

FINANCIAL PERFORMANCE EVALUATION OF

# Product Innovation



**Dr. Aarushi Kataria**

Financial Performance Evaluation of  
Product Innovation



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Dr. Aarushi Kataria

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Dedicated to

**My Son Veer Kataria**



## EXECUTIVE SUMMARY

The purpose of this research is to analyze the determinants of product innovation and its impact on the financial performance of the organizations. Specifically, the study examines the impact of intelligence generation, intelligence dissemination, product-process innovation, marketing support of the product, quality, Dependability/ Delivery, Technology selection, Flexibility on the financial performance of the automobile companies. The models of product innovation provided the theoretical framework for the research. The model of product-process innovation provides the basis for further research. The first concept explains the link between organizations surroundings and its innovation targets (Utterback JM 1974, 1975) (Miller & Friesen, 1982) (Milling, 1996) whereas the second concept explains the connection between firm's performance level i.e. innovative performance, financial performance, organizational performance and marketing performance and its innovation types i.e. product innovation, process innovation, organizational innovation and marketing innovation (Abernathy & Townseed, 1975) (Abernathy & Utterback, June/July 1978) (Gunday, et al., 2011). From these concepts evolved this study i.e. to evaluate the impact of product innovation on the financial performance of the organizations.

The researcher used **quota sampling dividing into the Delhi/ NCR** amongst four automobile companies i.e. the four of them are market leaders as per their market share and in each of these areas **purposive sampling** is used for the purpose of survey. It is a sampling techniques in which the sample is obtained by selecting convenient population units. For the purpose of the study, primary data was collected with the help of a well-drafted Questionnaire given to Top and middle executives in the automobile organizations (N=423). Measurements for the model's constructs were adopted from the literature and in some cases adapted for the study. Cronbach Alpha was used to evaluate the internal consistency of the scale items and Structural Equation Modelling was used to test the proposed hypotheses. Results suggest that determinants of product innovation influence the financial performance of the organizations. Implications for automobile organizations i.e. main leaders of the sector are presented along with future directions for research academics and industry practitioners.

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**Aarushi Malhotra**

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# **CHAPTER-1**

# **INTRODUCTION TO THE STUDY**

## **1.1 GENERAL BACKGROUND**

In current extremely viable world scenario, an organization's capability to launch novel ideas is a major determinant for long-term survival and growth (Clark and Fujimoto, 1991; Davila et al., 2007; Tidd et al., 2009). Introducing novel ideas in terms of goods and services is crucial as creativity in upcoming products and services is required for firms to adjust to varying surroundings in market place, new expertise and proficiency (Dougherty and Hardy, 1996, Utterback, 1996; McDermott and O'Connor, 2002; Bessant et al., 2005; Pavitt, 2005). In this theory I have selected the meaning of product innovation given by the firms for the development of the economy and its widen areas (OECD, 2005, p. 48).

The meaning of product innovation is the launching of new products and unique services with major improvements in their salient features and applications. This consists of considerable enhancements in technological disclaimers, tools and resources, integrated programs, customer easiness and supplementary purposeful features.

In broad, creative actions could be explained as the hard work to make useful and specific amendment by the firm within its capability of social and economical progress (Drucker, 1998). Additionally, innovation has been described by Popadiuk and Choo (2006) as an plan that has been made to a goods or services or is processes and has been industrialized. They emphasized that, in common, the theory of innovation is frequently linked to phrase newness, creativity, industrialization and/ operation. McDermott and O'Connor (2002) describes innovation as novel know-how or permutation of expertise that recommend useful and valuable advantages and they additionally make a note that the assessment of a expertise as creative also requires to be linked to old know-how, both from inside and outside corners.

According to the Oslo Manual (OECD,2005, p.46) a minimum condition for an innovation is that the product, process or technique innovation must be novel to the organization, which includes both novelty that the company is foremost to increase and those that are accepted from other organizations. Following from this disagreement, an innovation is considered to be new-fangled to the market if the firm is the primary to introduce the modernization on its marketplace (OECD, 2005, p.58).

Thus, the variety of innovations could go from the amplified concert of an old product, procedure or method to the development of entirely novel products, processes or methods. For one concern, an innovation could be regarding a moving up product improvement effort resulting in enlarged product concert, whereas for a further company, innovation could be about chief changes to their product variety, including a major element of uniqueness, both from an in-house and a marketplace perspective. According to Dewar and Dutton (1986) this variety of innovation links to the viewpoint of radicalness, where incremental innovation could be describe as attaching a low quantity of new information, as is the case with slight improvements or adjustments in present technology. On the other hand, radical innovation is about drastic changes in technology, linking apparent departures from old practice and a high quantity of new data. Leifer et al. (2000) observes that a radical innovation is based on new-fangled ideas or technologies that create a novel line of product or a novel product line. Tushman and Nadler (1986) argue that incremental innovation contains amendments in form of supplementary features and new series or extensions to a line of product, whereas a radical innovation includes the utilization of a novel technology or a new arrangement of technologies to novel market place demands.

Christensen (2006) examines the term sustaining innovation in opposition to disruptive innovation. A nourishing innovation does not have a troublemaking effect on old market place but could include both existing improvements (i.e. improving a product in an old market place in demanding styles) and radical alterations (i.e. developing a new marketplace by understanding the upcoming opportunity in a new style). Generally, sustaining innovations improve buyer worth by providing a higher amount of manufactured goods routine. A disorderly innovation, conversely, brings a completely diverse worth proposition to the marketplace that has not survived before.

During modern decades increasing ecological concerns have become a well-built encouragement to creative thinking. Ecological system will exert huge weight on production industries, which will augment in the upcoming time, enabling a more surviving globe for coming generation. The automobile industry is one of

several industries causing ecological pollution where cars have a important impact on all stages of the life cycle; manufacturing, use, reusing and dumping (Orsato and Wells, 2007). This business also continues to cultivate .The number of cars in worldwide use will amplify in close future, mainly due to growing command in budding countries. As an instance, the amount of cars sold in China has enlarged by over 25% per annum in the past ten years, building China the world's biggest car marketplace. In 2012, the international car fleet conceded the one billion score. As a result of the increasing car market, the automotive industry records for 27% of CO<sub>2</sub> releases in the world (WWF, 2013). Automakers have also shown an escalating awareness of the ecological impact of their products as environmental rules and market demands for ecologically less disparaging cars have augmented. The centre on reducing CO<sub>2</sub> has become a well-built driver in the growth of not only less ecologically vicious cars, such as Electric Vehicles (EV) and Hybrid Electric Vehicles (HEV), but also of mass-reduction way-outs. The heaviness of the car is one necessary factor that has a consequence on CO<sub>2</sub> emissions for both expected cars and for EVs and HEVs. An uneven estimate recommends that a mass reduction of 100 kg marks in decreased fuel flaming up of 5% (Swedish Association of Green Motorists, n.d.).The basic fact is that a 10% heavy decrease results in a 4e6% diminish in fuel utilization representing some of the prospective in focusing on frivolous concepts in the automotive business. Even though automakers realize and largely master sensible difficulties with choices to the all-steel body, and despite various phases of aluminium-intensive cases vehicles or low- quantity, high-performance sports cars, the conventional industry has even now majorly engaged the all-steel parts.

Given the all-embracing ecological confront facing the automotive industry, an infuriating situation is, however, that the business is a fully grown industry featured by bulk- production, a leading design and progressive growth (Abernathy, 1978; Clark and Fujimoto, 1991; Utterback, 1994; Orsato and Wells, 2007). The foremost mass-produced cars penetrate the market place at the starting of the 20th century. The moving assembly procession by Ford was a requirement for the bulk manufacturing of cars, but the bulk manufacturing of cars was incomplete unless and until the launching of Budd's all-steel parts in the 1920s (Nieuwenhuis and Wells, 2007). Previously accumulated and decorated when it indoors at the assembly line, this eradicates restricted access in assembly. This monologue formation, a opinionated body, has flourished since then. Budd's equipment, to a great extent, twisted the automobile industry as we identify it, ensuing in numerous rewards both from a method and goods point of view, permitting the manufacturing of inflexible, well-built and economical cars. Nieuwenhuis and Wells (2007:207) even disagree that the all-steel parts formed "a real change in the production of cars, even though the major effect of this cannot be foreseen in the longer run, when it actually took place".

The manufacturing of all steel parts became the major function of car manufacturing factories, recording for 75% of their capital (Nieuwenhuis and Wells, 2007), thus needed a mass level manufacturing to nurture the project further. Whereas, bulk manufacturing assists to make the automobile business of present scenario, the movable line of assembly or production, and all steel parts, combining with other conditions, stops the potential for transformation and the launching of new product developments (Abernathy, 1978). The command for novel goods has concurrently reduced the phases of product cycle, which leads to mergers and acquisitions in order to take the partially the burden of capital and to form the base where auto manufactures allocate parts such as the power train (Clark and Fujimoto, 1991; Williams, 2006; Wells,2010). The ecological test, specifically the requirement to decrease CO<sub>2</sub> releases due to the strict rules and policies on petroleum market in Europe, US and Japan, has, though, put forth immense force on automakers. The novel European aims for emanations of the total average novel car fleet of 130 g CO<sub>2</sub> per km by 2015 and 95 g/km by 2020 (Transport and Environment, 2011) require main actions and will pressurise auto manufacturers to not only focus on the power train but also to major efforts and will force automakers to not only go fast in on the power train, but also to search weight-reducing explanations, therefore questioning Budd's major structure (Nieuwenhuis and Wells, 2003; Orsato and Wells, 2007). Already research on ecological innovation in the automobile industry seems, however, to have mainly determined on searching the effects of the ignition engine and distinct options to impulsion like EV, HEV and petroleum cells (van den Hoed, 2007; Aggeri et al., 2009; Berggren et al., 2009; Zapata and Nieuwenhuis, 2010). Regardless of substantial achievement in budding high-strength steel, the all-steel parts is still too bulky. Less research has determined on options or variations to the all-steel parts and on the effect this specific technology could have the

potential to make easy to use theory that can decrease the ecological effects of cars. Our reviews of earlier research also indicate a deficiency of research that has been established access to the functioning level of automakers' inventiveness toward developing ecologically sounder options.

Moreover, a progressively more universal with fast increasing population leads to increasing demand for vehicles. To attain our possible for a superior life style and a long-term surviving society, our means of transportation and consuming habits must shift (Johan Rockström, Nobel talk 2013).

On the other hand, auto manufacturers have reflected an progressive knowledge of the ecological effect of their goods as ecological rules and policies and demand of the market for ecologically protective cars have been increasing. The ecological test, specifically the requirement to decrease CO<sub>2</sub> releases due to strict policies on petroleum regulations in Europe, the US and Japan, has exercised enormous force on auto manufacturers. The focal point on falling CO<sub>2</sub> has become a well-built driver in the growth not only of less ecologically critical cars, such as Electric Vehicles (EV), Hybrid Electric Vehicles (HEV) and other options to impulsion, but also of bulk-reduction way-outs. The new European aims for releases of the total new car fleet of 95 g/Km by 2020 and 130 g of CO<sub>2</sub> per Km by 2015 (Transport and Environment, 2014) requires major efforts and will force auto manufacturers to search novel way-outs.

An marginal growth in automobile business will not be enough. In spite, it will need new value-creation systems, altering the old industrial model of business based on investment oriented manufacturing, with bulk amounts (Williams, 2007; Wells, 2010) and the focus is on the development of scratch changes i.e. drastic innovations (Nieuwenhuis and Wells, 2003; van den Hoed, 2007; Beaume and Midler, 2009). The ecological issues will even involve basic change where new curves are evolved (Berggren et al., 2009) and the theory in the automobile business will have to be answerable.

Given the all-embracing ecological confront facing the automotive industry, an infuriating situation is, however, that the business is a fully grown industry featured by bulk- production, a leading design and progressive growth (Abernathy, 1978; Clark and Fujimoto, 1991; Utterback, 1994; Orsato and Wells, 2007). The foremost mass-produced cars penetrate the market place at the starting of the 20th century. The moving assembly procession by Ford was a requirement for the bulk manufacturing of cars, but the bulk manufacturing of cars was incomplete unless and until the launching of Budd's all-steel parts in the 1920s (Nieuwenhuis and Wells, 2007). The manufacturing of all steel parts became the major function of car manufacturing factories, recording for 75% of their capital (Nieuwenhuis and Wells, 2007), thus needed a mass level manufacturing to nurture the project further. Whereas, bulk manufacturing assists to make the automobile business of present scenario, the movable line of assembly or production, and all steel parts, combining with other conditions, stops the potential for transformation and the launching of new product developments (Abernathy, 1978). The command for novel goods has concurrently reduced the phases of product cycle, which leads to mergers and acquisitions in order to take the partially the burden of capital and to form the base where auto manufactures allocate parts such as the power train (Clark and Fujimoto, 1991; Williams, 2006; Wells, 2010). Previous ten years have been featured by alliances and take-overs, for e.g. Saab and Volvo targeting for advantages by sharing the base, bulk production, variety in product line, world-level development of products etc. (Wells, 2010, Zapata and Nieuwenhuis, 2010).

Taking on the ecological issue, it is argued that firm's don't have sufficient ways to check the market place and its demands such as methods to track the markets, tools and equipment and processes to check the demands and to search new options apart from already established businesses (Drucker, 2002). A General opinion in the innovation theory is that big, developed organizations in the automobile business generally face problems in enabling major innovations (Henderson and Clark, 1990; Utterback, 1996) and in spite focus the growth and application of marginal innovations (Dougherty and Hardy, 1996). The information regarding how to handle scratch and drastic innovations is very few because the methods, tools and processes to handle such innovations are vague (Pavitt, 2005) resultant in marginal enhancement which is considered to bring low threat and instant return (Dougherty and Hardy, 1996; Leifer et al., 2002., McDermott and O'Connor, 2002). It is also agreed that managers in big developed firms are not familiar with the process of drastic innovation or how they seems (Leifer et al., 2002, fler).

In revising the theory on drastic or scratch innovations it is known that the theory of innovation is vague. The broad definition of innovation has resulted in different and unclear in discussing these challenges (Henderson and Clark, 1990; Chandy and Tellis, 2000; Garcia and Calantone, 2002). Although researchers are not similar with the facts and distinct forms of innovation, it cannot be said that researchers will know from the research events (Garcia and Calantone, 2002). Since the theory involves the words “ Novel” and “commercialization” in the theory (McDermott and O’Connor, 2002; Popadiuk and Choo, 2006; Iler), the rule of innovation uses distinct forms of groupings; extent of system integration (Henderson and Clark, 1990), search and use (March, 1991), trouble-making (Christensen, 2006), marginal or drastic (McDermott and O’Connor, 2002; et al).

In addition, issues leading to drastic innovations are the arguing expectations to search novel choice in equidistant with day-to-day business (March, 1990) targeting for multi-tasking firms (Tushman and O’Reilly, 1996). There is a need to think about idea for the future development when managing with day-to-day activities of the technology and fighting with deficient materials. There is a requirement to know how to aim a stability between them and to cross legal hurdles attached with drastic plans (Leifer et al., 2000; see also Dougherty and Hardy, 1996). The usual expectation to determine on any of the plans that seems to be based on managerial, ecological and firm’s determinants (Lavie et al., 2010).

Although, the theory agrees the fact that over formal system is negative for drastic change projects, which expected to be handled in an flexible way (Eisenhart and Tabrizi, 1995; Veryzer, 1998; Benner and Tushman, 2002, Engwall, 2003). In addition, well developed or firms hierarchy discourage such innovations to start from scratch (Henderson and Clark, 1990; Wheelwright and Clark, 1992; Dougherty and Hardy, 1996; Christensen, 2006). A promise to old methods and marketplace not willing to disassemble old goods and their own capital leads to determine on marginal enhancements of major technologies (Chandy and Tellis, 1998; Stringer, 2000; Bessant et al., 2005; Assink, 2006).

There are, in fact, dangerous hurdles to handle if the automobile business is to successfully look the main theory in which it is stopped, although there are instances of how profitable firms such as automobile firms are able to aim novel ecological way outs in spite of lack of deficiency in their resources and technology (Chandy and Tellis, 2000; Hill and Rothaermel, 2003; Macher and Richman, 2004, Bergek et al., 2013). Although, to sustain in the 21<sup>st</sup> centurial a transfer in the industrial chart is required, inclusive of novel drive substitutes and distinct worth proposals to clients (Donada, 2013). The automate management, it is contended, has arrived the end of its current composition and in forthcoming will be featured by automation, marketplace and industrial paradigmatic difference (Wells, 2010). Current threats to the big chart come from both internal and outdoor the business.

A firm’s capacity to flourishingly launch entirely novel goods and services is a important beneficial component for nourishing competing benefit (Davila, Epstein, & Shelton, 2007). Amiably, this is specifically correct for the automate business, where being state of the art and providing modernization are reasons for sustaining instead of just a matter of sticking around nourishment. The last ten years has been featured by mergers, alliances, acquisitions and shut-downs in this field of industry, in regular trials to have cost benefits scale through staging amalgamations and different forms of mergers targeted to get incremental product scope beyond multiplying the uncertainties. Rules of inadequate manufacturing (Womack, Jones, & Ross, 2007) have been highly affected in making progressively effective growth and production procedure, yet many auto-mate businesses are still fighting to survive. In specific terms, tiny constructors with core products cannot fight with the massive level attempts of their enormous opposition and are therefore in furious want to create their solutions of the deadlocks.

An important threat for businesses searching for modernization is how to sharpen the knowledge about the role of uncertainties in cutting-edge manner. It argues that uncertainties needs to be grasped and maintained, not just decreased, if targeting to enhance business modernizing capacity. The theory of uncertainties requires to be seen not only in critical actions like product-mix decisions but all over the initial level growth process and actions to permit the firm to concurrently destroy increasing state of the art and search entirely radical market place variation or in fact unflinching altering modernizations (Benner & Tushman, 2003; March, 1991). This action of maintaining creative occasions and uncertainties taking in to account both

longer and shorter time point of view in equi-distant is component of the creator's plight (Christensen, 2006) because business are needed to concurrently make both surviving and trouble-making automation. Also, taking into account entanglement of synergy between both specialized setup and the integral shareholders, manufacturing a car could be visioned as nasty problem (Rittel & Webber, 1973) for which there is no specific trouble-making and no final exam of a result. As Pavitt (2005, p.88) observes, innovation is "natively vague, given the unfeasibility of anticipating correctly the expenses and execution of a novel art effect and the review of customers to it."

The nastiness of the troubles faced by automate business automatically links to numerous aspects such as increasing automated complications in terms of function allocation within parts, involvement of mechanization and technical components, more variation in light of evenness through product bases etc. Also, there is an increment process complication which links to the requirement for reducing margin periods , including more disciplines, execute extra work in equi-distant, making choices based on initial knowledge etc. (Flanagan, 2007). The interconnection between large chunks of parts and segments makes the arrangement of the car threatening in itself, and there is also a complicated integrate to the client, where the contentedness and client worth lies not just in shipment but in function which are more sophisticated and new to the customer (Clark & Fujimoto, 1991).

The problems in finding new client demands make it threatening to select which creative plans to start in the automate business. Car customers like any other client, may find it hard to clear their intentions on upcoming car versions although they inform what they want with current goods (Clark & Fujimoto, 1991). This challenge is difficult to manage in the automate business because the start time of a car is equally higher than many other customer goods.

Another threatening condition that is important for the continuous sustainment of characters in the automobile business is ecological issues. Environmental rules are already putting higher force on producers and this force will surely move up in the near time. The expectation that new automation should provide way outs for long-term goods in jointly with the clients more expectations for ecologically concern solutions will improve the essence of innovation actions.

At the core of innovation action is the capacity to, for instance, making and sharing of ideas, to join old innovations into novel way outs or use old way outs in a novel manner. A basic thing to achieve such a capacity is to make a allocation of knowledge of what, by whom and in which manner it will be implemented (Randall, Harper, & Rouncefield, 2007), but also the group has to give consensus on what an creativity is this. A leading strength for innovation action is the expectation to alter a condition, a product, a situation or the similar in to anything good. This wider use of the theory makes it viable to see innovation from many points of views, for instance from a product-making, a product process, marketing or a business cycle perspective (Moore, 2004). In common, the term of innovation is novel that has arrived a marketplace but such a generalization does not support knowledge. For example, what is novel? And what is a marketplace? A business perspective knows that there are minimum 15 distinct factors that come from the term innovation, and minimum 15 distinct variables which links to these (Garcia & Calantone, 2002).

Product innovation makes the healthy environment inside the firm that enhances the growth, improves the financial returns and superior brand image (**Error! Bookmark not defined.**) (Walker, June, 2004) . Studies have revealed that good experience within the firm is linked with growth of novel information and facts, which is significant element for organization results and uniqueness (Wheelwright & Clark, 1992) (Wong, 2014). Hence, there is need to address the issue of how to create product innovation in the organizations. The empirical research on the product innovation is limited both in volume and scope; especially in Indian Context. Thus, there is a need to understand the product innovation and its impact on the financial performance of the organizations.

Big business houses and new ventures are motivated to grab the market place openings through their unique selling products and services (Dess et al. 1999). Numerous wealthy firms and worldwide MNCs had modest initial stages as hatchling starting (for instance, Pizza hut, Sony, Apple). Several initially successful companies become contented, diverted their focus or found their competitive advantage falling down because of altering consumer demands, techniques and outside pressures. While entrepreneurs are glorified,

one cannot ignore the fact that a large number of start-up businesses be unsuccessful. Hasty judgments about the trends at the level of management can be main reason of shut-down of businesses at early stages. Small groups have inadequate resources and minor profit margins left for their mistakes. Barret and Weinstein (1998) (Worthington, 1998) proposed that big organizations have power to handle uncertainties and capacity to bear their mistakes (consider the Reliance Group, Tata Motors). The focusing point for large firms is to inculcate the favourable and unique ideas of tiny and start-up entrepreneurs. This can be facilitated by some positive attributes exhibited by these companies as outlined here. The bigger firms manage to take higher risk levels (Wu & Yu, 2010) (WWF, 2010). They have better information about the current happenings as compared to tiny ones. For example, development of novel products, MDPs, Advertising and promotional campaigns, research activities. Big houses have an upper hand in terms of availability of resources and its utilization, high-salaried professionals, modern methods and techniques, vast research and development facilities and assistants. They can easily bear the risk and uncertainties in the surroundings and can easily invest in the line of challenging businesses.

