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ADOPTION OF TECHNOLOGY PRACTICES FOR BUSINESS MODEL INNOVATION AND ITS IMPACT ON FINANCIAL PERFORMANCE OF FIRMS A STUDY BASED ON SELECT PHARMACEUTICAL COMPANIES IN INDIA

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1. INTRODUCTION

Successful organizations have reckoned with the fact that if they don‟t innovate they die. New product development can be viewed in the context of an engineering skill, an organization, an economy or a society. While innovations can be new to the world products, new product lines, addition to existing lines, minor modifications, repositioning, and cost reduction mechanisms (Booz, 1980; Hamilton,

1982), the recent innovations post 2000s have focussed more on business models. Whereas innovation is more typically seen in the form of a new product or service offering, a business model innovation results in an entirely different type of company with a game changing strategy that competes not only on the value proposition of its offerings, but aligns its profit formula, resources and processes to enhance that value proposition, capture new market segments and alienate competitors. Business model innovation has its focus on a profit formula clearly targeting cost, efficiency across functional streams (time, quality, and frequency), a unique experience, delivery mechanism etc. while realigning its resources and capabilities. Business Model Innovation (BMI) refers to the creation, or reinvention of a business itself.

The Indian pharmaceutical sector is a 70,000 crore industry, and is valued at USD 34 billion (including exports) in 2013-2014 constituting domestic demand for formulations and exports of both finished formulations and active pharmaceutical ingredients (CRISIL Research, DGFT). It is 4th in volume and 14th in value in the world with close to 300 organized firms in the market (IMS Prognosis Report 2013). Despite fragmentation and competition in prices, the organized pharma firms control 70% of the market share with the leader holding 7% of it. Indian top 10 pharmaceutical companies contribute to 41% of total sales. The next ten companies contribute to 22% of sales while the remaining companies contribute to 37% of the total sales (Crisil Research 2013). However the growth rate of the industry in the last 4 years is averaged between 9%-11% (Crisil Research, 2014).

The pharmaceutical industry among all other industries is the most innovative and knowledge driven sector (Knowledge Commission Report, GoI, 2011) and the use of cutting edge technology for innovation is synonymous to practice and literature. However new blockbuster products are not apparent in the market. Since the present times of innovation are model driven, the question if pharmaceutical firms are looking at new business models due to rapid changes in technology and market conditions is the subject matter of the present study.

2. MOTIVATION

In the last four decades there has been no new product, blockbuster drug or magic bullet antibiotics in the Indian pharma sector (Exploratory survey OPPI, Economic Times Reports). Post the TRIPS agreement regime in 2005, reverse engineering techniques was fully discouraged by the Government of India. Incremental and repositioning strategies ceased to be considered as „innovative‟ products. The Government‟s stringent policies with respect to IPR norms, tax regulations, pricing policies, and presence of counterfeit drug market have discouraged the incumbent pharma firms from engaging in active research. The MNCs are de motivated to operate in the Indian market due to the presence of compulsory licensing policies, patent cliffs and revocations, legal battles and parallel market. Generics business has become a highly competitive game with growing pressure on firms to buckle costs and enhance quality. The pharma firms began to look towards the west for their product acceptance. However, the challenges of operating in European and American market have become even more intense in the recent past. Other semi-regulated Afro-Asian markets are not a revenue generating sector even though their entry barriers are low. The spiralling global financial crisis of 2007-08, the rise in crude oil prices, punitive action on pharma firms for non-compliance to FDA‟squality norms, stringent rules for approving manufacturing units for exports by FDA, rising GDUFA costs complimented by shift to bid-pricing and cost cutting on healthcare expenditures by several European countries cumulatively made the business environment turbulent for the pharma firms. While the external economic and regulatory environment was getting challenging, the techno- market condition affecting the healthcare sector was undergoing a corresponding transformation. In the last ten years the nature and pattern of disease market has been changing (PWC „Healthcare Report‟ 2014). Chronic diseases are replacing acute diseases due to changes in lifestyle, socio- economic pattern, culture and norms, higher disposable income at the hands of consumer, and economic changes. Many of the chronic conditions are curable through DNA based therapies as generic options fail or lead to associated side effects. The growth

opportunity for chronic ailments is estimated to grow at 15% than for acute conditions which is estimated at 6-8% (Crisil Report 2014). Pharma firms are responding to market changes by shifting gears towards new business models of discovery NDDS models & BSmodels) as opposed to conventional business models (APIs, Branded and unbranded generics, contract research and outsourcing, contract manufacturing and loan licensing, dealing in unregulated and semi- regulated markets).

