Business Review Article.
- Leonard, D. (1995). *Wellsprings of Knowledge* Harvard Business School Press.
- Murtha, T. P., Stefanie, A. L., and Jeffrey, A. H. (2001). *Managing New Industry Creation: Global Knowledge Formation and Entrepreneurship in High Technology*, Published by Stanford University Press.

- Porter, M.E.(1998). "Clusters and the New Economics of Competition" Harvard Business Review.
- Park, S.H.and Russo, M. V. (1996). "When competition eclipses cooperation: An event history analysis of joint venture failure," Management Science, 42(6): 875-890.