The research about innovation and behavior of the managers with its usefulness keeps on growing. The use of this effort is to apply the outcomes of theory and practical study to know the determinants of product innovation and its impact on financial performance of the organizations. The study proposed that Firm innovation composed of many types, product innovation investigated in the research from organization's and consumer's viewpoint; examine in the literature both from customer's perspective and firm's perspective; inter-related product-process innovation, working place and HRM policies (Yamin, et al., 1999) (Yinghong & Morgan, 2004). Product or a process direction towards innovativeness will lead to success if the organization changes as per the market demands. According to Petrella (1996) making successful goods are difficult in today's dynamic world. Many firms are more succeeding almost every time and maintaining this status demands lot of efforts on the part of senior management. Some of the features that lead to development of product challenges are versatility, time limits, new developments and tradeoffs.

Product innovations can make use of novel information or techniques, or it depends on novel applications or two of them together i.e. old knowledge with modern technology. The definition of product consists of both goods and services. Product innovation is not a easy route motivated by modern methods, dynamic consumer demands, time pressures and growing worldwide competition. To become successful, it includes close communications inside the firm and with the outside environment as well (Akova et al., 1998) (Zahra, 1991).

## **1.2 SCENARIO OF INDIAN AUTOMOBILE SECTOR**

The automobile business involves two distinct businesses: (i) the automotive business; and (ii) the auto segment business. The automotive business further has three sub-parts: (a) two-wheelers; (b) three-wheelers; and (c) four-wheelers (passenger and commercial vehicles). While the history of India's growth in the economy is known in the last two decades, it is usually termed as a services-leading concept. Although, some production fields have played an major act in this industrial development and the automobile industry is important among them. The automobile industry's addition is not only in terms of sales revenues, incomes, taxes to be paid and jobs, but more particularly in production-process superiority, efficient enhancements and state of the art. This change has been vision through the sectors in the economic transportation, usability transportation, cars and automotive parts business. According to a research by the confederation of Indian Industry, superiority error percent in production falls from as higher as 12% in 1998 to 100 ppm in 2008- the Indian automobile industry which was at the front of the quality action can legally take attention for this major enhancement. The automobile industry is the most important place of the state of the art in Indian production. It stands for the 2<sup>nd</sup> highest average expenditure by business on research and development, followed by the pharma business.

The automobile industry is the pillar of global economy, a main driver of macro economic growth, stability and technological advancement in developed and developing countries, covering many adjacent industries (Kearney, A.T, 2013). According to the Society of Indian Automobile manufacturers (SIAM), India's auto industry is world's sixth largest producer of automobiles in terms of volume and value and has grown 14.4% over the past decade. The industry contributes to 7% of India's GDP and absorbs 8% of the total employed population having more than 35 automakers. India's automobile marketplace is one of the rapid moving auto

marketplaces in the globe. It is one of those production sector which have developed importantly since the freedom of the economic system which starts in a rough and tough way back in the 1980s. The business is also known for many numerous creativities. The business which was managed by just few home constructors was rarely acknowledged for any modernization before 1991, but is now one of the rapidly moving production business not here in India but at International Level also. In 2010, India has known as the second rapid developing car market in the globe after China. Sales of two wheelers moved beyond 10 million units during the one year, a foremost, with all important two-wheeler constructors having large multiple growth. India in 2010 is the largest tractor builder, second largest two-wheeler builder, fifth largest economic vehicle builder and the eleventh largest car builder in the globe.

There are many cases of modernization in the business, the Tata's Nano car being one of the renowned cases of these state of the art attempts. It can be said that it is an business which is truly enhanced in launching variety of Novel products not just in the home market but in the Global market as well. For the ambition of the investigation, the automobile sector has been chosen as it is known for its innovation and new product development.

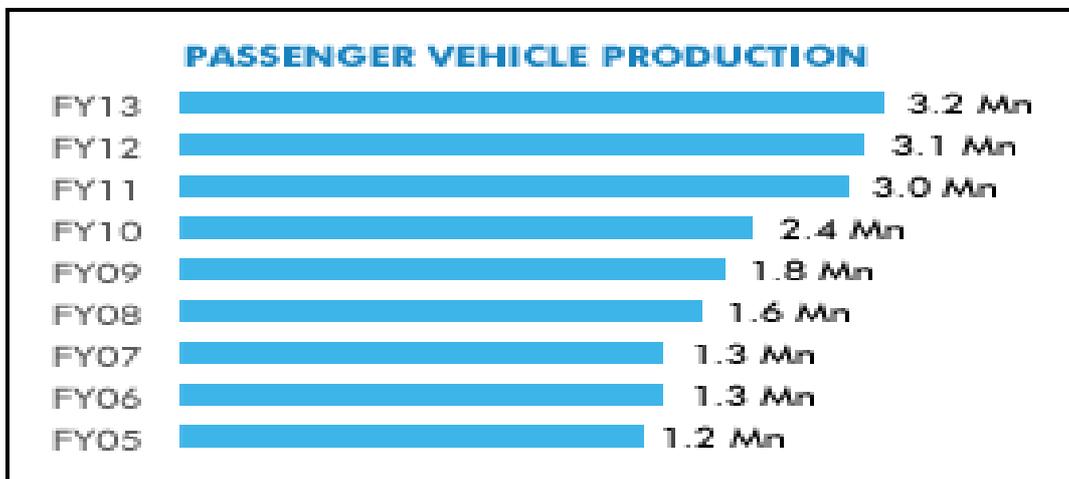


Figure-1.1: Passenger vehicle exports from India Passenger vehicle exports from India stood at 0.5 million during FY13.

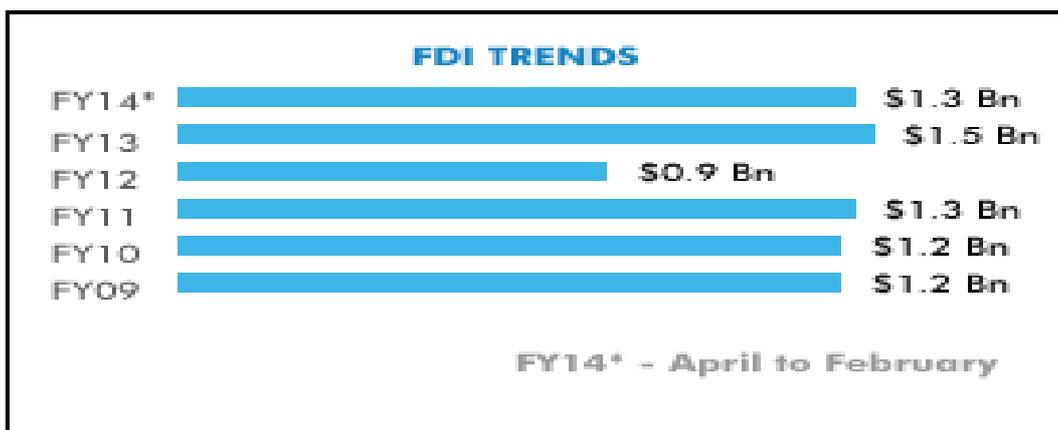


Figure-1.2: FDI in Indian automobile industry: FDI inflows in the Indian automotives sector aggregated to US\$ 9.6 billion during April 2000-February 2014.

### 1.2.1 Automotive Sector-Historical Perspective

In the Initial period after India's freedom in 1947, the Indian Govt. under the leadership of Prime Minister Jawaharlal Nehru embraced a planning of making heavy industry under a process of growth in economy. While the automate business was already known by that period as a parent business that could make better areas across the economy, India willingly under estimate the car industry ( which was seen as providing

personal conveyance for the upper class) and in spite motivated the making of production capability in Heavy vehicles. Two major firms that are main players to this day- Ashok Leyland and Tata Motors (then Tata engineering and Locomotive Company Ltd. - Telco) were set up in 1950s with amalgamations with Leyland and Mercedes Benz correspondingly to make the starting of a heavy conveyance vehicle industry. A finite car manufacturing capacity was also established afterwards by two firms- Premier Automobiles and Hindustan Motors. Ancillarisation was motivated in the late 1960s and many firm making auto parts were established in that period, generally through international association. Under the new industrial policy, international investors could not invest in domestic market independently neither in the final goods nor in raw-materials- Therefore they were interested to give technology association and help to domestic investors. The auto business varied after the freedom of economy which takes place in the late 1989s. Ford was the foremost to invest through alliances with M&M but the Escort model they introduced was already thrown out of other marketplace and it did not take much of a success in the domestic market place. General Motors suffered a same failure with its Opel Astra. The foremost foreign investors to make a success happen in the “Novel” Indian auto industry were Hyundai which manufactured car specifically for the domestic marketplace. The Santro, introduced in 1998, had fast race, the capability to move in compact surroundings, excellent fuel usage and efficiency and with its tall boy style, was different from the old cars in the market place. Over the last decade, everywhere all the main auto firms have invested in the domestic marketplace- Toyota, Volkswagen, Skoda, Honda, Fiat, Nissan and Renault are all now in India in addition to GM, Ford, Hyundai and of course, Suzuki which was the foremost to invest and still in position to capture the domestic auto marketplace and its well-built image credit goes to its presence in the lower end of a market sensitive to costs and process. Many producers involving Toyota (with the Etios), Ford and Volkswagen have launched cars which are specifically made or customized to the domestic marketplace. India Brand equity fund (2010) has separated the emergence of automobile business into three levels as:-

**Level 1: 1947-1983**

- Closed marketplace.
- Development of marketplace defined by home supply.
- Very rare creativity, old versions, expensive fuel.
- A total firm in number is 5.

**Level 2: 1983-1993**

- Collaboration between Indian Govt. and Suzuki to make Maruti Udyog
- A total firm in number is 6.

**Level 3: 1993 onwards**

- Industry was free from licensing system.
- Main blue chip companies (OEMS) started assembly in India
- Use of Value Added Tax (VAT)
- Imports permitted from April 2001
- A total firm in number is greater than 35.

**1.2.2 Innovations in the Automotive Industry**

There have been several cases of new product development in the India’s Automobile sector. The list below is comprehensive:

- The growth of the Nano, the innovative US\$2,250 car, has advertised India’s capability to creativity and Modernized.
- Reva, India’s first electric car, is also an instance in innovation;
- Firms such as M&M and the Hero Group are deciding to make electric vehicles;

- In the economical vehicles segment, Tata Daewoo, a branch of Tata Motors, has just made an LPG-based MCV (4.5 ton), the Novus, which leads to Euro V emission rule.
- Ashok Leyland has made India's first six-cylinder CNG engine for buses, which implement the multipoint fuel injection system and leads to Euro IV emission norms.
- Two-wheeler producers Bajaj Auto, Hero Honda and Mahindra are in talks with Energetek, a supplier of absorbed natural gas products, for technovation that will lead two-wheelers to move on natural gas in spite of gasoline.
- The automobile business is one of the biggest R&D contributors inside India's industrial base firmly ensuring the leader in this segment, named as pharmaceutical industry.

The automotive industry in India consists of all conveyances, involving 2-3 wheelers, passenger cars and multi-utility vehicles, light and heavy commercial vehicles, and agricultural tractors and other earth moving machineries, also the parts division for all these classes (see GenreChart for the various types of vehicles produced in India). The vehicles division and the related parts division are frequently known as auto-business. The business is featured by a large percentage (about 80%) of 2-3 wheelers manufacturing. To say, India is the biggest producer of motorcycles and second biggest in manufacturing of scooters in the globe. In tractor manufacturing also India is the second biggest manufacturer in the globe.

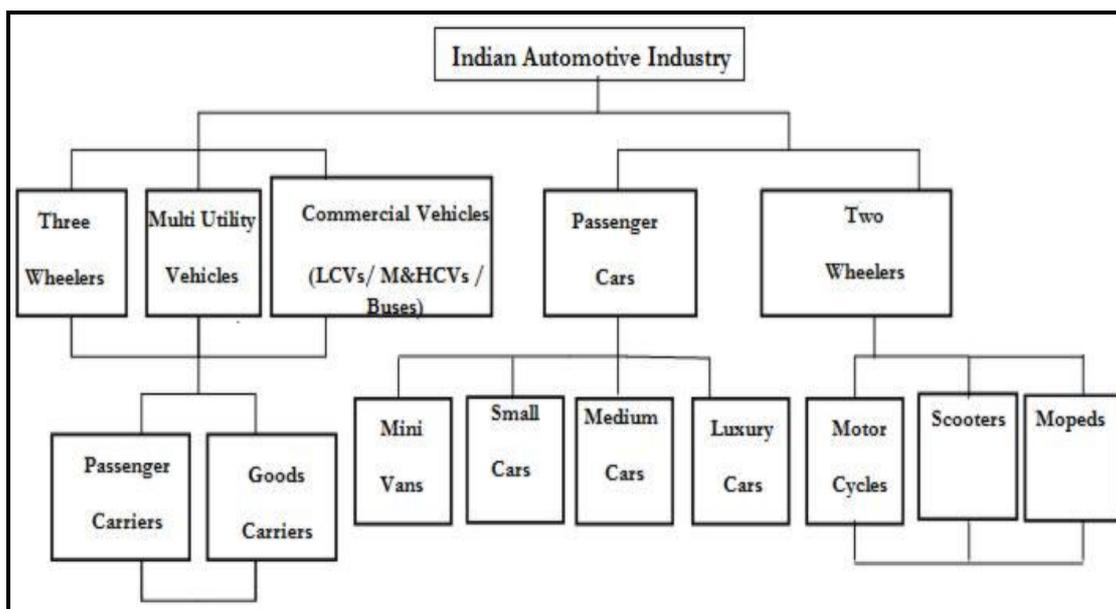


Figure-1.3: Source: ACMA, India

### 1.2.3 Brief synopsis of the major players in the automobile sector

The brief synopsis of major players in the automobile sector is examined and presented below:

#### 1. MARUTI SUZUKI INDIA LTD.

Maruti Suzuki India Limited (earlier known as Maruti Udyog Ltd) is a branch of Suzuki Motor Corporation, Japan and has been the ruler of the domestic auto business for last twenty years. Maruti Suzuki started the business and put a India on wheels. Since starting Maruti is known for with having assembled and led the innovation of the domestic passenger car business. Over its 26 years of period, Maruti Suzuki changed itself from a nourished Public Sector Company (PSU) to a active and renowned Multi-National Company (MNC), surviving its ruler ship rank and continued beneficial apart from difficult fight. In October 2, 1982 the company had written the license and joined hands with Suzuki Motor Corporation, Japan. It is the foremost firm in India for bulk manufacturing and sells more than a million cars. In the year 1983 the company launched their new model and introduced Maruti 800. In the year 1987 the company moved into the international market by selling first lot of 500 cars to Hungary. In the year 2005 company introduced

international level strategic car model popularly known as Maruti Suzuki Swift which enters the domestic auto marketplace. Presently Maruti Suzuki India Ltd has 14 brands which involve Maruti 800, Omni, Eeco, Zen Estilo, Alto, Alto-K10, A-Star, Wagon-R, Swift, Ritz, Swift Dzire, Sx4, Gypsy, and Grand Vitara. Maruti Suzuki has a total share in the market of 44.9% of the Indian passenger car market as of March 2011. Today Maruti Suzuki has made strong sales offices of 600 outlets spread over 393 towns and cities. The repairing help is given to the clients through 2628 workshops all over 1200 towns and cities.

## **2. TATA MOTORS**

Tata Motors Limited is domestic biggest auto firm company, with overall sales revenue of INR 1,88,818 crores (USD 34.7 billion) in 2012-13. It is the ruler in economical vehicles in each division, and among the first few in passenger vehicles with successful model in the small, middle size car and user-friendly division. It is also the globe's fifth biggest truck producer and fourth biggest bus producer.

Set up in 1945, Tata Motor's existence moved beyond the boundaries of domestic market. Over 8 million Tata vehicles follow on domestic lines, since the foremost moved in 1954. The firm's production base in India is all over the Jamshedpur (Jharkhand), Pune (Maharashtra), Lucknow (Uttar Pradesh), Pantnagar (Uttarakhand), Sanand (Gujarat) and Dharwad (Karnataka). Having a mergers and alliances with Fiat in 2005, it has established an collaboration with Fiat Group Automobiles at Ranjangaon (Maharashtra) to make both Fiat and Tata cars and Fiat powertrains. The firm's tall ship deals, jobs and allied components chain spread over 6600 contact marks.

Tata Motors, also registered in the New York Stock Exchange (September 2004), has known as an Global auto firm. Through branches and joint firms, Tata Motors has functions in the UK, South Korea, Thailand, South Africa and Indonesia. Among them is Jaguar Land Rover, taken over in 2008. In 2004, it takes over the Daewoo economical vehicles firm, South Korea's second biggest truck manufacturer. The redesigned Tata Daewoo economical vehicles firm has introduced many novel goods in the Korean marketplace, while also shipping these goods to many world marketplace. Presently, two-thirds of heavy economical vehicle ships out of South Korea are from Tata Daewoo. In 2006, Tata Motors made a 51:49 collaboration with the Brazil-based, Marcopolo, a world ruler in structure making for buses and coaches to produce fully-made buses and coaches for India - the factor is setup in Dharwad.

It was Tata Motors, which introduced the foremost endemic made light economical vehicle in 1986. In 2005, Tata Motors made a novel division by introducing the Tata Ace, India's foremost homegrown mini-truck. In 2009, the firm introduced its international level prime variety of trucks and in 2012 the drastic variety of world level light economical vehicles. In their capability, velocity ferry capabilities, functioning, economical and compacts, they will launch novel criterion in India and contest the excellence in the globe in achievement at a small expenses of the life phases. Tata Motors also launched India's foremost SUV in 1991 and in 1998, the Tata Indica, India's foremost fully home grown passenger car. In January 2008, Tata Motors launched its user friendly car, the Tata Nano. The Tata Nano has been frequently introduced, as decided, in India in March 2009, and thereafter in 2011 in Nepal and Srilanka. A growth, which reflects a foremost for the world auto business, the Nano brings the happiness of a car within the capacity of middle-class groups.

Tata Motors is equi-distant determined on ecological technovation in releases and fuel efficiency. It has made electric and joint vehicles both for private and civil vehicles. It has also been using many eco-friendly techniques in production process, importantly improving resources. With the base of its wealthy ancestry, Tata Motors is currently engraving a bright imminent.

## **3. HYUNDAI MOTOR INDIA LIMITED**

Hyundai Motor India Limited is a fully owned branch of Global fifth biggest auto firm, Hyundai Motor Company, South Korea, and is the biggest passenger car shipper. Hyundai Motor currently sells 49 variety of passenger cars across divisions. These involves the Santro in the B segment, the i10, the premium hatchback i20 in the B+ segment, the Accent and the Verna in the C segment, the Sonata Transform in the E segment.

Hyundai Motor, moving with its culture of being the rapid developing passenger car producer, accounted total sales of 559,880 vehicles in the year 2009, an increment of 14.4% over 2008. In the home marketplace,

it reached a development of 18.1% in comparison to 2008 with 289,863 units, while international sales moved by 10.7%, with shipment of 270,017 units. Hyundai Motor presently exports cars to more than 110 countries all over EU, Africa, Middle East, Latin America and Asia. It has been the number one shipper of passenger car of the India for the sixth year consecutively.

In a last ten year since Hyundai has been existing in domestic market, it has become the successful shipper of passenger cars with a total share in the marketplace of 66% of shipments of passenger cars from India, making it a prominent giver to the Indian auto business. In 2009, instead of a world crisis, Hyundai Motor India's ships moved up by 10.7%. In 2010 Hyundai decided to reach more markets with Australia being the recent entry to the index. The foremost export to Australia is of 500 units of the i20 and the entire i20 shipments to Australia are conventional to be in the area of 15000 per year.

#### 4. MAHINDRA & MAHINDRA

With a total share in the market place of 10.01% in economical Vehicles, 6.50 in Passenger Vehicles and 1.31% in Three Wheelers, Mahindra & Mahindra is majorly involved in the Multi Utility Vehicle and Three Wheeler divisions precisely. The firm fights in the light economical vehicle division through its collaborated branch Mahindra Navistar Automotives Limited and in the passenger car division through other collaborative venture branch Mahindra Renault. In the year 2009, on the home market side, the firm along with its branches sold a total of 220,213 vehicles (consisting of 44,533 three wheelers, 8,603 Light economical Vehicles through Mahindra Navistar Automotives and 13,423 cars through Mahindra Renault), accounts a jump of 0.6% over the last year.

The firm's home Multi Utility Vehicle total sales grew by 3.3%, as compared to a fall of 7.4% for business Multi Utility Vehicle total sales volume. A registered number of 153,653 Multi Utility Vehicles were sold in the home market in 2009 compared to 148,761 MUVs in the last year. Hence, Mahindra & Mahindra is now bolster its power of the home Multi Utility Vehicle sub-branch during the year, moving its share in the market to 57.2% over the last year's market share of 51.3%. Mahindra & Mahindra is spreading its impression in the international market place. In 2009 the Xylo was introduced in South Africa. The firm made new collaborative venture Mahindra Automotive Australia Pty. Limited, to determine on the Australian Market place.

#### 5. ASHOK LEYLAND

Total market share: Commercial Vehicles 16.47%. As compared to rapid fall in the demand for economical vehicles, during 2008-09, Ashok Leyland accounts total sales revenue of 47,118 Medium and heavy commercial vehicles (M&HCV), 37.5% less than in the last year. This involves 16,049 M&HCV buses and 31,069 M&HCV trucks subsequently, 8.7% and 46.3% less than in the last year.

The firm obscured 1.8% market share in the domestic medium and heavy commercial vehicle market place during the fiscal year 2008-09, majorly because of fall of sales in the truck division. This was because the Eastern Region, where the firm's existence had been satirically not string, was comparatively balanced, while the market place falls rapidly in other areas. While entire business quantity of the medium and heavy duty buses falls by about 8.7%, the firm's market share moved up incrementally and Ashok Leyland maintained its first rank in this area. The firm sold 6,812 vehicles in the international market place during 2008-09. This shows a fall of nearly 6.5% over the last year. Entire industry amount linked to global market place to which the firm ships (such as Sri Lanka, the Middle East) proved a fall of about 25% over the last year. To show the effect of fall in CV sales, the firm determined on non-seasonal industries in the mix. The firm made in total 54,049 vehicles during the current time. To have costs and save money, the firm functioned only about 50% of the functionings days in all its producing units during the next half of the. **The below table 1.1 shows the data the passenger car market share in the financial year 2014:**

Company Name	Market Share (%)
Maruti Suzuki	42.08%
Hyundai	15.18%
M&M	9.15%
Tata Motors	5.59%

Honda Cars	5.36%
Toyota	5.16%
Ford	3.37%

### 1.3 NEED FOR STUDYING PRODUCT INNOVATION

The success of any organization can be traced or linked with successful products and this based on their capability to search the wants of clients and to quickly make goods that fulfil these demands. Therefore, product development can be described as the life blood of any business organization Brown and Eisenhardt (1995), Balbutin *et al.* (2000), Efcharis *et al.* (2008), Chux Gervse Iwe (2010). Contending the wants of clients is not only a commerce obstacle neither is it only a architecture hurdle or production hurdle. It is new product development problem. Product development is an integrative function that needs help from almost all the activities of a company, however three activities are nearly focussed to a product development achievement. This consists of commerce, architecture and production (Ulrich and Steven Eppinger, 1995; Ulrich and Eppinger, 2007). The commerce activities arbitrate communication between the company and its clients. Commerce usually aids the recognition of client demands. Commerce also commonly organizes for interaction between the company and its clients fix prices and introduce and advertise the product internationally (Ulrich and Eppinger, 2007) (Zahra, 1993). The architecture activities edges the term of the substantial type of the good to better meet client's demands. The architecture activity could be construction, business, advertising or all of them, (Ulrich and Steven Eppinger, 1995) (Zahra & Covin, 1995). The production activity is mainly culpable for making and functioning of the manufacturing system in order to make the goods. Widely delineated, the producing activity also involves buying, allocation and setting up (Ulrich and Eppinger, 2007). Product development defines contributing novel or enhanced goods for current market place. By informing the current market demand, a company may see way outs to alter or improve goods characteristics, make many superior phases, or summate different forms or breadth by launching novel models of known plans i.e. properties of radical changes.