Complex generics and BS models have a major growth opportunity in future. "With 2012 sales crossing $130bn, accounting for 13% of the total pharma market, and growth outpacing the traditional pharma market growth, the biologics segment is emerging as the growth engine for companies. Big Pharma‟s increasing focus on biologics (350+ products in trials) and the declining number of patent expiries in the traditional small molecule market point to future generic pharma industry growth being increasingly driven by these products. While we estimate branded biologics products worth >$80bn in sales could face patent expiry through 2021(Espirito Santo Securities, Investment Bankers Report,2013)", market for biosimilars is likely to peak up to $220 billion in annual sales by 2017 (IMS and Sandoz survey 2014). „The market would result in 50% savings for the healthcare system globally and is a gradually shaping as a necessary evil for the industry (Citi Research, Equities, May 2015)".

Novel drug delivery systems (NDDS) are products manufactured through the use of complex technologies, platform technologies and nano technology. The method through which a drug is delivered (route of administration) can have significant impact on the efficacy of ailment and consumer unmet experience. Drug targeting to specific organs and tissues has become one of the critical endeavours of the century as against conventional dosage forms that involves difficulties in achieving the target site at the appropriate dose after or during a proper time period. NDDS is based on lead optimization techniques and hence is advancement in medical history. Consequently, the search for new drug delivery approaches and new modes of action represent one of the frontier research areas. They are referred as drug carriers in medical science world which come in three major categories: Injectibles, Topicals and Inhalers.

Bios similar (BS) are follow-on molecules that are highly similar to previously approved biologic products (similar to what generics are for chemical molecules). Bio similars are based on DNA coding for a given protein inserted into an expression system like yeast, bacterial, or mammalian cell through genetic engineering and the desired protein is expressed, extracted and collected. „Many of the NDDS are protein based drugs based on nanotechnology similar to bio-similar drugs. It is a multidisciplinary approach to delivery of therapeutics within tissues; interdisciplinary as it combines polymer science, pharmaceutics, bio conjugate chemistry, and molecular biology. „Such interim strategies (NDDS) help in generating new ideas on controlling the pharmacokinetics, pharmacodynamics, non-specific toxicity, immunogenicity, bio recognition, and efficacy of drugs which are crucial parameters while developing bio similars too (Dunne et al., BMC Pharmacology and Toxicology 2013)".

The regulatory aspects relating to labelling, extrapolation, assertion of immunogenicity and interchangeability are stringent for BS. It is simpler for NDDS as it follows the norms applicable to the generics route. „While biosimilars like mAbs are being developed through the biosimilar regulatory pathway; cytokines would be eventually marketed as biosimilars but sometimes developed for submission through the novel drug regulatory pathway for various reasons (Bernstein Research, May 2014)"

However both models involve similar use of higher and sophisticated gradation of nano and micro technology involving considerable spends and the competencies can be shared between the two models.. „When relatively same set of players are developing the capability for insulin it can be amortized over multiple products .....the competencies developed for NDDS/delivery carriers can be amortized over bio similar outputs..... (Esprito Santo Securities Report, Pharmaceuticals and Healthcare, 2013)" as the competences of NDDS and BS model are similar and replicable though they may be approaching a different regulatory pathway for various reasons (Bernstein Report, 2014)". Both models demand rigorous in-house chemical and biological culture studies, clinical trials (vitro and vivo studies, pharmacology studies), extensive and robust comparative, structural and functional studies, data harmonization from doctors, patients, consumers, scientists, hospitals and use of complex analytical models (simulations, algorithms, sensitivity testing) over critical observations affecting the final outcome.

The experience associated with such NDDS and BS models is way different from conventional drugs as lead optimization techniques catapult the effect and quality of without side effects. In order to be able to innovate in such new models the adoption of contemporary technology practices becomes crucial which is the subject matter of the present study.