Over the period, moving up amount of evidenced research have shown the connection between firm's creativity and its function. As a part of the interpretation, these research involves distinct forms of versions, predicted methods, financial performance measurement tools and creative function (Geroski *et al.*, 1997; Bottazzi *et al.*, 2001; Del Monte and Papagni, 2003; Loof and Heshmatt, 2006). There presents large structure of research which recommends that there is a tight connection between creativity and development (Nelson and Winter, 1982; Aghion and Howitt, 1992; Klette and Griliches, 2000; Klette and Kortum, 2004). For many companies, nourishing novel goods are appliances of development (Cohen, Eliasbergh and Ho 1997). Many ground works involving the life-cycle of the product and BCG's growth share matrix, hypothesize the requirement for goods that generate forth most benefits and needs companies to ensure that their lines of product do not become old (Cooper 1984, Chaney, Devinney and Winer 1991). In sales revenue terms, 25% of firm's sales revenue simply come from goods launched in previous three years time (Mahajan and Wind 1991). Numerous researches have examined the effect of either novel goods launches or advertisement on direct financial measurement tools or value of the firm (Bayus *et al.* 2001; Chaney *et al.* 1991; Eddy and Saunders 1980; Kelm, Narayanan and Pinches 1995; Wittink, Ryans and Buyus 1982).

### 1.4 OBJECTIVES OF THE STUDY

This study aims at studying impact of product innovation on the financial performance of the organizations and to evolve a model for practicing product innovation within the organizations. The broad objectives of the study are as follows:

- a) To analyse the factors that lead to product innovation in Automobile sector
- b) To analyze the impact of Product Innovation on the financial position of the Co. through impact on revenue, costs and ratios.
- c) To find the innovations and development in the automobile sector, by gathering the experience of people directly linked with the innovation process in the company and from the customers.

### **1.5 ISSUES FOR THE STUDY**

Firms adopted innovation approach since long-time, but very little published literature is available on the experiences of firms. Most companies are using the basic innovation approach without categorizing the types of innovation. However, the implementation strategies and managerial commitment to innovation approach vary from company to company. This study deals with the determinants of product innovation and its impact on the financial performance of the organizations. The study is focused on identifying the determinants of product innovation. The main issues covered in the study are as follows:

- a) Identifying the role of intelligence generation in stimulating product innovation within the organization.
- b) Identifying the role of intelligence dissemination in stimulating product innovation within the organization.
- c) Identifying the role of technology selection in promoting product innovation.
- d) Exploring the role of production Flexibility and quick delivery in facilitating product innovation.
- e) Identifying the relationship between process and product innovation in stimulating the product innovation within the organization.
- f) Identifying the role of quality and marketing of products in promoting the product innovation.
- g) Identifying the financial factors which measure the impact of product innovation on the organizations performance.
- h) Evolving a product innovation model, this may serve as a guiding framework to measure the impact of product innovation on the financial performance of the organizations.

### **1.6 SCOPE OF THE STUDY**

The ambit of the study is finite to product innovation. It does not consist of production process, commerce innovation, firm innovation or any other form. It does not involve the outside ecological factors such as economy, technovation, providers, rivals and government regulations that affect the product innovation. The basic underlying assumption is that the external environment is same for all the organizations, as the study has been undertaken in the Indian context. The performance is measured only in financial terms (Zahra & Sidhartha, 1993). Marketing performance, innovation performance, organizational performance or any other performance is beyond the scope of this research. The study covers the organizations in automobile industry. The study is focused only to know the impact of product innovation on the financial performance of the organizations.

### **1.7 OVERALL METHODOLOGY OF THE STUDY**

The thesis is based on the empirical research on the impact of product innovation on the financial performance of the organizations in Indian context. The complete study has been divided into two parts, i.e. pilot study and questionnaire based survey study.

The pilot study of select organizations has been carried out to identify the determinants of product innovation. Number of macro and micro hypotheses has been evolved, based on the conceptual framework, which have been statistically investigated/tested on the basis of a questionnaire-based survey conducted in organizations selected. The unit of analysis for the study is the firm. The data has been analyzed statistically using univariate, bivariate and multivariate analyses techniques. Based on the results so obtained, a product innovation framework has been evolved to understand its impact on the financial outcomes. Empirical Cum Descriptive Research Design is used for this research to find out the solution of the problem through the collection of primary and secondary data. For pilot Survey, Judgemental and Purposive has been used to collect the data of 100 respondents. It means questionnaire were filled through references from the firms of auto sector. EFA (Exploratory Factor Analysis) was conducted to know the number of factors extracted. To Analyze the impact of product innovation on financial performance, Structural Equation Modelling–Confirmatory Analysis and Path Analysis will be used.

### **1.8 LIMITATIONS OF THE STUDY**

**Limitations of the study are as follows:**

- i. The findings of the study is restricted to Delhi/NCR alone

- ii. The research is limited to product innovation only. It excludes all other types of innovation.
- iii. This study executively discusses about the impact of product innovation on the financial performance in auto industry with respect to Delhi/NCR region.
- iv. This study does not include marketing performance, organizational performance, innovation performance or any other type. Every effort is boiled down in financial terms.

### **1.9 STRUCTURE OF THE BOOK**

The following section provides an overview of the contents of the chapter that are presented in this research:

- i. **Chapter one:** Chapter one gives introduction to the study. This consists of the background of the study and its relation to the automobile industry. The research problem, objectives, issues and scope are defined. The overall methodology and limitations of the study has been described. In the end, organization of the thesis is outlined in brief.
- ii. **Chapter two:** Second chapter is the literature review which provides the existing work related to product innovation. This chapter in detail discusses about the meaning and definition of product innovation. This chapter also focuses on the need for product innovation. Part of the section also discusses about the determinants of product innovation. Next to that, this chapter focuses on the benefits of product innovation and also highlights the challenges encountered with the product innovation. Apart from these, this study also concentrates on the models of product innovation in detail. In addition to these, this study also concentrates on the financial factors that measures the impact of product innovation such as (ROI, market share etc.)
- iii. **Chapter three:** Third chapter is the research methodology chapter which provides an overview about research design, strategy for research, sampling design, sampling plan, sampling size, types of data or data collection, various data analysis and interpretation techniques that is used in this research. Apart from these, this chapter also discusses in detail about the ethics of the research.
- iv. **Chapter Fourth:** Fourth chapter is the data analysis where the factor analysis and SEM will be used along with the results in tabular form. Result chapter describes about the various concepts related to primary data which was collected by the researcher or investigator from the survey.
- v. **Chapter fifth is the** discussion chapter. The discussion section discusses about the determinants of product innovation and its impact on the financial performance of the organizations in Delhi/NCR.
- vi. **Chapter Sixth:** Sixth chapter is the conclusion and recommendation chapter. Conclusion and recommendation chapter that describes about the summary of findings obtained through the discussion section and also provides conclusion to the research followed by suggestions or recommendations and best innovation practices to be adopted to enhance the product innovation with respect to Delhi/NCR region. This study will provide valuable insights for the organizations to innovate their products and also helpful to future researchers.
- vii. **Bibliography:** This section lists all works of interest including those mentioned in the text.
- viii. **Appendices:** The appendices include all necessary relevant data supporting the study including the survey about the impact of product innovation on the financial performance of the organizations with specific reference to Delhi/NCR region considered in the study and to collect the primary data for the purpose of this study.

### **1.10 CONCLUDING REMARKS**

Innovation has important role in making the distinct of function and fights among companies' areas and even countries. For example, the research by Fagerberg et al. (2004) shows that creative countries had larger capacity and profitability than the less-creative ones. OECD reports market out that firms' that grow creativities in a more serious way and quickly, had also more educated labor class, paid much higher monetary incentives and provided more convincing forth most decisions for their staff (Zikmund, 1997). The entrepreneurial revitalization helps the company to become innovative which is a vital blood for the survival and growth of a company.

With setting of the research objectives in a clear manner and defining the relevant issues, the scope of the research problem has become clear and well focused. The study has been designed to understand the determinants of product innovation and evolve a frame work to measure its impact in financial terms.

# **CHAPTER-2**

# **LITERAURE REVIEW**

## **2.1 BACKGROUND OF THE STUDY**

This chapter describes about the meaning and definition of product innovation, need for product innovation. A portion of the division determines on the determinants of product innovation. Later on, this chapter focuses about the need for product innovation and issues linked with the product innovation. Consequently, the abstract framework of the product innovation is considered. Later division considers about the communications amongst innovation forms and its impact on the organizations performance levels. Additionally, this chapter also focuses on the impact of product innovation on the financial performance of the organization. Finally it summarized with the chapter conclusion.

## **2.2 MEANING AND DEFINITION OF PRODUCT INNOVATION**

To go into new-fangled markets, to improve the existing market share and to develop the cut-throat frame of the organization, Innovation is one of the primary tools for strategic growth (Berry, et al., 2010) (Birkinshaw, et al., 2008) (Busenitz, 1999). Organizations are now realising the essence of innovation in their day-to-day working as new and modern technology is adapted by competitors very quickly at world-level, thereby it wear down the worth of old products and services (Brown & Dant, 2014) (Adams & Jeanrenaud, 2008). Therefore, tough competitive edge gives the encouragement to organisations across the globe to learn the concept and application of innovation.

Therefore, innovation becomes an important element of marketing strategies for organizations for many reasons such as to improve manufacturing processes that produce maximum output at minimum costs, to perform well-built in comparison to opponents in the market place, to improve the goodwill of the organizations in the mindset of the customers (Coombes & Nicholson, 2013) (Buijs, 1993) (Hamel, 1998) (Hamel, 2006) and in nutshell, to gain long-term survival in a aggressive world (Cronholm, et al., 2013) (Andrews, et al., 2007) (Hamel, 2007). Over the past twenty years, innovation has gained popularity amongst the researchers who tried to characterize the impact of innovation on performance levels as this subject is very practical in nature (Dholakia, et al., 2010) (Amabile, et al., 1996) (Burns & Stalker, 1961). Innovation provides the platform to organisations to survive in long-term in the competitive planet with sufficient profit earning capacity. It is a tool that provides strategiesto fight with competitors (Ericsson & Sundstrom, 2012) (e.g. Drucker, 1985; Hitt et al., 2001; Kuratko et al., 2005, Hauser et al. , 2006) (Drucker, 2012) (Drucker, 1985a).

The scope of innovation is limited not only to products and its process of production but is also extended to marketing strategies and organization environment. Schumpeter (1934) (Capon, et al., 1992) (Goldkuhl & Cronholm, 2010) described various forms of innovation: new goods & services, latest processes, new manufacturing ways , new marketing strategies, new techniques of packaging and delivery of products and services and better options to manage the business. Drucker (1985) (Hervas-Oliver, et al., 2014) defined innovation as the course of preparing improved techniques, new technology and methods and increased uses of products and services. Innovation is intently connected to managerial understanding. Thompson (Thompson VA, 1965) (Hermann, et al., 2006) (Matzler, et al., 2013) describe innovation as the creation, recognition, and execution of new-fangled proposal, methods, manufactured goods, or services. According to Zaltman et al. (Zaltman G, Duncan R, Holbek J., 1973, (Calantone et al., 2002) and (Rogers., 1983, 1995) (McGrath, 2011) , it is an thought, exercise, or objects seeming as new by the ultimate users. Amabile et al. (Amabile TM, Conti R, Coon H, Lazenby J, Herron M., 1996; Lhuillery, S., 2014) define innovation as the flourishing use of Novel thoughts inside the organization (Hurley RF, Hult GTM, J., 1998; Baker, W. E. and Sinkula, J. M.,2009) (Metka & Galouj, 2012). The process of innovation includes the innovation process involves the possession, spreading, and application of new information (Damanpour F., 1991; Johnson JD, Meyer ME, Berkowitz JM, Ethington CT, Miller VD, 1997; Moorman C, Miner AS, 1998; Verona G., 1999, Amabile et al., 1996) (Burgelman, 1983a) (Rindell, et al., 2011).There seems to be extensive harmony that knowledge environment and innovation within the firm are closely related to each other and many authors have described over this to check that how they are related to each other (Hurley RF, Hult GTM., 1998; Damanpour F., 1991; Goes JB, Park SH, 1997; Sinkula JM, Baker WE, Noordewier TA, 1997) (Sorescu, et al., 2011). Innovativeness is one of the elementary tool of organizations corporate strategies to improve the existing share of the market, to explore new market places, to gain brand image in the minds of the

customers and to create long-run win-win situation (Baldwin & Johnson, 1996) (Sundstrom & Reynolds, 2014). In the past years, the essence of innovation is mainly taken up and it has become an main provider to success and profits of the firm since extra worth of existing products and services are falling as a result of replacement of old technologies with the new ones and world level competition exists (Teece, 2010). This concept has given more emphasis on improvement of old and new products and services for which innovations are highly focussed (Cooper, 1983) (Cooper, 1997) (Cooper, 2000) (Cooper & Kleinschmidt, 1987).

An innovation is written as an idea or product that is accepted as novel by an person or an group. “The apparent novelty of thought from the person;’s view point establish his or her response to it. If the idea is new for the person that he is experiencing for the first time, we called it as an innovation (Westerlund & Leminen, 2011) (Robertson and Tu, 2001). An innovation composed of much systematic facts about how the products or services performed than before. The importance of innovation in products and services and capacity of the organization to perform innovation function is a matter of concern for certain reasons. (Anthony, et al., 2007) (Battisti, et al., 2010). An improved products and services over the existing ones provides the firm opening in terms of improved goodwill, increased profits and growth as well as give opportunity to firms to gain advantage over its competitors (Zott, et al., 2011). Innovation is a concept of embryonic some code for overseeing new product development (Brown & Eisenhardt, 1995) (Cooper & Kleinschmidt, 1995) (Goodman, et al., 2013) because a product is very important as it is used by the ultimate customers who builds up the image of the organization (Hayes & Andrew, 2013) (Balbontin, et al., 2000). It can be called to as goods (physical, substantial products) or services (insubstantial products). New Product development is the group of actions starting with new opportunity that can be grabbed at market place and lasts with manufacturing, packaging, sales, and delivery of the product (Ulrich and Eppinger, 2007) (Jhang, et al., 2012). Product development requires the togetherness of many experts from different areas in order to achieve qualitative and technical product (Chux Gervse Iwe, 2010) (Ma, et al., 2014). There are a numerous incredible studies that accentuate on the production of new products and their impact in terms of increased profits (Zirger et al., 1990; Drucker, 1997; ImS and Workman, 2004; Wei and Morgan, 2004; Yannele, 2005) (Markoff, 2010) , Wheelwright and Clark (1992), (Noseworthy, et al., 2011) Page (1993) among others, they found a well-built sustain for the fundamental suggestion that product development and creative ideas affects the overall show of an business.

**Below is the table 2.1 showing the definition of innovation contributed by researchers and table2.2 showing the examples of companies practicing innovation**

**Table-2.1: Definition Of Innovation**

<b>Dimensions</b>	<b>Definition</b>	<b>Authors</b>
Innovativeness	Innovativeness refers to: <ul style="list-style-type: none"> <li>• Developing Novel ideas for product/service improvement,</li> <li>• Developing Novel ideas for market development,</li> <li>• Developing Novel ideas for process improvement.</li> </ul>	Khandwalla (1974), Miller and Friesen (1982); Drucker (1985); Covin and Slevin (1986); Khandwalla (1987), Covin et al. (1990); Covin and Slevin (1991); Zahra (1993); Knight (1997); Hamel (1998); Hornsby et al. (2003); Khandwalla (2003), Kuratko et al. (2005), Hamel (2006)

**Table-2.2: Examples of Companies Practicing Innovation**

<b>Firms</b>	<b>Sources</b>
Merck, Motorola, Nordstrom, 3M	Collins and Porras (1996)
Wal-Mart, MCI, ConAgra, Coca-Cola	Gertz (1995)
Intel, Whirlpool, Gillette, Union Carbide	D’ Aveni (1994)
Nike, Johnson and Johnson, 3M, IBM, Hewlett-Packard, Polaroid, General Electric	Treacy and Wiersema (1993); Kuratko et al. (1993)

Proctor and Gamble, Ford, Chrysler, Honda, Emerson Electric, Microsoft, Merck, 3M, Texas Instruments, McDonalds	Pearson (1992); Lengnick-Hall (1992)
Sony, Sharp, Yamaha, Toshiba, Motorola, AT&T, 3M, Citicorp, General Electric	Hamel and Prahlad (1991); Davis et al. (1991)

Source: Barret and Weinstein, 1998

Inbuilt in the above definitions of innovation is a component of newness. The issue that takes place is to know the amount of Novelty needed to call any revolution as innovation (Robinson, 1990). An explanation matter here is to differentiate innovation, the introduction of real newness to the market place, from replication, the acceptance of a innovative system or plan that is by now in the market. A product or process might be *new to the firm*, *new to the home marketplace*, or *novel to the globe market* (Hurt, et al., 1977) (IMS & Workman, 2004) (Iansiti & MacCormack, 1997). Evidently, the preceding of these, international uniqueness, is enough to meet the requirements of the product or process as an newness (Atuahene-Gima, 1996) (Drucker, 1985) (Roger, et al., 2002). For those goods and services that are not globally sold whether due to the character of the product, unreasonable convey charges, or curbs on deal—the investigation of being “novel to the home marketplace” is enough to create that there is an innovation element present within the nation. In our outlook, being “novel to the organization” is not sufficient examination for innovation, as the firm in issue may merely be accepting a merchandise plan, or a manufacture process, initiative by a opponent (Michael I, 2011) (Christensen, 1997) (Clark & Fujimoto, 1991) (Eisenhardt & Tabrizi, 1995) (Fagerberg, et al., 2004) . In this context we describe this as the diffusion of innovation. We describe an innovation as *novel to the organization and novel to the significant marketplace* (Rogerio, et al., 2007) (Ghariebeh, 2011). This appropriate marketplace is domestic or international is reliant on the merchandise or method in subject and the extent to which it is demanded in a ready for action worldwide or home surroundings.

An additional characteristic of two definitions of innovation is that the manufactured goods or method must be pioneered into the market so that customers or other firms can get advantage. This differentiates an innovation from an creation or sighting (Andrew, et al., 2009) (Rogers, 1995) (ALHussain, 2011). A discovery or findings boost the accumulation of information, but it does not right away reach your destination in the market place as a complete new product or process. Innovation takes place at the summit of taking to the industrial market new-fangled products and processes originated from uses of together old and new information (Chadha & Kapoor, 2010) (Rogers & Shoemaker, 1971). Therefore we can observe that innovation takes place at the core of a multifaceted method, started by inventions and lasts by the extensive acceptance of the novel variety of products by consumers, or the agreement of most excellent exercise methods in the mainstream of organizations. We entitled this last phase *diffusion*, and it is obvious that the advantages of innovation to the nation and its general public are not entirely comprehend in anticipation of this has taken place (Chawla & Joshi, 2010). The learning of innovation barely needs explanation as researcher, strategy creators, trade management, and public superintendent uphold that innovation is a chief foundation of trade and industry growth, work transform, spirited lead, and community provision (Chadha & Kapoor, 2010) (Borins, 1998; Boyne et al., 2006; Christensen et al., 2004; Tidd et al., 2001) (Burgelman & Sayles, 1986) (Covin, et al., 1990) (Robertson & Tony, 2001). The approval of innovation is a way for managerial alteration and revolutionize to assist in attaining the firm’s routine targets, mainly beneath the circumstances of powerful rivalry, swiftly transforming marketplace, in short supply possessions, and buyers and community order for superior worth and improved products and services (Boyne et al., 2003; Jansen et al., 2006; Roberts and Amit, 2003) (Covin, et al., 2000) (Roozenburg & Eekels, 1995) (Dutta & Lanvin, n.d.). To aid sustainability and get better their concerts, association present novel products and services to existing or new clientele or consumers, and bring in innovations in the organization’s fabrication or functioning structure and white-collar or managerial procedure (Elena, 2013) (Camison-Zornoza et al., 2004; Edquist et al., 2001; Hipp et al., 2000). Firms largely systematize their innovation pains through R&D activities and has thus determined on a narrow classification of product and process innovations linked with the R&D task in mechanized business (Fries, et al., 2011) (Gallouj and Weinstein, 1997; Miles, 2001) (Rose, et al., 2009).

Innovation is the method that provides additional worth and newness to the business and its contractors and consumers through the maturity of latest actions, results, products and services as well as innovative ways of doing business (Bessant, 2003) (Bessant & Von Stamm, 2007) (Rosenbloom, 1974) (Gholami, et al., 2013). Inside this process the main functions of the business industrialist are to confront official procedure, to review novel chances, to bring into line and develop assets and to shift the innovation process ahead. The commercial entrepreneur's supervision of the innovation course will guide to larger profits for the business. Corporate entrepreneurship can be distinct as the attempt of encouraging innovation in undecided surroundings (Nguyen & Mohamed, 2011) (Barret & Weinstein, 1998) (Barringer & Bluedorn, 1999) (Covin & Morgan, 1999) (Covin & Slevin, 1991). Corporate entrepreneurship, also known as corporate endeavour, or intrapreneurship, has been commenced in conventional institute for intention of effectiveness (Zahra, 1991) (Duncan, et al., 1988) (Goes & Park, 1997), tactical revitalization (Birkinshaw, et al., 2005) (Guth and Ginsberg, 1990) nurturing innovativeness (Baden-Fuller, 1995), getting hold of information for prospect income flows (McGrath et al., 1994), and intercontinental accomplishment (Birkinshaw, 1997) (Bhardwaj, et al., 2007). Previous researchers have defined corporate entrepreneurship (Danisman & Erkocaoglan, 2007) (Borch, et al., 1999) (Dess & Lumpkin, 2005) as exemplified industrial hard work that need directorial approvals and supply pledges for the reason of continuing out innovative activities in the shape of product, process, and executive innovations (Miller and Friesen, 1982; Covin and Miles, 1999; Burgelman, 1984; Kanter, 1985; Alterowitz, 1988; Naman and Slevin, 1993; Zahra and Covin, 1995) (Battisti & Stoneman, 2010). According to (Damanpour, 1991) innovation would contain "...the formation, spreading out, and carrying out of novel ideas or thoughts. An innovation can be a new invention or facility, an organizational structure, or a novel arrangement or proposal related to managerial members." In this framework, corporate entrepreneurship (Omerzel, 2010) (Burgelman, 1983) (Hornsby, et al., 2002) (Hornsby, et al., 1993) a focussed on repeated efforts and improving the aptitude of a organization to grab innovative talents and potentials. Zahra and O'Neil (1998) (Gautam & Verma, 1997) (Ginsberg & Hay, 1994) indicate that the factors in the outer surroundings and the business arrangement, requires the management to react imaginatively and do something in novel ways.

Innovation is observed as the central aim of an organization's scheme and a decisive aspect for it's ready for action strong point and nonstop continuation. Firms increase modernism to settle in to their outside setting and to act in response to superficial amendments within or peripheral the organization. Innovations can be put into practice in the organization's results, it's arrangement, and it's courses in order to keep or to get better rank of show or success (Portera-Zanotti & Rinsche, 2010) (Damanpour, Gopalakrishnan 1999). Noteworthy innovations let firms to open leading spirited locations, and have enough money to open new-fangled entrant firms, an occasion to put on an border in the marketplace. *A product innovation is the beginning of a good or service that is novel or considerably enhanced about its features or wished-for purposes; together with major improvements in scientific stipulations, workings and resources, including software, consumer easiness or other well-designed type* (OECD Oslo Manual, 2005). *Process innovation* is defined as the execution of a novel or radically enhanced invention or delivery system. for instance, going to visit the doctor and copy that you have reached for your prior arrangement by moving a screen as a substitute of discussion to a receptionist. Note down that the product innovation and the process innovation are strongly associated to the theory of scientific expansions and generally referred to as the *technological innovations* in the literature (Schwab, 2013) (Baer & Frese, 2003). A *marketing innovation* is the execution of a novel marketing means connecting important modifying in product making or wrapping, product assignment, product advertising or value. At last, an *organizational innovation* is written as the execution of a novel managerial means in the firm's trade practice, workplace organization or peripheral dealings. Some authors favour the term managerial innovation (F.Damanpour, 1987; C.Y., Y.Lin and M.Y. Chen, 2007).

## **PRODUCT INNOVATION EXAMPLES**

**Fabrication and Assembly Company (FAC)** is an illustration of varied, opening growth of novel manufactured goods. It was set up in 1972, where it firstly started with the making of crossing walls dock. Then they realised that this was limited platform to begin with the new project. Later on, they strived interweave appliance parts and its covers, but they were also unbalanced promote. Improved outcomes were obtained with temperature switchers for the steel production; and in 1978 stream counter cutting beds were

set up, by substantial succeeding growth. In 1987, FAC was initiated a original mechanism to take away rust dump from flame-cut steel, and was considering the likelihood of creating a automated treatment arrangement for grave steel plates, with authorization from Finland.

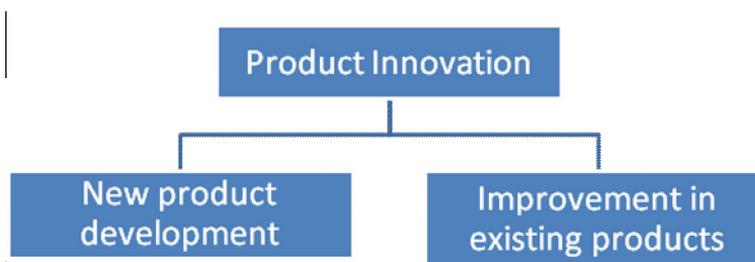
**Farm Machinery Manufacturer (FMM)** constructed a flourishing big business on the foundation of one exceedingly pioneering plan. This was a farm animals nourishing arrangement in which a machine connected to the creature stimulates an automatically inhibited nourish distributor. This showed the way to a string of expansions with more and more classy selection. After this slender area of expertise led to severe marketplace hindrances in 1983, the corporation started to branch out, and urbanized a thriving implant nourishing arrangement. It also commenced to affect its know-how to others problems, for instance the creation of light-controlled ambler voyages for hindered individuals.

**Specialized Knitting Machines (SKM)** was based on particular equipment (knitting) but was using this to new-fangled or focused struggles. It recognized by purchasing the producing and allocation rights of a variety of piece of equipments from an US corporation. Consequently it has urbanized a supercomputer guarded pullover interweaving appliance, which to a great extent amplified the series of blueprints and ways which could be shaped. It also urbanized a mechanism for weaving threads of white meat composite into a constant substance, which requisite interweaving idea novel to the business.

**Incinerator Company (IC)** is an illustration of together designed and opening modernization. It started on as a dealer and service provider of made-up workings. More a time it examined the likelihood of getting in to the market for superior incinerators. On the other hand it was only when a client firm, which was fitting an incinerator, request it to take over the bond with which it was having practical problems that it was able to take out its sketch. The corporation consequently initiated a novel kind of incinerator contributing additional entire ignition and abridged smoulder release. This had become the major basis of the company's enlargement and had legalized it to go into export marketplace.

### 2.3 NEED FOR PRODUCT INNOVATION

Product innovation means dissimilar equipment to diverse group. It can be opening of a new product into a market place for the first time (Kanter, 1982) (Kanter, 2006 Nov). Few people regarded innovation as the upgradings in the old products (Andreasen & Hein, 1985).Although, changes in the products for betterment is taken as product innovation in many corporate houses. Product Innovation may be distinct as the expansion of novel goods, alterations in features of recognized goods, or make use of novel resources or mechanism in the production of recognized goods.



**Figure-2.1: Represents the product innovation in two categories of innovation:**

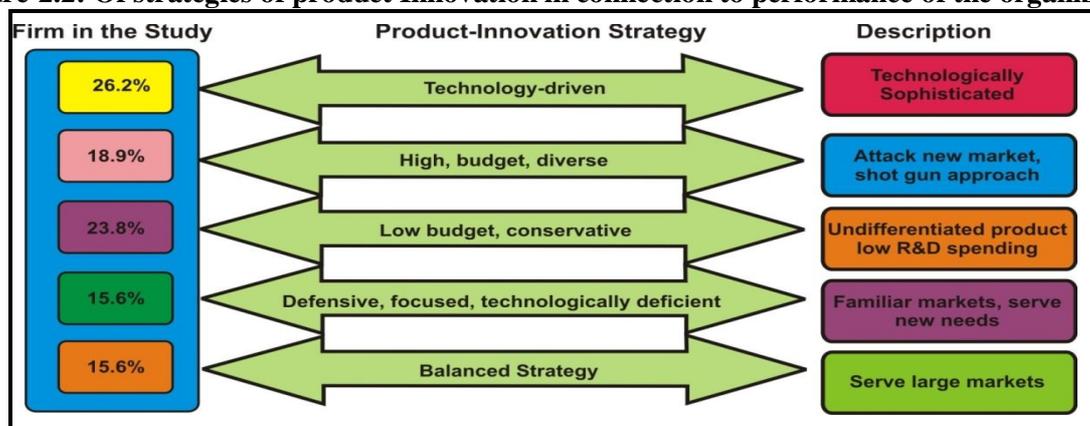
For the business to exist in the aggressive market, it is relevant to pioneer new-fangled goods and services (Cahill, 1996). On the other hand, it is established that over 80 percent of novel goods be unsuccessful. Further, even thriving opening do not constantly results in top-level development.

**In broader sense,** Product innovation is the formation and succeeding opening of good or service that is either new or improved on previous goods or services. Product development and innovative steer offers big business facilitates surroundings to attain a superior point of performance and improved purchaser standards (Sivasubramanian & Mageswari, 2011) Liu *et al.* (2002) (DeBresson & Amessee, 1991) (Kanungo, 1998). Researchers have also found that executive knowledge is connected with progress of novel facts, which in turn is key for firm innovativeness and firm performance (Liu *et al.*, 2002) (Damanpour, 1990) (Damanpour, 1991) (Damanpour & Evan, 1984). Important innovations permit firms to set up central ready for action

positions, and pay for new comer firms a chance to increase a frame in the marketplace. Firm innovativeness composed of diverse proportions, product innovativeness scrutinized in the narrative both from customer's viewpoint and firm's standpoint; innovation in product process, business organization and human resource management practices (Khandwalla, 2006) (Khazanchi, et al., 2007). A product or a process direction of firm innovativeness will result in achievement if the firm carry out activities appreciated by the marketplace. According to Petrella (1996) (Damanpour & Gopalakrishnan, 1999) (Damanpour, et al., 1989) launching successful goods is very difficult. Many corporations are exceedingly flourishing many times and it's a confront for NDP Managers. Some of the major challenges for managers are:- transactions, day-to-day changes, particulars, point in time stress, and conception. Others include contentment of community and individual want, panel range and group motivation. Transactions deals with creation of selections connecting product requirement and the effect of outlay just about the alternative. Client preference, competition in the environment and know-how are all vibrant elements. These cause grim dare to a product development attempt (Dess, et al., 1997). Product development judgment must regularly be made rapidly taking into account the fact that merchandise are meant to please the needs of consumers. It is also important to know that where all, it is important to include product development, everyone should be on toes and teams should be self-motivated (Sethi, 2000) (Isaken & Dorval, 1993) (Iwe, 2010) (Jaruzelski & Dehoff, 2007).

The worldwide competition motivates the big houses to determine their efforts on their innovation strategies and it becomes more difficult to achieve this target afterwards 80s (Kuratko and Hodgetts, 1998) (Jassawalla & Shashittal, 2000) (Jaumotte & Pain, 2005). Now-a-days, both corporate houses and managers at individual level started to assess and use their expertise and business strategies to fight the cut-throat competition (Drucker, 1985; Hult et al., 2003) (Jenkins, et al., 1997) (Johannessen, et al., 2001) (Theriou, et al., 2010). Officially, innovation is measured as expansions and new uses, with the rationale of introduction novelty into the monetary area (Wee & Chua, 2013) (Li & Autagene-Gima, 2001). It can be visualized as the alteration of information for profit worth. Innovation has great business-related significance due to its chances for growing the competence and the productivity of companies (Baker & Sinkula, 2009) (John & Davies, 2000) (Lengnick-Hall, 1992). Actually, the primary motive for innovativeness is the wish of firms to get bigger trade show and augmented ready for action frame. Companies acquire extra aggressive gain and marketplace profit share as per the stage of significance they give to innovations, which are essential elements for companies to make a status in the open market and thus to boost their marketplace share. (Yajnik, 2013) (Leonard-Barton, 1995) Metcalfe (1998) assured that when the stream of novelty and innovation dry out, firms' financial arrangement resolves down in an motionless condition with small enlargement. The impact of innovation on the performance levels can be seen in sales growth, change in market share, profit levels to output levels and competence (OECD Oslo Manual, 2005). McAdam and Keogh (2004) examined the correlation between firms' concert and its awareness with modernism and further investigation. They established that the firms' preference to innovations was of crucial importance in the aggressive atmosphere in order to get advanced reasonable improvement. Geroski (2005) observed the special effects of the chief innovations and copyrights to various business performance methods such as book-keeping, profit returns, stock prices and corporate expansions in terms of growth percentage. The examined straight effects of innovations on firm recital are moderately little, and the reimbursement from innovations are further likely not direct. However, innovative firms appear to be less vulnerable to recurring changes and ecological demands than other firms (Biemans, 1992) (Birkinshaw, et al., 2007). **Below is the**

**Figure-2.2: Of strategies of product Innovation in connection to performance of the organization.**



Source: Robert G. Cooper, “New Product Strategies: What Distinguishes the Top Performers”, Journal of Product Innovation Management, June 1984, PP. 151- 164.

**Figure 2.2: of strategies of product Innovation in connection to performance of the organization**

Below figure shows the experimental knowledge that evaluates the profits from adopting new-fangled item for consumption strategies which was done in Canada and only with business firms. Other studies may be happening, but their results are not obtainable. Peak performance businesses have in place a product innovation and technology plan motivated by the business headship players and a tactical idea of the business (Cooper R.G., Edgett, S.J. and Kleinschmidt, E.J., 2004).

### 2.3.1 Interactions Among the Innovation Types (ALPKAN, ET AL., 2010)

It is clear that firms have diverse stages of innovative talents; nevertheless innovative actions have to be determined on numerous features concurrently such as novel products, novel organizational and marketing customs or managerial systems, and novel process expertise (Baxter, et al., 2014) (Drejer, 2002; Garcia and Calantone, 2002; Johannessen et al., 2001; Lin and Chen, 2007) (McAdam & Keogh, 2004) (McKinsey, 2008). Furthermore, as Damanpour and Evan (1984) stated a reasonable pace of agreement of managerial and scientific innovations are extra useful in helping firms to safeguard and get better growth rates than using them individually (Dyer & Furr, 2014) (Sakkab, 2007) (Saleh & Wang, 1993). Even though innovation narrative does not signify results whether a definite innovation style is probable to give the effect on financial performance in positive or negative side, it can be concluded that innovations links with each other and require to be put into practice in concurrence (Walker, 2004) (Mairesse & Mohnen, 2010) (Marcus, 1988). Results in the past study entail that organizational (re)structuring turning to administrative and constitution revitalization or upgrading which is a catalyst for the other kinds of innovations. For example, Damanpour et al. (1989) concludes that directorial innovations led to scientific innovations in open libraries. Likewise, (Goffin, et al., 2012) Staropoli (1998) (Archer, 1971) highlighted the significance of supportive managerial rescheduling and harmonization apparatus to improve technical innovations in the pharmaceutical business, while Germain’s learning (1999) shown that managerial arrangement description might be important analysts of process innovations in the logistics sector. Further in recent times and particularly, Walker (2008) (Mol & Birkenshaw, 2006) (Mone, et al., 1998) declared that managerial, advertising and facility (or product) innovations were found to be interconnected in knowledge on communal organizations.

### 2.4 CONCEPTUAL MODEL/ THEORETICAL FRAMEWORK OF PRODUCT INNOVATION

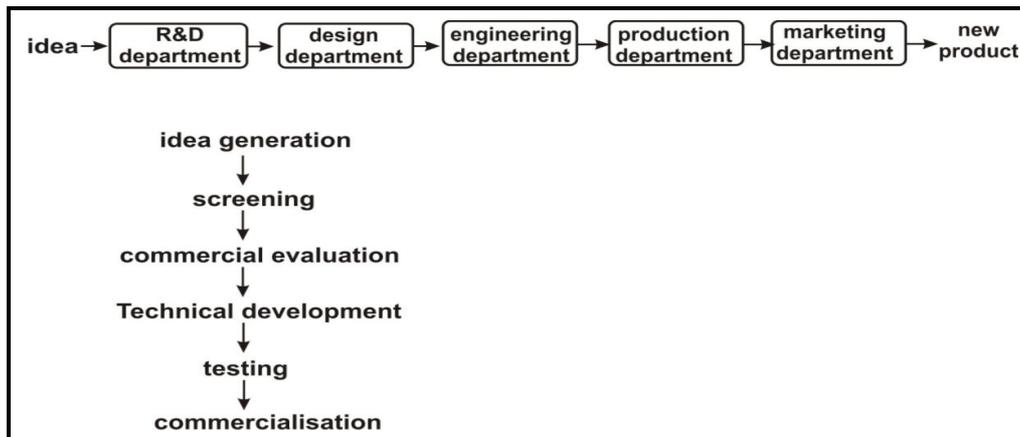
The theoretical foundation for a replica that includes these common associations among innovation, cutthroat strategy and situation of process development evolves in the amalgamation of two different but at the same time complementary lines of examination that have been followed separately by the current researchers. The relationship between a organization’s surroundings and its innovation goals such as performance maximizing, sales maximizing, or cost maximizing is one aspect that is questioned (Meyer, et al., 2010) (Utterback JM 1974, 1975) (Miller & Friesen, 1982) (Milling, 1996). The relationship between the firm’s growth process and innovation types such as the type, source and stimuli of innovation is another aspect to

be considered (Abernathy & Townseed, 1975) (Abernathy & Utterback, June/July 1978). The above two aspects are combined in to one aspect and took the form of model named as innovation to product and process evolution. A meticulous knowledge of the model and it’s changing nature is necessary to reach to an efficient and competent organization of the whole innovation course. A complete and informal move towards the model structure is necessary to describe and to assist to know that why detailed performance takes place (Milling 1996) (Geroski, 1995) (Gunday, et al., 2013) (Hagedoorn & Cloudt, 2003).

**2.4.1 Early Model of the Product Innovation Process By Delft Design School.**

Modeling innovation processes had become an accepted scholarly regulation. In the Conference on research design methods in UK, evolution of product innovation processes came up (Gregory, 1966; Jones 1970) (Schaltegger & Wagner, 2011). That conference discussion motivated the heads of Delft Design School that the main course was based on research methods and models that becomes the part of the discussion. (Wilde, 1997) (Saren, 1984).

The commencement of the product plan process was generally seen as a product proposal, chased by a phase in which this idea was scrutinized and developed into a product model. In the subsequently step this idea was developed and turned up into a working mold or sample. This example was then engineered for production and finally the new product was introduced on the market place (Schmidt & Rammer, 2007) (Schroeder & Robinson, 2004). The step consists of R&D department, design department, engineering department, production department, and finally marketing department under a department-based division. The steps consists of idea generation, idea screening, commercial evaluation, technical development, testing and commercialisation using an activity-based division (See below Figure 4)



Source: Saren, 1984

**Figure-2.3: Two Early Models of the Product Innovation Process. Above is the Department-Based View, and below, the Activity-Based View**

**2.4.2 Model of Process Development**

The fundamental plan underlying the projected representation of process development is that as a manufacture process expands over a period to increase the output levels, it does so with a attribute growing trend i.e. it becomes more money demanding, direct work output gets better through specialized way of labor division, the course of materials in the process takes on added of a straight row course excellence ( that is flows are efficient), the product plan becomes more consistent and the process level becomes bigger. As a process carry on to extend for advanced output through marginal deviations in these elements, a total impact is attained that considerably changes the entire process. The trend of variations are at all levels, from one level to a second, going ahead of the materialistic features to the efficiency factors. Three diverse phases of process development which are named as -Uncoordinated, segmental and systemic.

- **Uncoordinated:-** In this phase, the process is flowing, with movable and disconcerted relations between process essentials. Such a method is unrefined and adapts quickly to ecological variations but necessarily has sagging and is incompetent (Burns and Stalker 1961).

- **Segmental:-** Production systems, designed more and more for competence, becomes technical and inflexible. Actions become more particular and leads to more strict working controls. In stipulations of process, the production structure has a propensity to become complicated and tightly through mechanization and process management. Hence, production processes in this phase will have a segmented excellence.
- **Systemic:-** As a process becomes extremely developed and incorporated and as outlay in it becomes hefty, choosy development of process elements becomes gradually much more complex. The process becomes so well incorporated that variations become very expensive, because even a little change may require variations in other essentials of the process and in the product design. Process redesign usually comes more gradually at this phase, but it may be encouraged either by the improvement of new expertise or a by a unexpected or collective move in the necessities of the marketplace.

The vital design is that a process or industrious sector tends to develop and revolutionize over time in a steady and particular way (Abernathy and Townsend 1975). It demonstrates that process development is related to process innovation.

### **2.4.3 Model of Product Development**

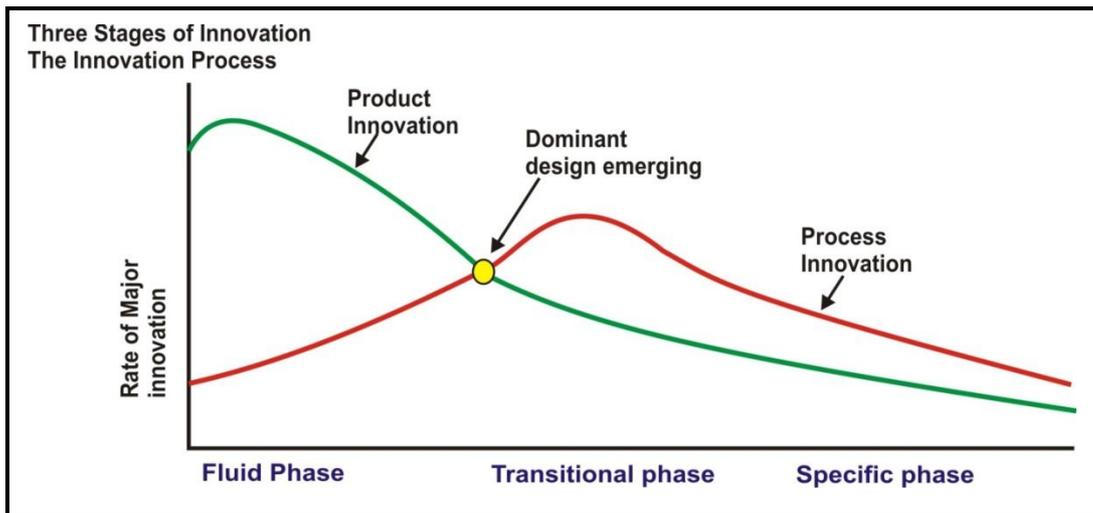
A product innovation is a novel skill or combinations of tools started marketable to meet a consumer or a marketplace want. The essential thought behind the projected replica is that products will be launched over period in a expected way with preliminary focus on product concert, then focus on product assortment and thereafter focused on product consistency and expenditure (Azaze & Evelyn, 2010). Therefore, a firm at one point may try to be the initial to bring in strictly superior products (performance-maximizing), or to check others innovate but be ready to rapidly settle in and set up new-fangled product changes and characteristics (sales-maximizing), or to move into the marketplace afterward in the product life phases with simplified and less costly adaptations (cost-minimizing) (Ansoff H and Stewart JM, 1967; Simmonds WHC, 1973). Therefore, there subsists the association between product and process innovation and also product development is related to product innovation.