3.Literature Review Summary

S No	Author	Research question/objectives	Model proposed/ Results derived	Research Gap
1	Gunday et al., (2008)	What are the determinants of innovation at the firm level?" and "what is the impact of innovation on firm performance?	The determinants of innovation were examined to have an impact on innovativeness and thus the performance. The innovation determinants included in the conceptual model included general firm characteristics, firm structure, firm strategies and sector related conditions and relaxations. These strategies were found to impact innovativeness and hence the overall performance of the organization. The results point out that innovations performed in manufacturing firms have positive and significant impacton innovative and production performance. However of the firm characteristics only firm size is significantly correlated to innovativeness.	This study was found to identify the determinants only within manufacturing companies. There is limited focus on intangible assets like intellectual property while tangible assets like machinery, supply chain and value network do play a vital role. The process of manufacturing and the related tangible assets need to be given importance.
2	Agoraki et al., (2007)	To estimate the determinants of business model innovation and to whether innovative behaviour influences performance	Their model indicates that business model innovation causes a direct and positive effect on their performance and that this relationship is mediated by individual, organizational and country level variables. Their results strongly suggest that, indeed, innovative firms are more efficient. Among the individual level variables it is observed that larger board systems with more independence enhance business innovation. Larger firms and firms with more human capital also seem to favour innovation. Among the firm level variables foreign ownership was observed to have a significant positive relationship. Among country variables only GDP has a positive effect on innovation.	The results of this study examined firms across different sectors which are technology intensive. The inclusion of firm dummies may have impacted the results. A focused study on specific industries may help.
3	Chesbrough and Rosenbloom(2002)	The objective of this paper is to identify if business models have a role in capturing value from the early stages of technology.	The model proposed in this study examines the technical inputs including feasibility, performance and other attributes and examines its relationship with the proposed business model. The business model is evaluated in terms of market, value proposition, value chain, cost and profit, value network and competitive strategy. A final impact on economic outputs is examined. The results offer an interpretation of the business model as a construct that mediates the value creation process. Technical and the economic domains, selecting and filtering technologies play a vital role in impacting the type of business model.	This study presents a model which is argued based upon heuristic value and does not take examine empirically the proposed model. A further empirical examination using OLS or SEM is required in order to identify the validity of the proposed model.

4	Zott and Amit 2007	The researchers explored the fit between a firm's product market strategy, and its business model. The objective of this study was to identify if novelty centred business models impacted firm price along with cost leadership and early market entry.	Independent variables of the model include novelty and efficiency of a business model, market position of the firm in terms of differentiation, cost leadership and timing. Dependent variables in the study include perceived firm performance and realized performance. The results of the study indicate that the firm's product-market strategy and its business model are distinct constructs that affect the firm's market value. The results also indicate that interaction with product market strategy impacts the perceived performance of firms as identified by market capitalization.	When firms redefine business models, they may concurrently identify customer needs and map them against the products and services offered by competitors. This study by focusing on product market strategy gives lesser importance to firm variables and business strategy measures which are vital to a business model.
5	Williamstein *et al*., (2007)	Aims to examine thedynamics due to shifts in medical biotechnology firms and how these have contributed to the distribution of business models in the population of medical biotechnology firms.	The service and platform business models are the possible starting points of the BMI process. Following this the second step involves combining service and product development activities in a manner that combines service and product development activities or platform technology and product development activities. Finally early and advanced stage drug developers were presented to have a specialised or a hybrid platform. The results of the study indicate that that dynamics in business models are caused both by dynamics in business models at founding in the population, as well as by shifts in business models of individual firms after founding. As the results show, it is not imperative that firms shift from one business model to another, even if firms are older in age. Their results presented a trend that the prevalence of the product business model and the hybrid product model at founding has increased during the past couple of years.	This study presents a stage wise change of different pharmaceutical firms, however does not identify the impact on business performance
6	Dubosson-Torbay *et al.* (2002)		Identifies four key components of a business model: product innovation (value proposition, target, capabilities), customer relationship (getting a feel for the customer, serving the customer, branding), infrastructure management (resources/assets, activity/processes, partner network), and financial aspects (revenue, cost profit)	The innovation readiness in terms of sustainable/ disruptive innovation is not identified in this study.
7	Halme*et al.* (2007)		Defines four factors of a business model: customer benefit, competitive advantage, capabilities/competencies, and finance arrangements/income flows. Additionally, the authors describe four prototypes of operative business models for eco-efficient services	This however does not differentiate the different strategic and value creating factors of the firm.

While innovation is more traditional to literature, new business models are fairly new to academic literature. The definition of innovation was originally coined by Austrian economist Joseph Alois Schumpeter. His definition of innovation included: new products, application of new methods of production or sales of a product, new process, new source of supply of raw materials, and newly explored geographies and creation of new industry structure. Products and services that change the basis of competition are often categorized as innovative. „…not to innovate is to die" (Christopher Freeman, 1982, Economics of Innovation).Occasional discontinuities causing creative destruction alter the basic social, regulatory, market and technological conditions dramatically (Schumpeter), post which a dominant design corridor emerges which Giovanni Dosi (1982) called the „technology trajectory". This applies to products and processes. Linear models of innovation such as technology push model (1950s and 60s), market pull innovation (1970s) followed by coupling model (1980s), interactive model (1980s/90s) linking technology push and market pull models, network model (1990) emphasising on knowledge accumulation and external linkages and open innovation models (2000s) were discussed in literature over a period of time. Chesbrough (2003) emphasized on further externalization of innovation linking knowledge inputs and collaboration to exploit knowledge outputs. According to Van der Meer (2007), „ managing the process of innovation is a paradox that will lead to evolving systems within firms leading to new innovation models".

Innovation driven by technology has been the fundamental cause for transformation in economic growth of nations (Schumpeter 1939, 1942; Karl Marx, Kondratieff 1935, 1951; Harrod, 1949; Domar, 1946), societies (Hall & Clark, 2003) and businesses. Clayton Christensen (2003) observed that moving with transitions in the market to capture unmet needs of the customers are fundamental to making technologies and businesses successful. His theory on disruptive innovation explains that it is not the presence of technology but the way technology is deployed which makes a difference between successful and unsuccessful firms. He observes that „companies which have failed are the ones who failed in deploying the existing technological knowledge appropriately („technology-need" configuration)." While discontinuities were debated between technology and market, Tidd and Besant in 2008 explained forms of discontinuities arising out of emerging political rules, market sentiments, regulatory regime, political upheaval, architectural innovation, shift in techno-economic paradigm and business model innovation.While the concept of „business model" has emerged during the new economy boom of the mid-1990s(Demil and Lecocq 2010; Leavy 2010; Magretta 2002; McGrath 2010; Teece 2010; Zott et al. 2010) it has evolved past its original domain of e-commerce to become a central element of corporate strategy in business today. Thus in the last decade BMI is influencing the process of new product and service development. Post 2000, BMI has evolved gradually to replace innovation management as a strong force of market discontinuity. Individual businesses have shifted focus towards business model innovations as it reflected the potential to effectively change the rules of competition due to shifts in technology, emerging market needs and environmental challenges.

Business Model Innovation (BMI) refers to the creation, or reinvention or completely newer ways of operating business by transforming the key elements of business (Amit & Zott, 2010). Whereas innovation is more typically seen in the form of a new product or service offering, a business model innovation results in an entirely different type of company that competes not only on the value proposition of its offerings, but aligns its profit formula, resources and processes to enhance that value proposition, capture new market segments and alienate competitors. It is a holistic perspective (not related to one specific functional stream) of how business is done (Osterwalder et al. 2005), rather than what, when, where of it with focus on value creation (not only value capture) and recognition to partners in the model (Chesbrough 2011, Amit and Zott, 2010). Business model innovation may complement innovation in products (Amit and Zott, 2010) and services, methods of production, distribution or marketing, and markets (Schumpeter, 1996), economic performance, sustainable innovations (Aghion, 2009; Porter & Kramer, 2011; Montalvo et al, 2011) and contribution to environment and its sustainability (Nidumolu, Prahalad and Rangaswami 2009; Porter & Kramer,2011). Content, structure and governance are the three design elements that characterize a company"s business model (Zott.et.al 2010) involving designing a new or modifying the firm"s extant activity system by doing more with existing capabilities and resources. (Amit & Zott, 2010).

The term „business model" has become quite a fashionable term (Lee et al., 2012), and received increased attention from different scholars in the field of strategy, competition and technological innovation (Teece, 2010; Mitchell & Coles, 2003). An appropriate business model is necessary for the successful commercialization of innovation technology while lack of an appropriate business model reduces the profit gained from technological innovation forcing firms to withdraw the application of a new technology (Chesbrough & Rosenbloom, 2002). Chesbrough and Rosenbloom (2002) while linking business model to technology management literature, define it as the „heuristic logic that connects technical potential with the realization of economic value," emphasizing its role in linking technology to market outcomes". When it comes to the commercialization of new technologies, it is the adopted business model rather than the technology itself that is responsible for its success, (Chesbrough & Rosenbloom, 2002). Rosenbloom et.al (2006) maintains that a business model innovation "unlocks the latent value from a technology". An average and non-descript technology can be made highly successful and