- **Performance-maximizing:-** A greater part of innovations shaped by performance-maximizing organizations would be predicted to be market motivated with a important scale of ambiguity about their final marketplace likelihood. Innovation may repeatedly occur from unanticipated basis or instructions of query. These firms would be likely to depend mostly on peripheral basis of knowledge, and on more different basis of knowledge than would others. Product innovation is likely to be determined or inspired by novel marketplace wants and occasions. The dangerous imminent for innovation is frequently attained by recognizing the skill. The success for innovation is in the person or association that is closely well-known with desires. Scientific innovations which may have marketplace function lie down empty until marketplace can be known or formed (Assis, 2003) (Bao & Yang, 2004).
- **Sales-maximizing:-** These firms would have a tendency to describe wants based on their image to their clients. Innovations that lead to enhanced product show might be predicted to be less expected, unless performance upgrading is simple for the purchaser to assess and evaluate. The lessening in market want vagueness, with better dissemination of product utilization enables improved use of highly developed expertise as a basis of supplementary product innovation. The outcome will more often be product deviation, or novel mechanism. This phase of product innovation approximately match up to the segmental phase of process evolution. Process variations will mainly be enthused by the requirement for higher productivity and these may become not a continuous process innovations that include novel techniques of firm and product styles as well as manufacturing methods.
- **Cost-minimizing:-** As the product life cycle develops, product choices tends to be decreased and the product becomes uniform and basic for all users. Then as a succession, the foundation of rivalry commences to move to cost of the product where profit margins falls down, the firm started to have the characteristics of oligopoly industry and therefore, effectiveness and more output at lower cost is the main aim of the firm. In the cost-minimizing phase, important improvements often take place that includes variations in the design of product and process and must be integrated with the structure as a whole

(Schubert, 2010) (Seebode, 2011). Because outlay in process tools in place is far above the ground and product and process alterations are mutually dependent, innovations in both product and process may be likely to be chiefly marginal. Innovations will classically be urbanized by tools contractor for whom the encouragement are relatively larger and accepted by bigger consumer organization (Freeman C, 1968) (Jin, et al., 2004) (Jansen, et al., 2006).

#### 2.4.4 Innovation and Stage of Product Development

The blueprint of associations between a segment’s phase of development and innovation can be seen in the below figure 2.4.



Source: James Utterback, 1975, Mastering the Dynamics of Innovation

#### Figure 2.4 shows the segment’s stage of development and Innovation

Variations in occurrence of innovation are shown on the vertical axis and related to the phase of the product and process development on the horizontal axis . This replica shows an arranged and still succession of product and process growth, consistency and enhancement in sales amount. Process segments which reveal the main charge of development in output do certainly appear to develop through the phases pointed. But this is not essentially the instance for all process segments (Abernathy WJ and Townsend PL, 1975) (Johnson, et al., 1997).

There is a motive to consider that in several cases the succession may discontinue for extended time, or even turn around. An organization which does track the development of process segment to the last extent may realize that they have attained the advantages of higher output at lower costs along with reduced flexibility and modernism. It must expect fight from pioneering products that are shaped by other more supple divisions that are more competent of alternate products, overseas trade in, rival goods from other industries having demand with the feature of soaring cross-elasticity, or process variations by consumers to eradicate the product openly (Abernathy WJ and Wayne K, 1974).

Numerous significant issues in running technological innovation are tackled by the model (Czepiel, 1975) (Damanpour, 1987) (Dougherty & Hardy, 1996) (Doganova & Eyquem-Renault, 2009):

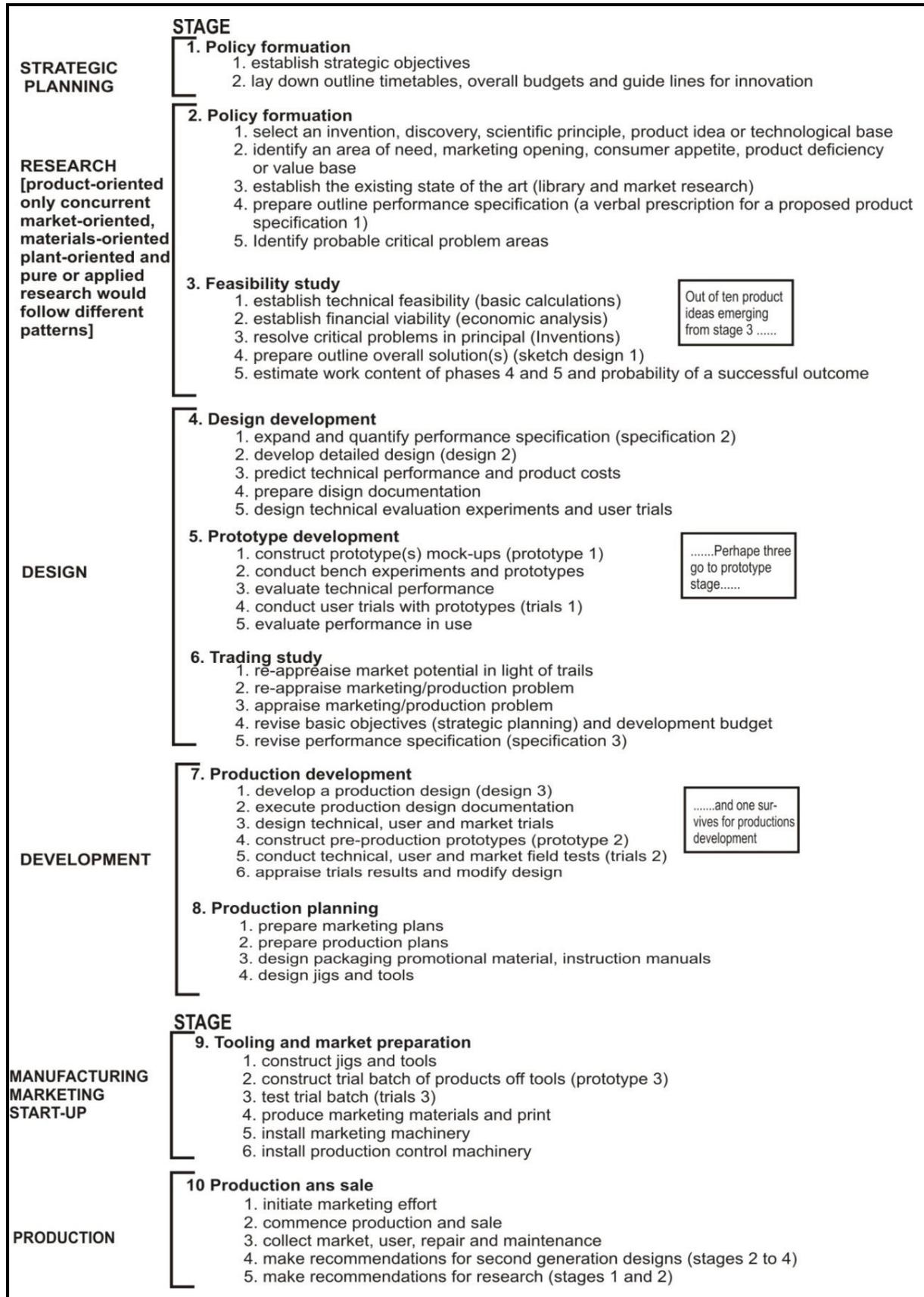
1. The success of innovation moves with the phases of development:- In the unconnected stage in the growth of a process, innovative imminent comes from those persons or firms that are very well known with the beneficiary practice, instead of those closely recognizable with novel expertise. The decisive contribution is not situation of the skill knowledge but novel approaching about the want. Afterward, in the systemic phase, desires are well described, “structure resembling”, and simply expressed. These wants demands the composite technical explanations and the leader will regularly be one that takes novel technical visions to the difficulty. In the action to be taken, to enhance innovation, it is essential to value these differences so that the most probable basis of innovation can be recognized, cultivated, and sustained.

2. The kind of innovation that is expected to achieve something, whether technically multifaceted or uncomplicated, and whether practical to product or process, also depends upon the phase of development. During the unconnected situation most technical use are to the products that the industrious division will generate. A small number is to process upgrading and those that do takes place tend to be easy in use and to handle individual desires. Compound technical arrangement of process tools does not take fit when the beneficiary process is not well distinct and formless. The contrary is factual in the systemic phase. Separate drastic innovations, of yet main implication, rarely increase receiving when the beneficiary industrious division is in the systemic phase (Bessant, et al., 2009).
3. The entire range of difficulties to an innovation, like the suitable kind of innovation, modifies masterpiece with the phase of development. In the unconnected phase, confrontation moves around insights of insignificant. In the systemic phase confrontation comes from the troublemaking character of innovation. The replica commences to assist to clear the varying character of these difficulties.

#### **2.4.5 Innovation Process According To Archer (1971)**

The one most popular design theorist was from UK named as Bruce Archer. He had trained in Ulm and was at that point in time university lecturer at the Royal College of Art in London. In 1971 he published a six-phase model of the product innovation process, and within the phases he positioned diverse ladder. He did not begin with a product thought or an ideation phase, but was one of the first researchers to start the plan that product characteristics should be integrated with business strategies of the firm. He also put the efforts to integrate the engineering and commercial sectors together. His model is renowned as the incorporated replica and he was first to introduce such model. The model is set out in below Figure 2.5.

The essence of the concept lies in the complete enhancement of the product innovation process. He attempts to integrate the engineering and commercial world as well as associate NDP with firm's strategy making i.e. business strategies. From this minute on, new product development was, in premise, not a remote process for product planners or advertisers only, but could be managed as a commercial instrument for expansion and success (Belliveau, et al., 2002).



Out of ten product ideas emerging from stage 3 .....

.....Perhabe three go to prototype stage.....

.....and one survives for productions development

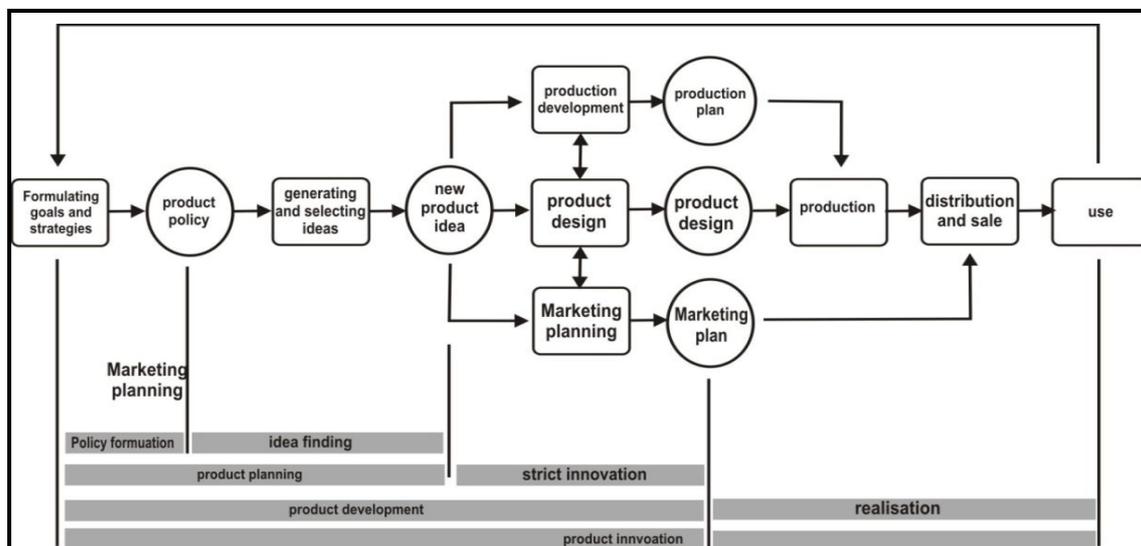
Figure-2.5: The Innovation Process according to Archer (1971)

### 2.4.6 The Product Innovation Process According To Roozenburg & Eekels (1995, Original Dutch Version 1991)

Eekels and Norbert Roozenburg made the earliest description of the Delft Innovation Model. **They classified the overall product innovation process into four steps:**

- *Policy making*, which prepared the product strategy;
- *Idea generation*, which generates the novel business idea;
- *Authoritarian enlargement*, in which three equivalent processes are there; product planning leads to a product plan, Promotion preparation leads to a market arrangement and manufacturing expansion leads to a assembly map;
- *Realization* consists of three major actions: production; distribution and sale; and (product)-use.

Policy making and idea generation are the components of *product planning*; product planning and *Authoritarian enlargement* are the components of *product development*. Product development and *realization* are the components of the complete *product innovation course* (see below Figure 2.6).



**Figure-2.6: The Product Innovation Process According to Roozenburg & Eekels (1995, original Dutch version 1991)**

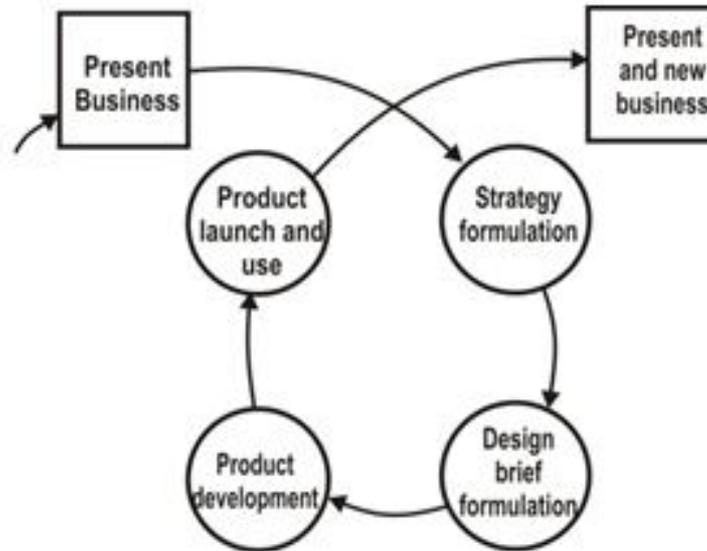
### 2.4.7 Innovation Model Developed By the Innovation Consulting Group (1978)

One more corresponding expansion took place in the Innovation Consulting Group, also placed in Delft, but at TNO (The Netherlands Organization for Applied Scientific Research). It slowly developed an enhanced replica of the product innovation process, in which simple terms were used. In the improved model, they tried to unite the ideas of Archer, Brankamp, Eekels and Roozenburg (and all forerunners), but supplement it with some additional simple utilization and people trade to it. Innovation Consulting Group explored for simple-to-use models we had come through a four stage model of the (product) innovation process developed in Proctor & Gamble by Carlsson, Keane and Martin (1976). Their replica is based on Kolb's model of experiential learning (Kolb, 1976). The four learning stages are 'concrete experience' (CE), 'reflective observation' (RO), 'abstract conceptualization' (AC) and 'active experimentation' (AE) as revealed in Figure 2.7 below.

Kolb planned his model to explain the learning process of persons. Carlsson, Keane and Martin practically used it to explain R&D procedure within Proctor & Gamble. Using the basis that the product innovation process (which in their viewpoint is identical to the R&D development) is alike to a learning process, because launching new products and services is the explanations (learning) of a company respond to its dynamic competitive scenario.

In 1978 we pioneered our four-stage product innovation model – the Step-by-step Innovation Model (Figure below). **The four phases are:**

1. Strategy formulation;
2. Design brief formulation;
3. Product development;
4. Product launch and use.



**Figure-2.7: The Step-by-Step Innovation Model Developed by the Innovation Consulting Group (1978)**

#### 2.4.8 Product Innovation Model: The Delft Step-By-Step Innovation Model

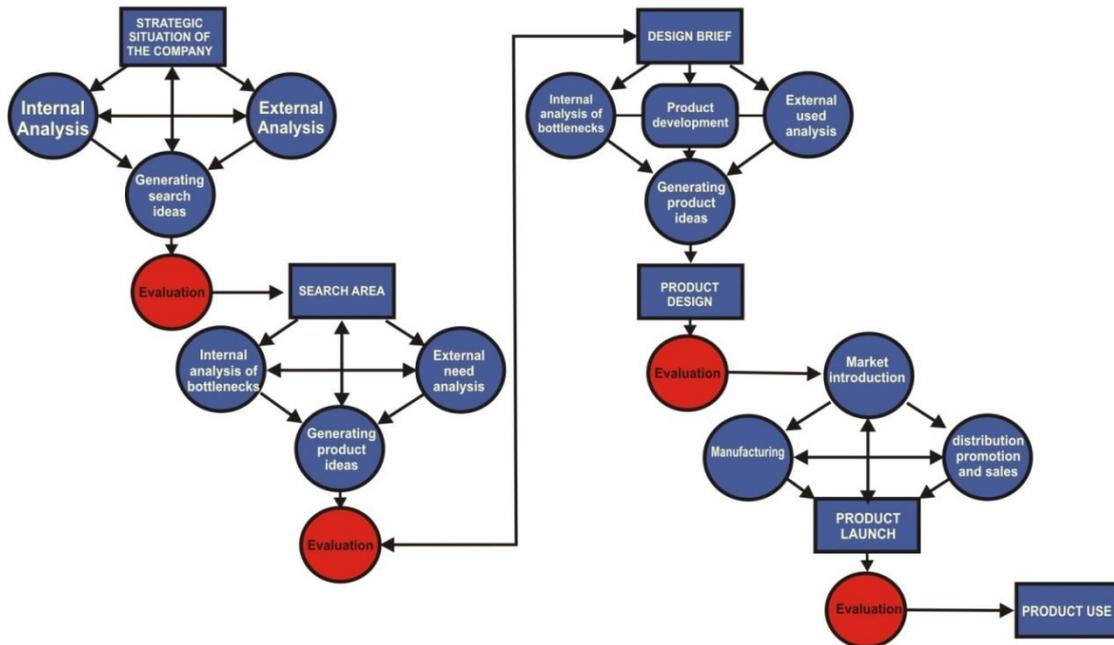
The total thorough model of the product innovation process composed of 17 different steps in a prearranged sequence (below figure). **The Delft step-by-step product innovation model comprises the following essentials:**

1. strategic situation of the company	12. generating search areas
2. internal analysis	13. chosen search area
3. evaluation	14. internal analysis of bottlenecks
4. external need analysis	15. evaluation
5. generating product ideas	16. product development
6. design brief	17. developing manufacturing
7. product design	18. evaluation
8. market introduction	19. manufacturing
9. distribution, promotion and sales	20. product launch
10. evaluation	21. product in use
11. external analysis	

The above 17 essentials in the figure are actions or (secondary)-processes; the next five essentials consists of strategic situation of the company, (preferred) explore area, design concise, product plan and product instigate are the (in-between) outcomes of those course and are shown in the above figure.

When they made this model over the period they completely realised the existence of all different types of models of the product innovation process. The seventeen steps (activities) sufficiently include the complete product innovation process, but exclude required fundamentals for managing innovation (like choosing a project leader, outlining a team or corresponding to dealers).

**Different models: TU Delft step-by-step**

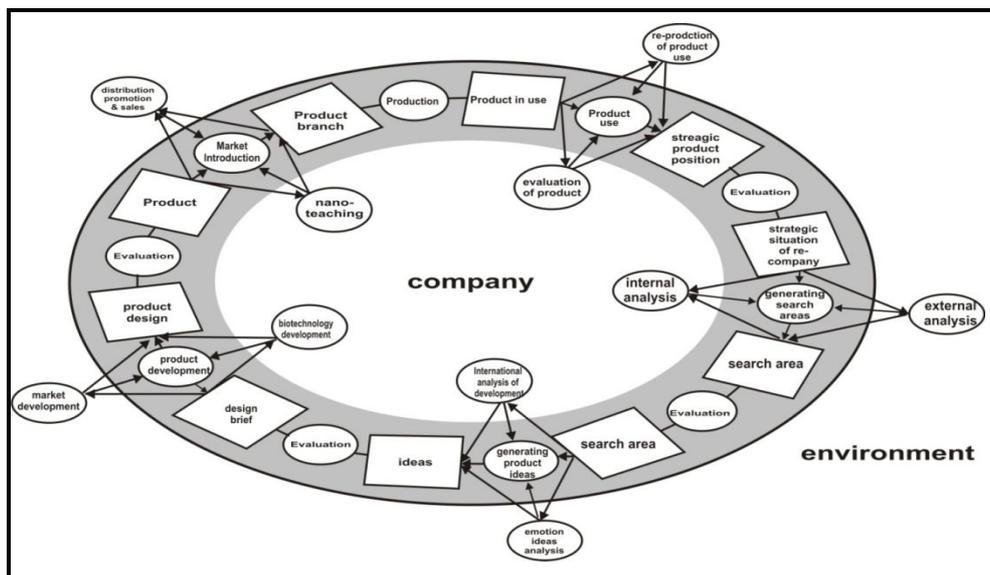


**Figure-2.8: The complete Product Innovation Model: the delft step-by-step Innovation Model (Delft, 2003).**

**2.4.9 Circular Model of the Product Innovation Process (March 2003)**

Product innovation processes are projected to aid organizations to plan and launch novel goods, which consumers wish to purchase and please to utilize them. Hence, in the usage of goods, innovation process finished but new innovation process starts at the same time.

Thus, they arched the linear model to become the new circular model which reveals the product innovation process in detail (see Figure 2.9 below). Looking at the the process as a circular model recommends that there is no initiation nor ending, which is factual in the manner that if the product which has been through the process of innovation and results in grand success, it will force the rivalry to react i.e. they might launch new product or launch improved version of the product or service. This forced the innovative product to restart with is process of innovation to maintain the competency edge in the market.



**Figure-2.9: Circular Model of Product Innovation (Jan Buijs, 2003)**

In Figure above, the product-use step is positioned at the peak, and strategy formulation is the next step, positioned to the right, followed by the design brief formulation, Product development, and product launch and use steps. They ends where they initiates. To make this transformation from the linear version to the circular version in Figure above, they supplements some additional steps into the product-use phase to make the complete circle.

The 26 innovation elements in the detailed model are given in the below table 2.3:

1. product use	13. internal analysis of bottlenecks
2. evaluation (commercial) of product use	14. generating product ideas
3. evaluation (technological) of the product	15. evaluation
4. strategic product position	16. design brief
5. evaluation	17. product development
6. strategic situation of the company	18. market development
7. external analysis	19. developing manufacturing
8. internal analysis	20. product design
9. generating search areas	21. evaluation
10. evaluation	22. market introduction
11. chosen search area	23. manufacturing
12. external need analysis	24. Distribution, promotion and sales
	25. product launch
	26. evaluation

After this last assessment the new-fangled merchandise is in use, which will lead ultimately to commence the next product innovation cycle. The model is presenting that elements within the circle leads to internal characteristics of the business (like manufacturing), and elements outside the circle leads to the business-related and cut-throat surroundings of the business (like sales or market research). Elements on the central circle line are the key product innovation actions and outcomes.

**2.4.10 Model Establishing the Relationship Between Product Development, Product Innovation and Organizational Performance (Udegbe Scholastica E.; Udegbe Maurice I., 2013)**

Figure 2.10 represents the product development is symbolized by (PD), innovation is symbolized by (IN), and organizational performance is represented by (OP). The goal of this model is organizations (manufacturing and servicing firms) which in latest years have been featured by many pioneering goods in the forms of change in superiority, styles and their sizes. In general, author defined product development in terms of product lines and product size.