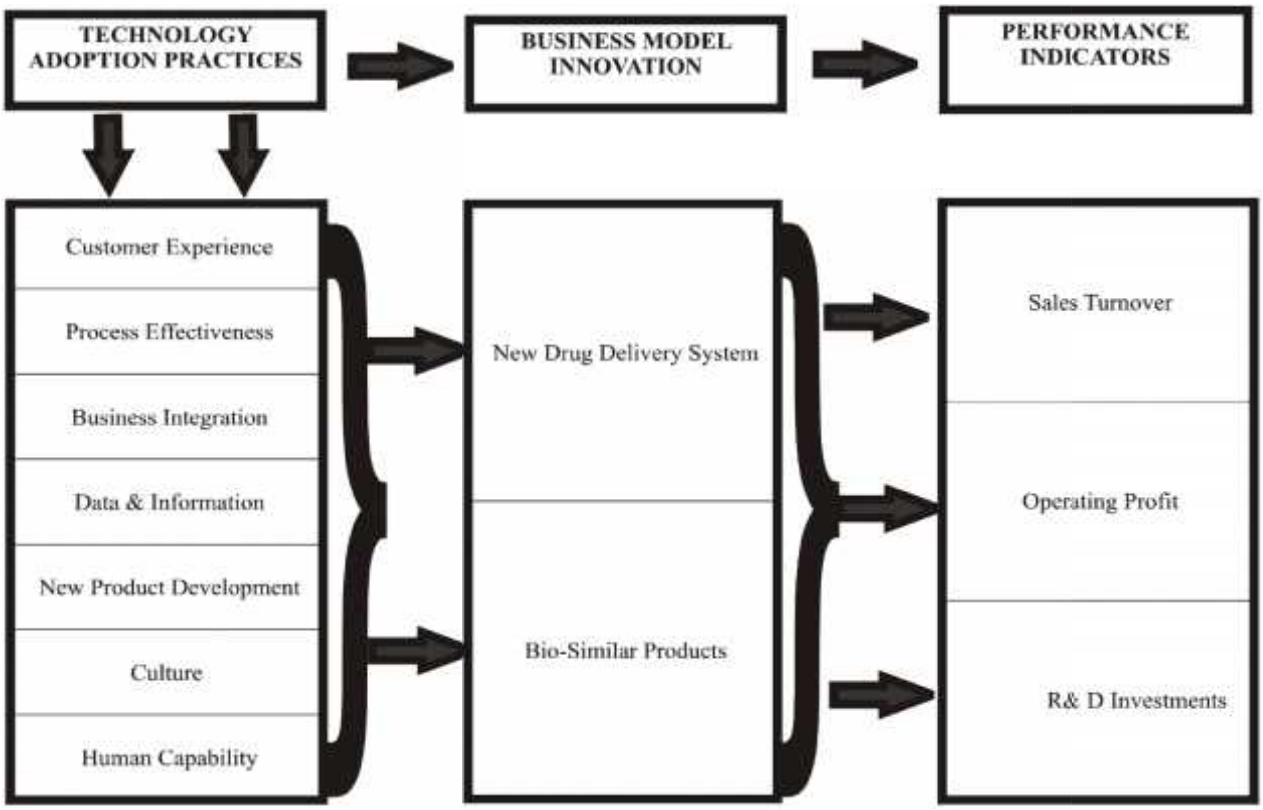
valuable by following a good business model than a good technology exploited by an average business model (Chesbrough, 2010). From the leveraging perspective Gassmann et al. (2010) argue that business model thinking is crucial and external commercialization of created technology and intellectual property is a future field with high potential. A number of scholars have focused on business model innovation as a vehicle for transformation and renewal of business (Velu & Stiles, 2013; Velu & Prakash, 2010). IBM Global CEO Study 2006, provides data that shows a strong correlation between higher operating margin growth and business.

While contributions in the field of business models and business model innovations have increased significantly over the years (Zott, Amit, & Massa, 2011), but „Adoption of specific technology practices for BMI in the pharmaceutical industry and its impact on firm performance" is less examined hence is the primary focus of the present study. The impact of BMI on firm performance in the present study is measured through sales turnover, operating profits and research investments.

The research model follows: Three concepts- technology practices, BMI, outcome metrics of BMI have been studied. A set of technology adoption practices labelled and classified into 7 separate factors are identified to impact BMI. Firms in the pharma sector having adopted these practices are hypothesised to have an impact on business models. These new models are bio similars and new drug delivery systems. New business models are hypothesized to impact the performance of the firms.

Financial indicators to measure the impact of BMI are sales turnover, operating profits and research investments.

Figure 1: Conceptual model/Framework of the Study



4. RESEARCH QUESTIONS

1. How do technology adoption practices influence the choice of business model?
2. Is there a difference in the technology adoption practices between the firms that adopt NDDS
3. model versus those that adopt BS model?
4. Is there an impact on the financial performance of pharma firms due to BMI?

4.1 Research Objectives

1. To study the impact of selected technology adoption practices on BMI.
2. To examine the differences (if any) that exists in the technology adoption practices of firms that choose different business models.
3. To explain the impact of BMI on firm performance through financial indicators.
4. To examine the difference in firm characteristics (size and ownership) and
    a. Technology adoption practices.
    b. BMI.
    c. Financial performance in terms of sales turnover, operating profit and research investments.
5. To examine the difference in firm characteristics in explaining the relationship between
    a. Technology adoption practices and BMI
    b. BMI and financial performance
    c. Technology adoption practices, BMI and financial performance

4.2 Proposed Hypothesis

1. There is no significant difference between selected technology practices adopted by firms and BMI.
2. There is no significant difference in the technology adoption practices between firms that follow NDDS versus those that follow BS models.
3. There is no significant difference technology adoption practices between firms that follow BS versus those that follow NDDS models.
4. There is a no significant difference in performance output measures between firms that adopt NDDS versus those that adopt BS models.
5. There is no significant difference in performance output measures between firms that adopt BS vs those that adopt NDDS models.
6. There is no significant difference between performance output measures in firms and their business model innovation.
7. There is no significant difference between the firm characteristics and their technology adoption practices.
8. There is no significant difference between the firm characteristics and NDDS model.
9. There is no significant difference between the firm characteristics and BS model.
10. There is no significant difference between the firm characteristics and BMI.
11. There is no significant difference between the firm characteristics and the performance output measures.
12. There is no significant difference in the firm characteristics regarding the nature of relationship between technology adoption practices and NDDS model versus those that follow BS models
13. There is no significant difference in the firm characteristics regarding the nature of relationship between technology adoption practices and BS model versus those that follow NDDS models.
14. There is no significant difference in the firm characteristics regarding the nature of relationship between technology adoption practices and BMI.
15. There is no significant difference between firms following NDDS model and its performance output measures based on firm characteristics.
16. There is no significant difference between firms following BS model and its performance output measures based on firm characteristics.
17. There is no significant difference between firms following BMI and its performance output measures based on firm characteristics.
18. There is no significant difference between technology adoption practices of firms following NDDS model and their performance output measures based on firm characteristics.
19. There is no significant difference between technology adoption practices of firms following BS model and their performance output measures based on firm characteristics.

5. RESEARCH METHODOLOGY

a) Nature of the Study: Exploratory, empirical and descriptive, sample based survey method has been used in the present study. Primary and secondary sources of data have been used to complete the study. An in-depth exploratory research through open ended survey and direct interviews was considered suitable as the formative step to understand the issues, challenges, and the models across which the industry is functioning. Financial statements of companies, Annual Reports, health survey reports both (private and Government of India),consultancy reports, research databases based on SEBI and RBI

data, EBESCO, Proquest, Webopac, Crisil, ICRA, Business Beacon, CMIE, India stats etc. were the secondary sources of information. The compilation of both sources led to conducting a Delphi technique of inquiry among top company officials influencing decision making within organization. This led to convergence on the idea that new models are being explored by pharma companies in the light of several market and technology level changes. The need to study technology adoption practices and BMI in the industry emerged as an area that needed inquiry after the observations were gathered from company officials during exploratory survey, more so through Delphi technique. Empirical and analytical methods were employed to derive results in the end.

b) Sampling Design: The companies listed in the BSE and NSE were chosen to comprise the sample frame. Random Probability sampling was used and nearly 100 companies were chosen to figure in the survey but only 55 companies agreed to reveal their current and future growth strategies relating to their business models. Post the administration of pilot questionnaire; only 50 companies were found appropriate for the final study. No personal bias was involved at any stage. Many firms did not qualify as they did not engage in BMI. There were 100 respondents in all, who were chosen based on their knowledge and experience in pharma industry. The sample size includes large, medium and small and MNCs firms as found registered and listed in stock exchange. The companies chosen for the study are largely representative of the population more so because they innovate across their business models.

c) Questionnaire Design: Open ended questionnaire was administered at the preliminary stage to find which firms following or intending to innovate its business models. This was followed by a pilot survey through structured questionnaire comprising of 130 items but only 99 were retained as they were most appropriate to satisfy the research questions. Items that lacked clarity, comprehension and found redundant were dropped. In the actual field-testing phase 7 factor labels were identified for the study. 5-point Likert scale ranging from „strongly agree" to „strongly disagree" was used to collect data across the labels identifies to represent „technology adoption practices". The final data was collected (questionnaire-survey) was majorly conducted through direct personal contact. Very few were obtained over the mail. The respondents recorded how far the firm was engaging with practices in each item of the questionnaire that would affect BMI. However missing items and incomplete responses were obtained once again by providing suitable clarifications to the respondents. After data classification they were entered in the SPSS format for analysis.