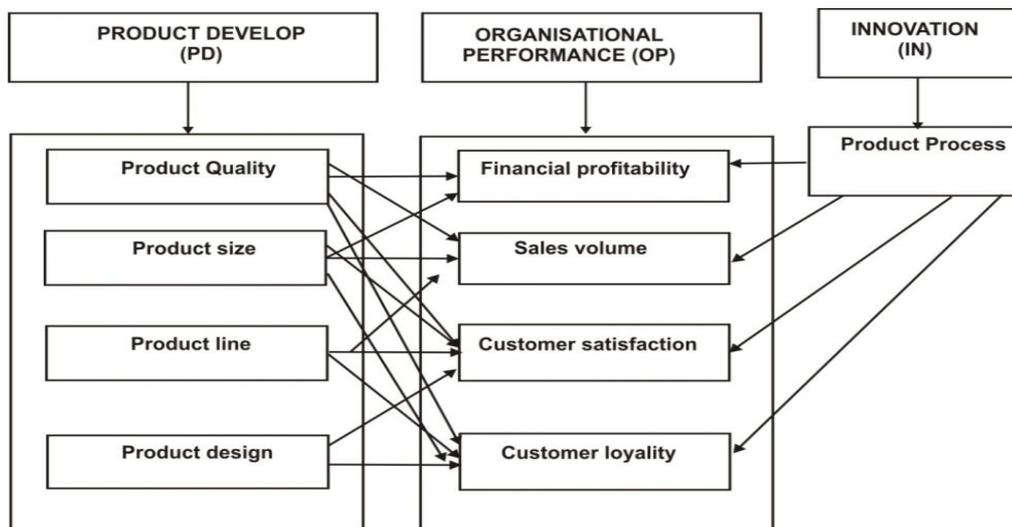
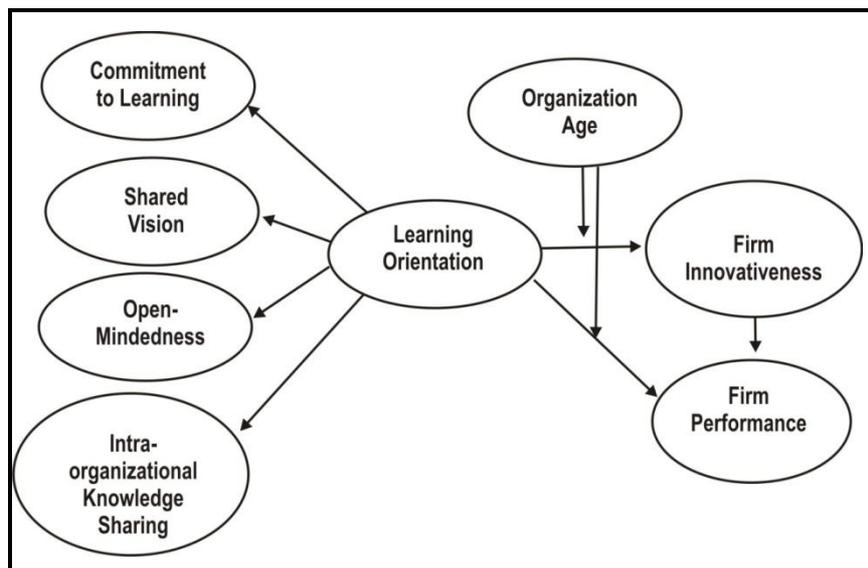


Figure-2.10: The relationship between product development, product innovation and organizational performance (Udegbe Scholastica E. and Udegbe Maurice I., 2013)

However product excellence will be measured for the rationale of this research. Innovation is seen in shape, and innovation, in product process. It should be focussed at this point that there are other ways that may be helpful to check development of product and its innovation. Organizational performance in this learning is seen in provisions of success, sales amount, share of the market, satisfaction and loyalty of the consumers.

**2.4.11 Conceptual Framework Linking Learning Orientation to Firm Innovation and Performance (Argyris & Schon, 1978) (Baker & Sinkula, 2009) (Baker & Sinkula, 1999) (Calantone, Et Al., 2002)**

The framework in Fig. 2.11 below was shown from the fiction on organizational learning and innovation (Rogers EM., 1983, 1995; Hurley RF, Hult GTM, 1998; Brown SL, Eisenhardt KM, 1995; Mone MA, Mckiinley W, Barker VL, 1998; Monotoya-Weiss MM, Calantone RJ, 1994) (Hurley & Hult, 1998) (Hurt & Teigen, 1977). Authors have found that organizational learning is linked with the growth of novel information, which is important for firm capacity to innovate and for the overall performance of the firm (Hurley RF, Hult GTM, 1998). An organization dedicated to learning is expected to have known expertise in their field (Gatignon H, Xuereb J-M,1997) (Lukas, et al., 1996), which results in better capacity to innovate in products as well as processes. Additionally, capacity to innovate is favourably connected to the overall performance of the firm (Mone MA, Mckiinley W, Barker VL, 1998). Learning orientation is imagined as consists of four elements: commitment to learning, shared vision, open-mindedness, and intraorganizational knowledge sharing (Hurley RF, Hult GTM, 1998; Hult GTM, Ferrell OC , 1997;1998). The second is included because learning cannot take place till the time firm has a successful and well-organized scheme of knowledge input, which permits a repeated test of previous judgment approaches and execution deeds (Moorman C, Miner AS, 1998). Additionally, the association between learning orientation and organizations innovation capacity is reliant on age of the firm (Lukas BA, Hult GTM, Ferrell OC ,1996). The grown-up the organization, the well-built is the connection between learning orientation and organization’s innovative capacity. Learning orientation denotes to firm’s broad action of generation and application of information to improve cut-throat edge. This consists of creating and distributing knowledge and facts about changes in the market tastes, changes in customer desires, aggressive reactions of rivalries and upgrading of new modern techniques to explore novel goods that excels in comparison to their competitors (Moorman C, Miner AS, 1998). Learning orientation affects what type of knowledge is collected (Dixon NM, 1992) and how it is understood (Argyris C, Schon DA, 1978) , assessed (Sinkula JM, Baker WE, Noordewier TA,1997) , and distributed (Moorman C, Miner AS, 1998). As shown in Figure below, the four elements of learning orientation are commitment to learning, shared vision, open-mindedness (Sinkula JM, Baker WE, Noordewier TA,1997), and intra- organizational knowledge sharing (Moorman C, Miner AS, 1998).



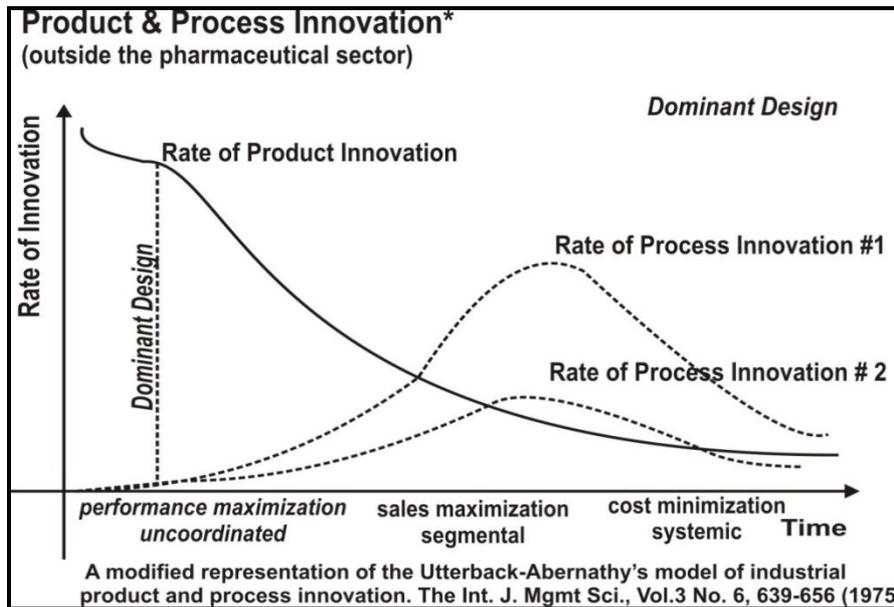
**Figure-2.11: A framework linking learning orientation to firm innovation and performance (Roger J. Calantone, S.Tamer Cavusgil and Yushan Zhao, 2001)**

#### **2.4.11.1 Learning Orientation, Firm Innovativeness and Firm Performance**

Innovation entails the creation, approval, and execution of new-fangled thoughts, processes, goods or services. It is clear that a learning orientation is directly connected to the innovation of the firm. Many authors talked about the significance of such an direction to improve the capacity of the innovation (Damanpour F., 1991; Verona G., 1999; Cahill DJ, 1996; Day G., 1991). Learning takes place mainly through firm's action within and strategies in the outside environment. To gaze at innovation, consumer desires and needs, technical confusion, and cutthroat doubt are decisive surrounding aspects (Cahill DJ, 1996). Thus, a firm's commitment to learning can improve its innovative capacity in three ways. Firstly, it is more probable to be dedicated to innovation, have the knowledge of modern technology, and use that know-how in innovations. It is more possible to have the ability to make and advertise a technical get through. Secondly, the business is not expected to fail to notice the openings formed by developing needs of the market place because it has the information and capability to know and foresee consumer wants (Damanpour F., 1991; Cahill DJ, 1996). To focus the significance of knowing those wants and desires, Urban and Hauser (Urban GL, Hauser JR, 1993) mentioned the term "core benefits proposition," which defined that a firm must construct on its complete knowledge of articulated and hidden consumer desires (benefitted through knowing the needs of the customers very closely). It must be obvious and brief, and it must straightforwardly attached to the strategy of the product (to shape a mutual dream in the firm). Novel goods must reveal consumer worth (Urban GL, Hauser JR, 1993) if the threat of collapse is to be reduced. Thirdly, an firm dedicated to learning is probable to have better capacity to innovate than rivals (Damanpour F., 1991). One feature of such an firm is that it directly checks rival's strategies at the market place (Gatingon H, Xuereb J-M, 1997). It comprehends the pros and cons of competitors, and takes the learning not only from their achievements but also from their fall downs (Slater SF, Narver JC, 1994; Lant TK, Montgomery DB, 1987). Various researchers have recognized the essence of learning orientation to the performance of the organization (Slater SF, Narver JC, 1994). A firm with a well built learning orientation is not only a store of information but a workstation of it. Comment from clientele, communication channels, and rivals must be studied to develop business strategies. A learning orientation affects the extent to which firms are probable to encourage creative learning as a long-term strategy (Sinkula JM, Baker WE, Noordeweir TA, 1997; Hunt SD, Morgan RM, 1996). The planned research recommends that there is no strategy that permits businesses to make more than expected profits (Jacobson R., 1992). One of the main significant feature of learning-oriented firms is that they forecast surroundings and changes in the market place tastes and desires and make changes accordingly. For instance, many successful auto companies have innovate their vehicles design for next year. Learning-oriented firms are in fact wish to monitor their well set organizational systems and upgrade primary operating policies (Mone MA, Mckinsey W, Barker VL, 1998; Senge PM, 1990). Such firms make the marketplace rather than be obsessed by it. Such firms with competitive behavior and successful business strategies should lead to higher performance levels. Capacity to innovate is the main factor of overall performance of the firm (Mone MA, Mckinsey W, Barker VL, 1998), a judgment sustained by many experimental researches (Cooper RG, 2000; Cooper RG, Kleinschmidt EJ, 1987). The dissemination of innovation research also supports this opinion (Rogers EM., 1983, 1995) and recommends that organizations must be thoughtful to benefit from cut-throat environment in order to sustain in long-term (Li T, Calantone RJ, 1998).

#### **2.4.12 Utterback/Abernathy's Model of Industrial Product and Process Innovation, 1975**

It is observed by Utterback and Abernathy that the speed of innovation, be it of product or process, is based on current stage of life cycle of the product. It has to be pointed out that this theory can defined to the life cycle of a one line of product and its production process as well as to a particular product creation and the development of a complete business division linked to this age band of goods. The course of replacement by a entirely changed, refined type of goods is not considered for examination. Figure 2.12 shows the distinctive guide of product and process innovation, including the three diverse stages.



The first stage of the innovation process—the uncoordinated stage—is considered by regular alterations in design of the product and low output of the allied process. In this stage rivalry is just depends on the performance of the product, a leading design of the product has not developed as of now. Due to the clumsy and little included process of the manufacturing (technological and organizational) there are less restrictions for the betterment of the product. These regular alterations in the characteristics of the product affects the homogeneity of its process, which leads to higher costs of manufacturing.

After introduction of a main product design, the organization or the manufacturing division slowly moves into the segmental stage. Particular manufacture apparatus is launched, the speed of innovation linked to the process of the production rises, and the process becomes more synchronized. In this stage product innovations requiring major changes in the process of the production are cancelled; the increasing of the innovations in the product rate falls down. Costs of the manufacturing falls down which results in rising of the sales volume and higher manufacturing amount.

In the systemic stage, much incorporated technical answers are applied in the organization, manufacturing method is more uniform while cost reduction becomes an main aim. A closer connection between product and process characteristics takes place. Changes in the product and process are very integrated, which must be taken in to notice by executives. The course of consistency lessens the chances of more basic alterations in the product and process. The pace of innovations in product as well as process falls down due to these limitations.

## 2.5 DETERMINANTS OF PRODUCT INNOVATION

### 2.5.1 INTELLIGENCE GENERATION

Intelligence generation has initial roundness in creativity. Intelligence generation has been defined as a psychological procedure, in which forms of antinomies are made through effective interactions among managers, companies and enclosing setup (Nonaka and Toyama, 2002). Wiig (1997) termed intelligence generation as knowing, determining and handling arranged, clear and willingful intelligence arrangement, renewal and application. The application of intelligence generation to enhance function preference has also been focused. The definition “intellectual capital” includes all forms of companies brilliance that can be changed into income, plus expertise and procedures, copyrights and exclusive rights, as well as the talent and practice of workers and dealings with clientele and contractors. The quantity based opinion of the firm has led to an growing concern in the concept that brilliance is a important capital that companies must radically handle if they are to survive over rivals in the long run. Theory of intelligence-generating firms gives for firm’s to state that intelligence generation is important for product innovation (Nonaka and Takeuchi, 1995). Additionally, he also

forwarded the inquiry of how firms arrange the procedure of intelligence generation and sharing and implement it to architect the novel goods, services or methods (Barringer and Bluedorn, 1999; Covin, 1991). Additionally, MNC'S tend to link in upper phase of information searching act (Hambrick, 1982; Narver and Slater, 1990; Jawaroski and Kohli, 1993; Barret and Weinstein, 1998; Nonaka and Toyama, 2002; Ramachandran and Ray, 2006).

Balancing healthy interaction with outside units, specifically clients gives the knowledge sharing and other capital that are important for novel business establishment (Barringer and Bluedorn, 1999; Fiol, 1996; Hornsby et al., 1993; Kanter, 1982; Lumpkin and Dess, 1996; von Hippel, 1978; Zahra, 1991). Christensen (1997) and Utterback (1994) barbed to the crisis of permitting clients to explain creativity. Given an tight consideration in to the lack of brilliance procedure and their causes, it is probable to scrutinize that either changes in the organization, the information and information intelligence or the human resource of the company are needed to consider them.

H1: Intelligence generation is a vital factor influencing the product innovation

### **2.5.2 INTELLIGENCE DISSEMINATION**

Companies behavior is based on market place brilliance consisting of the brilliance of clients and rivals. The theory of intelligence dissemination has also been focused for creative results. Exact framework and procedures are the tools for enhancing intelligence dissemination (Ruggles, 1996) (i.e., selecting, telling and motivating team to share intelligence) and companies acts (i.e. adjusting team to enhance sharing intelligence). It has been seen that person's communication leads to higher beliefs, transparency and promises between them (Frances and Sandberg, 2000), which leads to the dissemination of exact transactions of peer groups and motivates their confidence. Knowledge with each other leads to a protective ecological system that facilitates the generation of different opinions leading to more efficient decision process (Nonaka and Takeuchi, 1995; Sheshadri et al., 2003).

H<sub>2</sub> Intelligence dissemination is a vital factor influencing the product innovation

### **2.5.3 TECHNOLOGY SELECTION (DRUCKER, 1997) (EFCHARIS, ET AL., 2008)**

As technology innovation can assist the organization to make the cut-throat strategies through the production of competing goods and services and much more efficient process to make such products, or developing novel businesses. Academic researchers and executives are focussing only on the successful corporate strategies. Since there is rising trend in costs of innovation, reduced life cycles of innovation strategies and much more complex technology, the accomplishment of firm's innovation goals will not be immediately realised but it can be seen in the later stages. Studies can be separated in two parts i.e. external factors and internal factors (Hao & Yu, 2009) (Lawless & Anderson, 1996). The first group that focuses on the external factors which are responsible for the success of the innovation, (A.B. Assis, 2003; B. Chakravorti, 2004; C.C. Rogerio, M.G. Fabio and L.M. Gilnei, 2007), also monitors that the innovation success depends upon the joining hands of many firms together where in each firm holds different potential to tackle the competing demands in a versatile environment ( W.G. Biemans, 1992; J.A. Czepiel, 1975; C. Debresson and F. Amesse, 1991; H.G. Gemunden, T. Ritter and P. Heydebreck, 1996). The second study is focussing on internal factors which are responsible for the success of the innovation such as culture of the company where it survives, what corporate strategies firm is adopting, dealings in relation to capability of technology and partnerships with capable parties (S.L Brown and K.M. Eisenhardt, 1995; R.G. Cooper, 1997; R.G. Cooper and E.J. Kleinschmidt, 1995). Given these two parts for accomplishing innovation success, we require to evaluate the fundamental potentials on which their effect is based. Numerous researches have seen into the task of technological capability participated in innovation success (K.H. Tsai, 2004; T.Ritter and H.G. Gemunden, 2004), and consider technological potential as the key of innovation success. Although, other than technologies potential, the other capabilities are also important for the success of the innovation such as capabilities of the executives, effective use of resources of the firm (B. Carlsson and G. Eliasson, 1991; G. Dosi and D.J. Teece, 1993; F. Malerba and L. Marengo, 1995; R. Sanchez, 1996). Within the executive potential, technology executive potential has been caught by researchers these days. Apart from this, firms has to make the choice of new methods and techniques, also launch new technology on a regular basis as to survive in the competitive world and also to meet the changing demands and tastes

of their customers. There exists the favourable connection between selection of the technology, technological innovation and performance of the firm. Selection of the best and appropriate technology specially, strategy to choose the right technology is considered as the major factor of product and process innovation.

The theory concept is introduced to explain the effect of capability of the technology and within this, the capability of management to handle technology on a firm's innovation strategies success and results of the firm. Later on, selection of the right and appropriate technology is included. Moreover, selection of technology is a decision taken at different stages (M. Torkkelo and M. Tuominen, 2002), incorporating strategy decided to choose the technology and existing selection of the technology which is available. Strategy used for the selection of the technology included emphasising more essence on development of novel products and R&D and to fulfil the wish to become the leader in the selection of the technology. An organisation who wish to choose right technology always pay emphasis on R&D, hire experts with the knowledge of specific areas and also develop healthy environment in the company which is suitable for innovation. These are the primary ingredients of capability of technology judgement. In addition, real selection of technology includes the creation of novel and modern methods of manufacturing, which are referred to as the part of technology capability (Cetindamar, et al., 2009). Management of the technology involves resources required to handle the new technology, management of the entire firm, management of total quality system where as strategy needed to choose technology involves planning of the resources needed, mode of managing quality system and deciding the structure and hierarchy in the organisation. Hence, management of the technology will be effected directly or indirectly by strategy required to select the technology. In addition, selection of the technology decides the importance of technology management. For instance, if a business chooses self-regulating R & D plan or a foremost plan, the explanation of technology supervision is predicting the technology, R&D management of employees and risk levels (Brockhaus, 1980). If a business chooses simulated plan or a subsequent plan, management of the technology will given more emphasis to attainment of technology specifically, cost, speed and the extent of attaining technology. Moreover, selection of the technology is the key for the process of technology management.

The goal of selection of technology is to get novel expertise, materials and new schemes which will aid the firm to develop demanding goods and services and efficient processes to develop such products (M.Torkkelo and M.Tuominen, 2002). The literal meaning of selection of technology is the creation of modern methods, which gives chances to both goods and services segregation and developing new ways of business (J.Morone,1989). Apart from this, few studies stated that appropriate technology strategy that chooses the right technology is important to the success of the firm innovation process (S.B. Hao and B.Yu, 2009; G.M. Bao and J.Yang, 2004). Capability of the technology means that a firms' capacity to know, utilize and take advantage of current technology in-house (T.Ritter and H.G. Gemunden, 2004). This capacity helps the firm to put worth to existing goods and services and also through the development of new and novel products and their methods of manufacturing such products. At that time, the firm becomes a market leader. Therefore, it is proved that organizations with more capability to handle technology are successful than lower levels of capability to handle technology. Various firms put higher emphasis on R&D by hiring professionals of different areas, developing a healthy culture for the firm and intake of more resources needed for technology selection. Although, the outcomes of R&D are not favourable for the success of the innovation and development of novel business. The main Cause to this fact is that the firms does not focus much on the management of technology capability. Management of technology capability is a type of changing and versatile capability targeting to know the manner in which a firm collects resources needed and also determines the process of innovation over a period of time, how the resources are produced and set up its old process and resources and also from where they takes new resources needed (D. Cetindamar, R. Phaal and D. Probert, 2009). The extent of this capacity tells that how effective the resources are utilized. Numerous researches have proved that management of technology capability puts higher effect on the development of novel goods results (G.M. Scott, 2000; W.W. Wu and B. Yu, 2010; D.Z. Levin and H. Barnard, 2008). Numerous researches have monitored the function of innovation in technology that participated in the development of the performance of the firm. Robinson's experimental research measures

that the effect of innovation in goods is on share of the market and the outcomes will be positive as compared to rivals in terms of increased market share (W.T. Robinson, 1990) (Myers & Marquis, 1969) (Naranjo-Valencia, et al., 2011). Deng proposed that innovation is the focal mover of firms' output and expansion, copyright measures showing the effect of firms' study on other innovations and the nearness of R&D to the field of science are connected with the results of research oriented firms' (Z.Deng, B.Lev and F.Narin, 1999). Yamin scrutinized the connection between innovation and performance levels in the firm in australian firms' and the outcomes revealed that performance of the firm is linked to the innovation success which includes product, administrative, and technical innovation (S.Yamin, A. Gunasekaran and F.T. Mavondo, 1999) (Narver, et al., 2004) (Nemeth, 1997).

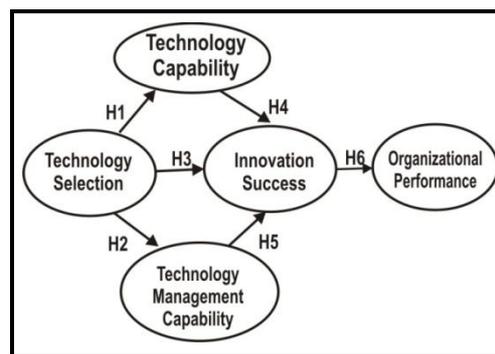


Figure-2.13: The theoretical model ( Shengbin Hao, Bo Yu, 2011)

**H<sub>3</sub>** Technology selection is a vital factor influencing the product innovation.

#### 2.5.4 OPERATION PRIORITIES – COST, SPEED OF DELIVERY, FLEXIBILITY AND QUALITY (ALPKAN, ET AL., 2003)

Big business authors who does research in this field mention that operations plans and operations main concern among the main striking subject matter of operations management, since this topic are amongst the important elements of financial performance and of planned processes of an firm (Sum et al., 2004; Boyer and Lewis, 2002; Malhotra et al., 1994; Hayes et al., 1988). Here we implement as operations priorities flexibility, quality, cost, and delivery, which have become broadly used as declaration of the aggressive magnitude of production (Voss, 1995) (Liu, et al., 2009). Organizations target to favour from supplementary economical benefit and to attain improved company performance through the use of operations strategies, which have to be in appropriate arrangement with the characteristics of the aggressive setting the organization is in. Numerous authors have inspected the associations between production strategies and financial performance (Corbett and Campbell-Hunt, 2002). Based on an experimental research, Noble (1997) explained that production strategies of blue-chip firms are similar to loss-making firms. To comment on, their results proved that improved performance organizations are more likely to focus on potentials parallel and are more probable to have defined business strategies. McAdam and Keogh (2004) examined the connection between organization outcome and its awareness with innovation. They established that organizations inclinations to innovations are important in the manner of making the association between competitive advantage and innovation (Sethi, 2000) (Shapiro, 2006). Zahra and Sidhartha (1993) concluded that business strategy is a vital forecaster of corporate performance. Gunday et al. (2008) mentioned that based on an experimental research that innovations within the organization are benefitted with higher financial outcomes.

Operation priorities components are adapted mainly from Boyer and Lewis (2002), Alpkhan et al. (2003), Noble (1997), Ward et al. (1998), Vickery et al. (1993) and Kathuria (2000). Elements of production or operations performance, i.e. speed, quality, flexibility, and cost efficiency, seem to be correlated to the corporate performance in process, and product innovations according to the recent literature (e.g. Quadros et al., 2001). For example, according to Koufteros and Marcoulides (2006) regular hard work and superior outcomes in innovations promote learning within the firm and boosts the rate and superiority of the processes. Therefore, technical innovation can simply be included and any plan or eminence shortages have

been improved quicker than the rivals. In addition, López-Mielgo et al. (2009) told that specifically innovations within the process puts a positive effect on the TQM of the firm. Other than quality and speed of the process, performance of the firm is based upon other aspects i.e. efficiency in costs and flexibility (Alpkan, et al., 2007). Accomplishment in the revitalization hard work particularly in organizational system, production process, and new-fangled products can give widely to the spreading of information and efficiency of harmonization inside the firm, which are essential for flexibility and effective costs (Koufteros and Marcoulides, 2006). In this concern, Liu et al. (2009) reported in an experimental research the constructive link between flexibility and success of the novel products. As for the reduction in costs and its effectiveness, Peters (2008) reports that all the innovations with in the process does not results in savings of the costs but some helped the organizations to sell products at prices lower than competitors. Gonzalez-Benito (2005) mentioned that the capability of the manufacturing function that becomes the source of ready for action strategy for the organization. Manufacturing performance is the combination of firms' achievement in enhancing speed, quality, flexibility, and cost efficiency in the day-to-day workings results in the improvement of market place status and financial outcomes. The previous experimental research reported that inspiration for using operations objectives as increase in the flexibility, improvement in quality of products for the contentment of the clients, speed of the process and cost efficiency helps in the improving the organizations performance as a whole (e.g. Alpkan et al., 2002; Alpkan et al., 2003). Particularly for the manufacturing and market performance link, Li (2005) confirmed that industrialized potentials -such as higher productivity levels, speed of process etc. leads to the better market place performance by improvement contentment of the consumers and enhancing client dealings. Manufacturing performance, as a blend of attainments in all these – cost reduction, improved quality, increased flexibility, speed of the process- is one of the sources of inspiration for success (e.g. Chenhall, 1997), therefore efficiency and competence in manufacture would result in higher gains. Additional experimental research reported this statement (e.g. Worthington, 1998). For example, Fullerton and McWatters (2001) pointed out those organizations that have spent much more in excellence exercise gained from higher financial outcomes. Likewise, Fullerton and Wempe (2009) in a current research, develops a constructive association between production performance and financial performance.

**H<sub>4</sub>** Flexibility is a vital factor influencing the product innovation

**H<sub>5</sub>** Dependability/ Delivery is a vital factor influencing the product innovation

**H<sub>6</sub>** Quality is a vital factor influencing the product innovation.

### **2.5.5 LINKING PRODUCT-PROCESS INNOVATION (ETTILE, 1995) (FRUIN, 1998) (GALBRAITH, 1982) (MEEUS & EDQUIST, 2006)**

The harmonious and the synchronized implementation of diverse innovation forms is an significant determinant for the firms agreement (Damanpour, Gopalakrishnan 1999). Organizations have to introduce novel classy goods in a dynamic scenario and their capability to rise up to complete manufacturing amount quickly is important for accomplishment (Pisano 1997). As the life cycle of the product reduces, it becomes more important to spread manufacturing capacity quickly to produce sales amount and earn growth funds. For manufacturing firms, product innovation system and specifically its related processes are important (Li, et al., 2007). Due to technical reasons there is a fixed association between technological goods and the process used to produce goods. The executives who looks after innovation process has taken in to account the connection between product and process (Hayes & Wheelwright, 1979) (Kim, et al., 1992) (Koufteros & Marcoulides, 2006). Alterations in the product scheme have major effects for the organizations production arrangement and for technological and organizational processes (Utterback, Abernathy 1975; Hayes, Wheelwright 1979 a, 1979 b; Kim et al. 1992). The alteration in the process essentials are very important, if new product is launched. The stiffness of the connection between product and process characteristics changes with the manufacturing division. In the process business like pharmaceuticals, chemicals etc. ("Process Driven", "Process Enabling", Pisano 1997) an unexpected close up association between products and production process can be observed. The examination centres on the innovation process in production firms. Innovation management in industrialized firms is expected to develop incorporated innovation and business strategies. An enhanced results of industrialized firms can

be usual from closer associations between innovation of product as well as process (Kim et al. 1992). "Supervising this product-process link is one of the peak dare of the age" (Ettlie 1995, p.1224). The product-process life cycle assumption of Utterback and Abernathy (Utterback, Abernathy 1975) provides a helpful replica assisting to know the trend of various manufacturing process in innovation. This replica achieves something in developing the close links between the stages of life cycle of the product, the related process stages and its cut-throat strategies.

The importance of technical and firms togetherness in product and process in the light of business and innovation strategies can be seen in the current literature review (Damanpour, Gopalakrishnan 1999; Pisano 1997; Ettlie 1995; Kim et al. 1992; Prahalad, Hamel 1990). In these examinations, it is checked that production firms that highlights the joint product-process integration process along with the rules, procedures, policies and systems are more profitable. In opposition to the above, occasionally the concept that firms product and process progress potential are commonly selective, can be seen in the current literature. Experimental outcomes revealed that combined strategies if applied in an efficient and effective way can increase the potential of product and related processes (Milling 1998; Pisano 1997) (Hall & Mairesse, 2006). Li et al.'s (2007) study on Chinese firms also proved that innovations in product and process are linked to each other very closely. Although, current literature does not have experimental outcomes that proved this relationship of product and process. Still, few unrelated researches exist that mentioned this relationship of product and process. For example, Oke's study on British firms (2007) shows that if related processes are well built, then it leads to the betterment of the product and process innovation automatically. Hence, enhancement of the processes is a main factor for the higher innovative production levels. Therefore, innovative way out providing the ladder of the production process with recently better returns - such as quality of the manufacturing goods, speed, cost of the manufacturing goods and value can improve the probability of the main components of the product, its ingredients, major specifications, main technical issues etc. to fulfil the requirements of the consumers much better than ever before.

**H<sub>7</sub>** Product- Process Innovation is a vital factor influencing the product innovation

### **2.5.6 MARKETING SUPPORT OF THE PRODUCT (HAUSER, ET AL., 2006) (HENDERSON, 1994)**

It is very ordinary that innovations in the product are created through alterations in the market place and consumer desires. Consumer markets have given high essence to the major functions of the marketing. Needs of the consumer can be satisfied through promotions and novelty, which create likelihood for additional manufactured goods modernism. Performance of the innovation in the form of success of novel goods is associated to an increase in the share of the market and sales volume, since it adds significantly to the contentment of old customers and new clients can be gained (e.g. Pelham, 1997; Wang and Wei, 2005). It is also probable to declare that in adding to novel product achievement, accomplishment in process, organizational and marketing innovations results in the pleasure and contentment of consumers and also increase the customer base towards the innovation companies (Lhuillery, 2014). In current scenario where customer is the king of the market, where number of customers is important to get financial outcomes, competitive advantage in the market is one of the significant basis of performance of the financial results (e.g. Li, 2000) since, sales volume and share in the market may openly add to the financial aims, major contributors are rising prices and sales amount and falling variable costs per unit which results in increase in profits of the firm (e.g. Buzzel and Gale, 1987; Venkatraman and Prescott, 1990, Wang and Wei, 2005).

**H<sub>8</sub>** Marketing Support of the Product is a vital factor influencing the product innovation

### **2.5.7 IMPACT OF INNOVATIONS ON FIRM PERFORMANCE (ALPKAN, ET AL., 2005) (ANTONCIC & HISRIC, 2004)**

Firm performance can be improved through innovation in many ways. Specifically there are four proportions of performance are used in the previous research to measure the performance of the organization (Narver and Slater, 1990; Barringer and Bluedorn, 1999; Antoncic and Hisrich, 2001; Hornsby et al., 2002; Hagedoorn and Cloudt, 2003; Yilmaz et al., 2005). **These proportions are financial performance, market performance, innovative performance, and production performance.** Innovation has a significant contact on business performance by creating a better marketplace point that communicates economical benefit and

greater outcome (Walker, 2004) (Altuntas & Donmez, 2010) (Lin & Chen, 2007) (Liao & Chuang, 2006). A big figure of researches are based on the association between innovation and its results that generates a favourable assessment of superior innovation which leads to higher financial outcomes (Damanpour and Evan, 1984; Damanpour et al., 1989; Deshpande et al., 1993; Dos Santos and Peffer, 1995; McGrath et al., 1996; Gao and Fu, 1996; Han et al., 1998; Olson and Schwab, 2000; Hult and Ketchen, 2001; Du and Farley, 2001; Calantone et al., 2002; Garg et al., 2003; Wu et al., 2003).

The two ordinary forms of innovation scrutinized are: Process and product innovations. The researches by Marcus (1988), Ittner and Larcker (1997), Whittington et al., (1999), Olson and Schwab (2000), Knott (2001) and Baer and Frese (2003) based just on process innovations while researches of Atuahene-Gima (1996), Subramanian and Nilakanta (1996), Han et al., (1998) and Li and Atuahene-Gima (2001) (Nistish, et al., 2010) based just on product innovations. Numerous of these studies hold to a extent a favourable relationship between performance of the organization and innovation but at the same time there are few researches that establishes the unfavourable or no connection at all (Capon et al., 1990; Chandler and Hanks, 1994, Subramanian and Nilakanta, 1996). As Miller (2001) assured largely organizations look for innovation in technology to benefit cut-throat strategy in their specific market place. Therefore, support of marketing and organizational innovation is must for this hard work to succeed. In general, studies ignore the marketing and organizational innovations which are uniformly important to the expansion and efficient working of the organization (e.g. Damanpour and Evan, 1984, Damanpour 1991). Comparatively little researches on the potential of innovation support marketing and organizational innovations. They report that more organizations with innovation strategies focus on the styles of management (Baldwin and Johnson, 1996) and attain long-term growth along with the superior results (Han et al., 1998; Ravichandran, 2000; Hult and Ketchen, 2001; Guan and Ma, 2003). Wolff and Pett (2004) and Walker (2004) carried out relative study for comparing the impact of product and process innovation on the performance of the organization. They reported that specific enhancement in the product are favourably linked with the expansions of the organization. Gopalakrishnan (2000) widened the research topic while focussing that the speed and magnitude is equally important characteristics of innovation, two of them have favourable effect on the performance of the organization. Regardless of the fragile connection they established, Lin and Chen (2007) (Montoya-Weiss & Calantone, 1994) (Morris & Kuratko, 2002) connected innovations with bigger organization level of sales and they mentioned that organizational innovations relatively than technological innovations showed to be the largely crucial cause for sales level (Garcia & Calantone, 2002). On the other side, John and Davies (2000) make sure that sales level will be improved through innovation in marketing strategies by enhancing the consumption of the product which produces extra earnings for the organization. Moreover, Oke (2007) in a current experimental research on UK companies revealed that many forms of innovation were established to have positive relationship with the performance of the innovation. Performance that takes place because of innovation strategies occurs as a result of accomplishments in the firm such as rejuvenation and enhancements done in various forms such as process, marketing, organizational system, marketing etc. Hence, innovation outcome is combined factor that comes from various mark points such as new projects, new techniques, new methods, novel products, new patent and copyrights, new ways of organizational system (Hagedoorn and Cloudt, 2003). Innovative performance is considered in the research as one of the large significant factor of other elements of organizational performance such as creation of an firm knowledge environment and starting new renewals, enhancements, discoveries and learning from past experiences and acceptance to quick alterations in versatile atmosphere (Bulut & Yilmaz, 2008). For example, Han et al. (1998) focussed that innovative performance is the collective result of administrative and technological innovation that leads favourably to expansion of the firm and long-term profits. They declared that innovative performance is the lost connection between firms business strategies and outcomes. Damanpour and Evan (1984) (Walker, 2008) reported that firms can deal with competitive demands by incorporating administrative and technological innovations in to their firms system which leads to the enhancement and betterment of their long-term objectives. Generally, to fulfil the targets of manufacturing and marketing such as excellence quality of products, improvement in share of the market, cost reduction, increase in flexibility, expansion of novel markets, innovations on regular basis are done (Quadros et al., 2001) (Walker, 2004). In initial stages of investment in innovation strategies, it might

cause short-term losses to the firm but in the long-run, it leads to the positive relationship between firm's profits and business innovation strategies. Lawless and Anderson (1996) mentioned that implementation of novel expertise for innovations entail an early punishment. Likewise Damanpour (1984) focussed that usually a grave point in time stage may go by to monitor affirmative effects of innovations on the performance of the organization. This is only primary reason that innovative performance is initially linked to the other factors of performance such as contentment of the consumer, speed delivery of the orders and later on, it leads to the better and improved financial outcomes (Appuhami, 2007) (Walker, 2006). In nutshell, the innovative performance enhances the marketing and production performance which in turn improves the financial returns thereby leads to higher earnings for the management.

#### **2.5.7.1 FINANCIAL PERFORMANCE (AKTAN & BULUT, 2008) (ANDRIESSEN, 2007)**

The operations and its financial outcomes are inter-related to each other. Research has proved that the topic of firm performance is composite in nature i.e. it is linked to many factors at the same time (Venkatraman and Ramanujam 1986). Within the firm performance, the emphasis is always on the financial results because ultimately everything is boiled in to financial terms and it is accepted from long time. Additionally, investor's, major shareholders and other stakeholders such as creditors, debtors etc. are keen to know the financial condition of the organization (Fis & Cetindamar, 2009) (Floyd & Woolridge, 1990). The facts which are of financial nature such as share prices, net revenue generated, net profits, return on equity etc. are the most primary and acceptable information to know the actual condition of the firm (Gatignon & Xuereb, 1997) (Gopalakrishnan, 2000) (Gunday, et al., 2011). On the other side, knowledge about finance must be provided to regulatory and legal houses to calculate the taxes to be paid. The disclosure of financial information is made to the general public or to the regulatory houses based on many factors such as type of ownership i.e. private or public, size of the firm i.e. big or small, whether it is listed on the stock exchange or not listed (Heshmati & Loof, 2006) (Lumpkin & Dess, 2001) (Malerba & Marengo, 1995) (Mankin, 2007). Corporate performance means the capacity of the firm to produce new earning sources or profits from the day-to-day working operations of the organization over a period (Fullerton & Wempe, 2009) (Gan & Saleh, 2008) (Zahra, et al., 1999). The financial performance actions can be separated into two main forms: (1) conventional actions based on bookkeeping/financial information (i.e. the consequence of measures on one year's earnings, ROI, ROE, etc.) which shows the past results of the organization; (Bartoloni & Baussola, 2009) and (2) current actions derived from share market prices (i.e. Stern Stewart & Co.'s Economic Value Added [EVA] and Market Value Added [MVA] approaches) which are based on stock valuation doctrine (Kaplan and Norton 1992, 1993,1996, 2000 and Broadbent and Cullen 2005) (Zaltman, et al., 1973). Flourishing commercial activities will certainly influence the organizational monetary outcomes in the extended period, hardly in the small period; there might be no connection among the product innovation environment aspects and organizational monetary results norm due to project funds and organizational in-house reserve uses or probable sufferings (Hayton 2005) (Sharma, 1999). Therefore, the initial symbols of effective firm's attainments may be extracted from market, for instance, improvement in level of sales and increase in share of the market. Later, in the longer period, these enhancements in the aggressive period in the market may lead to superior monetary results as well as the results of product innovation (Wagner, 2011) (Zirger, et al., 1990). Thus, one or more than one elements i.e. market share, ROA ,ROI, Profitability, growth percentage, revenue generated etc are taken in to consideration to monitor the link between product innovation and firm performance. Financial performance decisive factor are tailored primarily by studies of Barringer and Bluedorn (1999), Hornsby et al. (2002), Narver and Slater (1990), Zahra (1995) and Yilmaz et al. (2005).

- H<sub>9</sub>** Intelligence generation is a component of product innovation that has a significant impact on financial performance.
- H<sub>10</sub>** Intelligence dissemination is a component of product innovation that has a significant impact on financial performance.
- H<sub>11</sub>** Technology selection is a component of product innovation that has a significant impact on financial performance.
- H<sub>12</sub>** Flexibility is a component of product innovation that has a significant impact on financial performance.

- H<sub>13</sub>** Dependability/ Delivery is a component of product innovation that has a significant impact on financial performance.
- H<sub>14</sub>** Quality is a component of product innovation that has a significant impact on financial performance.
- H<sub>15</sub>** Product- Process Innovation is a component of product innovation that has a significant impact on financial performance.
- H<sub>16</sub>** Marketing Support of the Product is a component of product innovation that has a significant impact on financial performance.

**Table-2.4: Showing Constructs, Measurement of Variables and Authors**

Constructs	Measurement Variables for Investigation in the Study	Author(s)
<b>Intelligence Generation</b>	a) Process of intelligence generation	Nonaka and Toyama, 2002; Wiig ,1997 ; Ramachandran and Ray, 2006
	b) Design of new products, services or systems.	
	c) Capability to generate intelligence and utilize it	
	d) Capability to engage employees in innovative activities.	
<b>Intelligence Dissemination</b>	a) Interaction among employees	Ruggles, 1996; Frances and Sandberg, 2000; Nonaka and Takeuchi, 1995; Sheshadri et al., 2003
	b) Availability of appropriate infrastructure and processes	
	c) Familiarity with colleagues	
	d) Identifying and designing intelligence dissemination processes.	
<b>Technology selection</b>	a) Selection of leading strategy	Shengbin Hao, Bo Yu, 2011; M. Torkkeli and M. Tuominen,2002; S. B. Hao and B. Y,2009 ; G. M. Bao and J. Yang,2004;J. Morone,1989; D. Cetindamar, R. Phaal and D. Probert ,2009; D. Cetindamar, R. Phaal and D. Probert ,2009
	b) High emphasis on R&D activities	
	c) Selection of advanced technology in industry.	
	d) Develops new products totally different from the current ones.	
	e) Product modifications have a better market response.	
<b>Flexibility</b>	a) Increase the ability of producing non-standardized products.	G. Ulusoy, G. Gunday, L. Alpkan and K. Kilic, 2008; Gurhan Gunday, Gunduz Ulusoy, Kemal Kilic, Lutfi Alpkan, 2009; Boyer, K.K., Lewis, M.W.,2002
	b) Increase the product orders with different specifications.	
	c) Ability to change machine and equipment priorities.	
	d) Increase the ability of flexible production.	
<b>Dependability/</b>	a) Increase the delivery speed of	G. Ulusoy, G. Gunday, L. Alpkan and K.

Constructs	Measurement Variables for Investigation in the Study	Author(s)
<b>Delivery</b>	products	Kilic, 2008; Gurhan Gunday, Gunduz Ulusoy, Kemal Kilic, Lutfi Alpkan, 2009; Matthew N. Saunders <sup>1</sup> , Carolyn C. Seepersad and Katja Hölttä-Otto, 2009
	b) Determines and eliminates non-value adding activities in delivery related processes.	
	c) Increasing the ability to meet the delivery commitments	
	d) Decrease the make span from taking the orders to the completion of delivery	
	e) Increase the just in time delivery.	
<b>Quality</b>	a) Increasing the product and service quality according to customer's perception.	G. Ulusoy, G. Gunday, L. Alpkan and K. Kilic, 2008; Gurhan Gunday, Gunduz Ulusoy, Kemal Kilic, Lutfi Alpkan, 2009; Gunday, G., Ulusoy, G., Kilic, K., Alpkan, L., (2008
	b) Increasing the product and service quality compared to rivals.	