d)Framework of Analysis: The questionnaire was found reliable as the Cronbach alpha was found to be 0.79. The questionnaire was found valid by conducting tests of content and face validity. The hypotheses emerged from the study which has been tested empirically to arrive at the conclusions. Technology adoption practices have been studied under 7 labels- Consumer experience, process effectiveness, business integration, data and information, new product efficacy, culture and human capability. Adoption of such practices impacts business model innovation (NDDS model and BS model) which in turn impacts the performance of firms in terms of sales turnover, operating profit, and research investments.

An empirical research design was followed and hypotheses were tested through various techniques such as t-tests, ANOVA, Chi-square tests and multiple regression. The relationship between technology adoption practices and business model innovation is examined through t- test and ANOVA. The relationship between business model innovation and performance output variables (sales turnover, operating profit and research investments) is examined through t-test and ANOVA. The relationship between firm characteristics and technology adoption practices has been examined through ANOVA, firm characteristics and BMI through Chi-square test and firm characteristics and performance of firms with ANOVA.

e. Limitations: Only 55 companies agreed to submit themselves for the purpose of this study. The study attempts to cover almost all the relevant technology practices expected to influence BMI. Sampling variables are covered to the extent possible. Such studies can be replicated across industries, in start ups and newly emerging ventures in Western geographies and other Asian emerging economies. The industry is closely guarded. The respondents were diffident about letting out trade secrets hence deeper probe and commitment to protect secrecy helped to get valuable information. The financial statements of Indian firms did not project classified information related to expenditure on newly purchased technology and those that were improvised. No apparent information could be gathered through company annexure or notes to accounts as to the number of pipeline projects and their stages of development in BS model or NDDS model. The revenues from BS model or NDDS model is not segregated in the financial statements which impedes the scope to compare new business models and the distinct revenue imputable to the them. Such a study would be even more impactful if read under the backdrop of regulatory policies which are seminal to almost every single movement in the pharma industry.

6.RESULTS AND CONCLUSIONS

Pharmaceutical firms are recognizing the importance of BMI and the potential business opportunity it holds for future growth. They are proactive to adopting technology driven practices for BMI in the light of transforming market conditions and its unmet needs. The adoption of technology practices is impacting BMI. Firms have allocated resources and developed capabilities in niche therapeutic areas where NDDS model has market and commercial relevance. Since novel drug delivery systems are providing a different health experience to consumers as against conventional chemical drugs, it has contributed to overall firm performance irrespective of their size and ownership. Firms are gradually engaging in BS model especially the large ones, as it holds good business opportunity to cater to the changing healthscape of India. However BS model requires an elaborate technological infrastructure through the discovery process of a product. Pharma firms are taking careful steps in this direction. However technology adoption practices within firms are found wanting in areas relating to evaluating the quality of clinical trials, practices reflecting transparency in the product launch phase, streamlining workflow routines for process effectiveness and collecting information from practitioners on patient progress and state of recovery.Firm characteristics play a strong influencing role in defining the nature of relationship amongst technology adoption practices, new business models and firm performance.

Technology in pharmaceutical sector comes at a formidable cost. Resistance to following certain practices emerges from volatile regulatory policies and less friendly tax regimen of the government of India. Favourable regulatory and government policies would motivate firms in all categories to engage in BMI especially in BS model.

REFERENCES

1. Agoraki, M. K., Siachou, E. and Ioannidis, A. (2004) Effectual Upshots on Firm Performance: Adeterminative perspective of Business Model Innovation.
2. Aghion, P. (2009) 'Some Thoughts on Industrial Policy and Growth', Working Paper 2009 -09, Paris,ObservatoireFrançais des ConjoncturesEconomiques Bernstein Report, 2014.
3. 3.Chesbrough, H. & Rosenbloom, R. S., (2002) The role of the business model in capturing value from innovation: Evidence from Xerox corporation‟s technology spin-off companies. Industrial and Corporate Change, 11(3), pp. 529–555.
4. Chesbrough, H. (2003) Open Innovation: The New Imperative for Creating and Profiting from Technology, Boston: Harvard Business School Press.
5. Chesbrough, H. W. (2007) „Business Model innovation: It‟s not just about technology anymore‟,Strategy and Leadership, 35, pp. 12-17.
6. Dubosson-Torbay, M., Osterwalder, A. and Pigneur, Y. (2002) „E-Business Model Design,Classification, and Measurements‟ : Thunderbird International Business Review, 44(1), pp. 5-23.
7. Ernst & Young (2008) Global Introduction: Reinnovation and Reinvention. In: Beyond Borders, Global Biotechnology Report, 1-13.
8. Espirito Santo Securities, Investment Bankers Report, 2013
9. Hall, J. and Clark, W. W. (2003) 'Special issue: Environmental innovation', Journal of Cleaner Production, 11(4), pp. 343–346.
10. Halme, M., Anttonen, M., Kuisma, M., Kontoniemi, N. and Heino, E. (2007) „Business models for material efficiency services: Conceptualization and application‟, Ecological Economics, 63(1), pp.126-137.
11. Johnson, M.W., Christensen, C.M. & Kagermann, H., (2008) Reinventing Your Business Model.Harvard Business Review, pp.1–11
12. Lee, Y., Shin, J. & Park, Y., (2012) The changing pattern of SME‟s innovativeness through business
13. model globalization. Technological Forecasting and Social Change, 79(5), pp.832–842.
14. McKinsey (2006) 'An Executive Take on the Top Business Trends: A McKinsey Global Survey',McKinsey Quarterly.
15. Ministry of Commerce and Industry (2008) "Strategy of Increasing Exports of Pharmaceutical products – Report of a Task Force", New Delhi: Ministry of Commerce and Industry.
16. Mitchell, D. & Coles, C., (2003) The ultimate competitive advantage of continuing business model innovation: Journal of Business Strategy, 24 (5), pp.15–21. 32. Mitchell, D. W., & Coles, C. (2003) The Ultimate Competitive Advantage of Continuing BusinessModel Innovation, 24 (5), 15-21.
17. Montalvo, C., Pihor, K. and Ploder, M. (2011) 'Analysis of market and regulatory factors influencing sector innovation patterns Automotive Sector', Europe INNOVA Sectoral Innovation Watch, for DG Enterprise and Industry, European Commission.
18. Osterwalder, A. et al., (2005) Clarifying Business Models: Origins, Present and Future of theConcept: Communications of the Association for Information Systems, No.15.

19. 36. Porter, M. E. and Kramer. M. R. (2011) 'Creating Shared Value: How to Reinvent Capitalism and Unleash a Wave of Innovation and Growth', Harvard Business Review 37. PWC „Healthcare Report" 2014.
20. Schumpeter, J. A., (1934) The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle, Cambridge, Mass.: Harvard University Press.
21. Stewart, D. W. and Zhao, Q. (2000) „Internet Marketing., business models and public policy":Journal of public policy and Marketing, 19, pp. 287-296.
22. Teece, D. J. (2010). Business models, business strategy and innovation: Long Range Planning, 43(2/3),172-194. doi:10.1016/j.lrp.2009.07.003.
23. Tidd, J. et al., (2005) Managing Innovation: Integrating Technological, Market and Organizational Change, 3rd edition, John Wiley.
24. Pohle, G. and Chapman, M. (2006) 'Ibm's global ceo report 2006: Business model innovation matters', Strategy & Leadership, 34 (5), pp.34.
25. Porter, M. E. and Kramer. M. R. (2011) 'Creating Shared Value: How to Reinvent Capitalism and Unleash a Wave of Innovation and Growth', Harvard Business Review.
26. PriceWaterhouse Coopers Research Report (1999) 'Health- Cast 2010', Smaller World, Bigger Expectations, Available at: http://www.pwcglobal.com.
27. 44. Velu, C. & Stiles, P., (2013) Managing Decision-Making and Cannibalization for Parallel Business Models: Long Range Planning, 46(6), pp. 443–458.
28. Gunday, G. (2008) „Management of Innovation and Technology, 2008", ICMIT 2008, 4th IEEE International Conference on 21-24 September, Turkish Inst. for Ind. Manage. (TUSSIDE), Kocaeli.
29. Willemstein, L., van der Valk, T. and Meeus, M. T. H. (2007) „Dynamics in business models: An empirical analysis of medical biotechnology firms in the Netherlands", Technovation, 27 (4), pp. 221-232.
30. Zott, C. And Amit, R. (2007) „Business model design and the performance of entrepreneurial firms",Organization Science, 18 (2), pp. 181-199.
31. Zott, C., & Amit, R., (2010) Designing your future business model: An activity system perspective: Long Range Planning, 43, pp. 216–226.