Constructs	Measurement Variables for Investigation in the Study	Author(s)
<b>Marketing support of the product</b>	a) Renews the design of the current and new products	Hauser, et al., 2006; Henderson, 1994; Pelham, 1997; Wang and Wei, 2005; Lhuillery, 2014; Li, 2000; Buzzel and Gale, 1987; Venkatraman and Prescott, 1990, Wang and Wei, 2005
	b) Renews the distribution channels without changing the logistics processes.	
<b>Product-Process Innovation</b>	a) Determines and eliminates non-value adding activities in production processes.	Ettile, 1995; Fruin, 1998; Galbraith, 1982; Meeus & Edquist, 2006; Damanpour, Gopalakrishnan 1999; Pisano, 1997
	b) Decrease manufacturing cost in components and materials of current products.	
<b>Financial performance</b>	a) Increase in the ratio of return on sales	Aktan & Bulut, 2008; Andriessen, 2007; Venkatraman and Ramanujam 1986; Fis & Cetindamar, 2009; Floyd & Woolridge, 1990; Gatignon & Xuereb, 1997; Gopalakrishnan, 2000; Gunday, et al., 2011; Heshmati & Loof, 2006; Lumpkin & Dess, 2001; Malerba & Marengo, 1995; Mankin, 2007
	b) Increase in the ratio of return on assets	
	c) Increase in the general profitability of the firm	

	d) Increase in the cash flow of the firm.	
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**2.6 BENEFITS AND COSTS OF PRODUCT INNOVATION (AKOVA, ET AL., 1998) (ANDREW & SIRKIN, 2006) (BLOODGOOD, 2014):**

- **Development, extension and achieving a monopoly position in the market:** A firm that has the ability to change their goods from their rivals running their business in the same line of product to a good extent is able to earn extra profits comparatively (Verona, 1999). This can be seen in the businesses who manufacture unique and novel products and make it attractive for customers to purchase them that such organizations always stay in benefit and will survive in the business in the long run ("Product Differentiation",2014). Thus, companies who will be able to utilize resources effectively, efficiently and innovatively will be able to grow faster at a large scale.
- **Brand change:** companies try to lure their clients to stick to their brand and also try to focus on new customers to switch to their brands by offering them innovative products and services and hence able to increase the customer base (Vourlioti, et al., 2008). One case of innovation where customers immediately shifted from all brands to one particular brand is the Apple iPhone because of its unique characteristics. Customers of Nokia, Sony Ericsson, Motorola, Samsung shifted in huge numbers to Apple iPhone. This is the instance of the mobile industry.

**2.6.1 Advantages of Innovation to the organization (Australian Bureau of statistics, 1994, 1995) is given below in the table 2.5**

Ranking	Advantages / Goals of Innovation to the organization
1	Enhancement of quality of the product
2	Development of novel market place
3	Improves the share of the market
3	Stabilised the share of the market
4	Increase the range of the products in the same line
5	Meet regulations and legal standards
6	Achieve cost efficiency
6	Betterment of conditions of the working in the organization such as safety measures
6	Enhances the flexibility in product adoption
7	Minimise impact on ecological system
8	Achieve manufacturing costs at minimum level
9	Immediate replacement of the product, out of demand

**2.6.2 NUMEROUS DISADVANTAGES OF PRODUCT INNOVATION INCLUDE**

- **Opposite impact of the product innovation:** It is not always necessary that the innovation in the goods and services shows the positive relationship between profitability and innovation success (Porter & Kramer, 2011). It may take the turn to the other side. For instance, some companies do not necessarily create new products but can also lead to improvements in the existing line of products and now it might happen that the product is no more in demand by customers and hence it ruins the profits of the firm and throws it out of the industry.
- **Increase in costs and risk levels:** whenever the firms try to increase the product range by differentiating from its rivals, they incur extra costs in the hit and trial process. This approach also demands a lot of time, which might lead to wastage of time at the end and level of risk and uncertainty also increase because of continuous efforts towards developing innovative products (Quinn, 1985) (Quinn, 1979).
- **Disturbing the exterior world:** For product innovation to take place, the firm will have to alter the manner in which it is moving, and it might result in bad relations and dealings with contractors, clients and its business peer groups (Ritter & Gemunden, 2004). Moreover, alterations more than needed are there, might lead to a bad brand image in the minds of the final consumers.

## **2.7 CHALLENGES IN PRODUCT INNOVATION**

### **I/ Converting innovation in to cut-throat advantage** (Pinchot, 1987 March-April) (Pisano, 1997) (Takeuchi & Nonaka, 1986)

- How to search novel markets where there is well-built worth to take it? Specifically, identify new markets where there's strong value to capture?
- How to infiltrate novel market places and throw the existing brands?
- How to get off the risk of disturbance in the main line of business?
- How to increase the Return On Investment (ROI)? In other way, how to ensure that every penny invested in innovation strategies will bring the positive and higher returns?
- How to develop new products different from existing ones to attract and increase customer base?

### **II/ Increasing the product range** (Peters, 2008) (Pinchot, 1985) (Subramanian & Nilakanta, 1996)

- How to enhance my existing goods and services and how it will lead to develop customer worth?
- How to develop new products that new consumers accept and feel satisfied?
- How to decrease the costs of the product without sacrificing its quality?

### **III/ Process of Innovation and firm competitive culture** (Oke, 2007) (Peeters & Van Pottelberghe, 2003) (Shiu, 2006)

- How to develop the healthy environment in the organizations which will make easier for the organization to adopt changes wholeheartedly and easily. Also, how to generate new ideas and apply them?
- How to sell innovation to one's boss? How to consider innovation as the source of success and core element of earning higher profits?
- How to decrease variations and mistakes in the process of innovation?
- How to select the preference of one project over second one and what criteria will decide this?

### **IV/ Closeness of product-process relation (Ettlie 1995, p.1224)** (Page, 1993) (Tellis, et al., 2009) :- The nearness of the association between product and process changes from industry to industry. For example in the chemical company (Pisano, 1997) an unusual link can be seen. Maintaining the nearness between product and process innovation is one of the top challenge of this era. For a growth of incorporated innovation and production policies, taking into consideration the unyielding product-process contact a study of the dependency on each other i.e. Product characteristics and linked manufacturing process appeared to be helpful.

### **V/ Measuring Innovation** (Thomke, 1997) (Tidd & Bessant, 2009) (Anon., 2013)

Given the width, complication and indefinable environment of innovation, its dimension is very demanding. The important of innovation is increasing day-by-day, therefore, there is real need to measure it. There are two schemes to measure i.e. Conventional and modern technique. The traditional view emphasizing on considering the how the research activities are going inside the organization (Brown, 2011) (Torkkeli & Tuominen, 2002). For instance, how much organization is investing on research activities, number of patents, number of copyrights, number of research publications, number of national and international conferences attended etc. Currently, due to stiff competition in the market place, the focus is shifted on consumer needs and wants, changing taste buds of the customer, ongoing trends in the market place and finally everything boils down to finance i.e. how much financial return the firm is generating on regular basis. Therefore, the new orientation is based on three things i.e. inputs, process and output measurements (Anthony, 2007; Hempel, 2006; Mankin, 2007; Andrew, 2009).

**2.8 SIGNIFICANCE OF PRODUCT INNOVATION**

Firms must be able to adjust and emerge if they willing to sustain. Firms’ work with the information that their rivals will surely enter to the marketplace with the new products that alters the bases of fight. The capability to alter and adjust is important to sustain. Currently, the concept of creativity is broadly adopted. It has become component of our art- so much so that it comes on becoming a common place. But even though the definition is now seen in our dialect, to what degree do we fully know the theory? Additionally, to what degree is this information distributed? A researcher’s opinion of creativity may be very distinct from that of an accountant in the similar firm. The Apple Inc. story puts in to situation the field of innovation and new product development. In this instance, Apple’s introduction of Novel goods in the cell phone marketplace will assist Apple bring about enhancing revenues and moved up company. Innovation is the main part of many firms’ function. Not to create is to shutdown, says Christopher Freeman (1982) in his popular research of the economics of innovation. Therefore, firm that have based themselves as technovation market rulers have revealed an capability to grow nourishing novel goods. On virtual base, all business, from aerospace to pharmaceuticals and from motor cars to computers, the major firms have shown an capability to create (see table 5).

**Table-2.6: Market Leaders in 2007**

<b>Industry</b>	<b>Market Leaders</b>	<b>Innovative new products and services</b>
Cell phones	Nokia	Design and new features
Internet-related industries	eBay; Google	New services
Pharmaceuticals	Pfizer; Glaxosmithkline	Impotence; Ulcer treatment drug
Motor Cars	Toyota;BMW	Car design and associated product developments
Computers and software development	Intel; IBM and Microsoft; SAP	Computer chip technology, computer hardware improvements and software development.

**2.9 LIMITATION OF THE STUDY**

Commonly, dimensions of measure such as return on investment, return on equity, return on sales and return on assets are used for measuring the financial returns. But certain non-financial efforts cannot be measured with these financial tools (Zahra, 1993) (Tsai, 2004). In general, the subject to discuss is a continuous process that how to measure innovation. Damanpour (1990) maintained that the strong relation of innovation and performance of the firm based on the criteria of measurement. The traditional orientation is dependent upon the number of research activities (new processes, products or technologies) undertaken by the organization to monitor the level of performance (Hagedoorn and Cloodt, 2003) (Tushman & O’Reily, 1997). Jaumotte and Pain (2005) mentioned that economy is having income on higher side only when it is research-oriented. Usual innovative performance dimensions are R&D spending, the number of patents, number of copyrights, etc. (Alpkan et al., 2005). The five likert scale measurement ranging from unsuccessful to extremely successful may bring in partiality in the responses of executives but are extensive exercise in experimental study (Khazanchi et al., 2007). The main cause to use such scale is unwillingness on the part of the executive to disclose financial figures(Boyer et al., 1997; Ward and Duray, 2000). Moreover, senior executives are experts in providing exact subjective information needed (Choi and Eboch, 1998). Moreover, objective question restricts the comparison part in answers (Dess and Robinson, 1984; Porter, 1979) (OECD, 2005).

Conversely, a definite quantity of period might be required in order to examine the indication of favourable impact of corporate performance levels. A time gap exists between product innovation and its impact on financial performance (Zahra and Sidhartha, 1993; Teece, 1988; West 1992). This is only reason that senior management always criticize that they do not able to reap the results of innovation. Boston Consulting Group’s Annual Innovation Report (Andrews, 2007) (Boston Consulting Group, 2011) subsequently confirmed the top management research about the same concern. However, innovation vestiges an apex tactical focal point for the mainstream organizations and the expenditure on innovation has a rising

inclination every year, lot of executives studied-stay unhappy with financial outcomes on their initial investments in the innovation process (Ulrich & Eppinger, 2007) (Ulusoy, et al., 2013).

### **2.10 RESEARCH GAP**

The previous researches have not evidently calculated the impact of product innovation on the financial performance of the company. The researches are questionable regarding the impact on long-term financial performance of the company. There are also studies and researchers that focused on the innovation and its effects. There are also researchers that concentrated on impact of innovation forms on the performance of the firm (Gunday; Ulusoy, 2011). McAdam and Keogh (2004) (Urban & Hauser, 1993) focused on the performance of the firm and its knowledge with research and innovation process. Authors also focused on the analysis of major innovations and patents to various corporate performance dimensions such as accounting profitability, growth rates etc. (Geroski, 2005) (Utterback, 1994). There are also studies that discussed about the flow of novel products and its impact on the brand image of the firm in the mindset of the consumer (Metcalf, 1998). (Utterback & Abernathy, 1975) (Fagerberg et. al (2004) revealed that innovative economies had advanced efficiency and earnings than the fewer innovative ones. Academic research have initiated the innovation research that has been developed and complete by the new study which strived to explain the innovation idea by explaining firm practices, procedures and rules and features wherein firm evaluate their hard work for the generation of novel ideas about goods and services in the market place (Pinchot, 1985; Stevenson and Jarillo, 1990; Hitt, et al., 2001) (Nwokah, et al., 2009) (Valkenburg, 2000). Although there has been no particular research that determines on impact of product innovation on the financial performance of the organizations with respect to Delhi/NCR. Thus, this research focuses to fill the gap by interpreting the impact of product innovation on the financial performance with particular reference to Delhi/NCR.

### **2.11 CONCLUDING REMARKS**

This chapter includes a literature review present on the researches done to interpret the impact of innovations on the financial performance of the companies with major determination on the Auto business. The research is divided in two separate parts: 1) Interpreting the factors of product innovation and 2) Interpret the effect of product innovation on the financial performance of the organization. There presents diverse opinions on the impact of product innovation on the financial performance of firms. Some researchers conclude that product innovation has positive impact on firms' financial performance whereas some conclusions are not in favor of product innovation improving financial performance.

# **CHAPTER-3**

# **RESEARCH METHODOLOGY**

### **3.1 INTRODUCTION**

Research Methodology is a organized procedure used to gather data and facts, perform a anxious examination and factually, test it for the aim of creating business and economic judgments. The procedure could consist of broadcast study, information gathering processes, how to oversight conversations and inspections and other research accesses. Research may involve knowledge from current and previous researches.

The research methodology is essential and the main important element of research writing as it determines on forms of research approaches and states the distinct designs, procedures and crucial phases followed in the thesis writing and assists us to make a decision out of them, based upon our research issue and favored technique. It is compulsory to involve a basis of the theories and facts that control these designs. There are numerous distinct solutions to access the research that meets the needs of a thesis.

The designs and procedures are selected in order to meet the research targets beneficially. This thesis has been taken out to analyze the effect of determinants of product innovation on the financial performance of the selected organizations in India. This chapter states the distinct research designs followed in the distinct levels of research thesis. The major sections of the chapter includes the method of the study, augmentation of tool which states the process used in making the tool, pilot study, gathering the information and information scrutiny which states the factual instruments used to check the information.

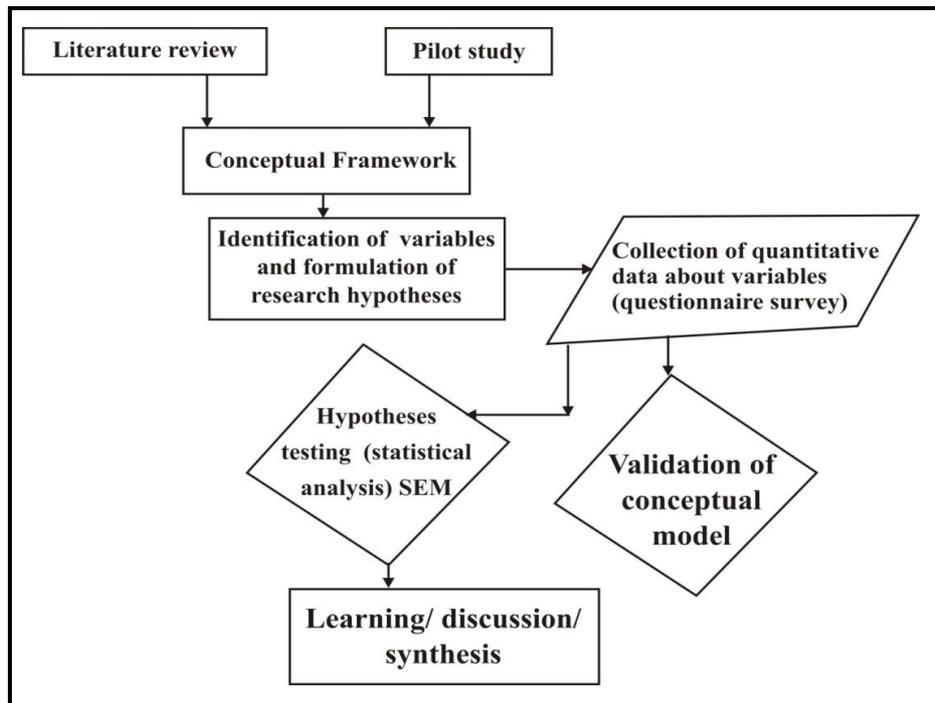
### **3.2 RESEARCH DESIGN**

Research design is the advising route of the research which is targeted at making the research in a sense those outcomes in the solution of the made-up challenge (Sekaran, 2003). There are many forms of researches; fundamental, detailed, cause and effect or case study investigation. Each of them is a way of clarifying issues, or for knowing development of concern and achieving extra information in that field.

The research approach accepted for the research was detailed research. Greenfield (1996) found that descriptive evaluation states the questions of who, what, where, when and how. It does not give solution to the questions of why. Descriptive evaluation handles everything that can be measured or numbered. Descriptive evaluation is majorly taken out when the scientists requires having perceptible attention of the items under research. This study also tries to establish causal linkages among items.

It states the link between basic determinants that affect determinants of product innovation such as Intelligence generation, Intelligence dissemination, technology selection, linking product-process innovation etc. and their impact on the financial performance of the organizations.

To the finest of the scholar's information, this research is the foremost trial to perceptibly check impact of product innovation on the financial performance of the select organizations in Delhi/NCR. Therefore, the use of a detailed and cause and effect research method was considered suitable. Detailed and cause and effect studies have been widely used to check the impact of product innovation on the financial performance of the selected organizations (Gill & Biger, 2009; Srivastava, 2007; Bennet et al, 2012; Dharmaja et al, 2012; Ting and Yu, 2007).



**Figure-3.1: Framework of the Research Methodology**

### 3.3 RESEARCH OBJECTIVES

The main objective of the research is to explore answers and inquiries to a novel business economy issue and to meet a diligent adventure of curiousness. However, every study is done and taken out with particular aim, here are few of the common aims for the study.

1. To achieve an information of a theory or to generate novel intuition into it. Study with such a target is divided as fundamental or basic study.
2. To accurately state the particular features of a individual, context or a team. This study taken out with such an aim follows the detailed research design.
3. To notice the frequency at which an event takes place or the dependent items linked with that act. It can be seen by following distinguishing study procedure.
4. To evaluate the assumption of causal linkage between the independent items and dependent items correspondingly.

Any examination may have primarily two aims i.e. academic aims and utilitarian aims. A strong wish for learning is the principle segment of intellectual research. Academic research was exceptionally generally respected at one time. However, now there is a great deal of progress in exploration world and examination is presently more related utility-turned than simply academic arranged. The purpose of this study is to study the impact of product innovation on the financial performance of the organizations. There are many performance criteria of product innovation but this research is related only to financial performance criteria. The topic describes the determinants of product innovation and its impact on the financial performance of the organizations.

#### **THE RESEARCHER HAS PROPOSED THE ACCOMPANYING FUNDAMENTAL FOCUSES**

##### **1. To analyze the factors that lead to product innovation**

- a) Whether Intelligence generation is a vital factor influencing the product innovation?
- b) Whether Intelligence dissemination is a vital factor influencing the product innovation?
- c) Whether Technology selection is a vital factor influencing the product innovation?

- d) Whether Flexibility is a vital factor influencing the product innovation?
- e) Whether Dependability/ Delivery is a vital factor influencing the product innovation?
- f) Whether Quality is a vital factor influencing the product innovation?
- g) Whether Marketing Support of the Product is a vital factor influencing the product innovation?
- h) Whether Product- Process Innovation is a vital factor influencing the product innovation?

**2. To analyze the impact of product innovation on the financial position of the organizations**

- a) Whether Intelligence generation is a component of product innovation that has a significant impact on financial performance?
- b) Whether Intelligence dissemination is a component of product innovation that has a significant impact on financial performance?
- c) Whether Technology selection is a component of product innovation that has a significant impact on financial performance?
- d) Whether Flexibility is a component of product innovation that has a significant impact on financial performance?
- e) Whether Dependability/ Delivery is a component of product innovation that has a significant impact on financial performance?
- f) Whether Quality is a component of product innovation that has a significant impact on financial performance?
- g) Whether Marketing Support of the Product is a component of product innovation that has a significant impact on financial performance?
- h) Whether Product- Process Innovation is a component of product innovation that has a significant impact on financial performance?

The independent variables of this research are: Determinants of product innovation (Intelligence generation, Intelligence dissemination, Technology selection, Flexibility, Dependability/ Delivery, Quality, Marketing support of the product, Product-Process Innovation). The dependent variable include: financial performance.

**3.4 RESEARCH METHOD**

Research design is the advising route of the research which is targeted at making the research in a sense those outcomes in the solution of the made-up challenge (Sekaran, 2003).

Research methods can be divided into distinct forms such as detailed or cogent, practiced or exploratory (fundamental research), measureable or subjective, theoretical (usually termed as imaginary and research based) or experimental, inaugural or derivable. Each of them is a way of clarifying issues, or for knowing development of concern and achieving extra information in that field.

Research can be taken out following either of the above or a mix of above methods based upon the form of research and area of study. These research approaches matches to distinct forms of research procedures; theoretical method and check aspect. Here is a short description of distinct research methods.

**DESCRIPTIVE VS ANALYTIC RESEARCH**

*Descriptive research* involves inspections and statistical inquiries of distinct forms. In research study, descriptive research is also defined as after-effects research. This approach is selected in instances where we required knowing the amount of dimensions such as the repetition of behavior or acts, choices of individuals or identical data. In comparison cogent *research* study is dependent on the previous figures and knowledge.

The research approach accepted for the research was detailed research. Greenfield (1996) found that descriptive evaluation states the questions of who, what, where, when and how. It does not give solution to the questions of why. Descriptive evaluation handles everything that can be measured or numbered.

Descriptive evaluation is majorly taken out when the scientists requires having perceptible attention of the items under research. It's a design where the analysts plans what to study; asks particular, short inquiries; gathers measureable data from respondents; evaluates these figures using facts; and holds the question in an impartial, detached sense (Malhotra, 2007). Further, the research targets at making the link between items in the issue. The questionnaire inspection method is considered to be appropriate to gather knowledge from the examined group. The questionnaire was made and pre-checked before providing to the participants. On the basis of the theoretical model made through research studies, assumptions were achieved and certified factually using multivariate reasoning. The multivariate factual instrument, structural equation modeling is applied to search the association between distinct factors of product innovation. The inspection way was seemed suitable for this type of issue as it is simple to use and the information generated is accepted trustworthy since the replies are confined to the options given (Malhotra, 2010).

#### **APPLIED VS FUNDAMENTAL RESEARCH**

*Applied Research* targets at researching an response or answer for a specific issue being confronted by a public, a firm or a particular sector. It is targeted at generating depth to a societal or corporate issue and setup outcomes. This research comes in the class of applied research as it leads to product innovation industry and attempts to search and evaluate the determinants affecting its acceptance and development. In common this study design is aimed to search social, economic or political changes those are probably to affect a specific association or sector. Marketing research and analysis study are instances of applied research. In other way, *Fundamental* or *Basic Research* is majorly deals with the innate experience or linking to real maths.

#### **QUANTITATIVE VS QUALITATIVE RESEARCH**

*Quantitative research* is a procedure of calculating items and authenticates old models and assumptions. This research follows the measurable design as includes the gathering of major information, which leads to accurate measurable evaluation in a explicit and definite trend. Information has been used to derive new assumption dependent on the outcomes of the information gathered about distinct items. The course is started with the making of a questionnaire with the aim to collect factual figures from the feedback of the people. Questionnaire vision to be a meaningful and simple way gathering and compiling data and information from population. Questionnaire may involve of open and close-ended questions. It may also involve MCQ's for the participants to select the most important feedback to a inquiry. It is very hard to make and codify a questionnaire. Frequently participants may go to duplicate marking of choices in the same arrangement or generally choose the average choice in a feedback of 1-5 measurement scale. Participants can usually omit or bounce the subparts of a question. Thus, a anxious attention and an professional suggestion is taken while making and explicating the questionnaire. Scientists has to take care that the questions are simple to explain and fair to participants to give a worth feedback.

Quantitative research can further be divided into *inferential*, *experimental* and *simulation* research. The target of *inferential* approach is to collect the information to generate features or linkages of people. This usually involves survey research where a part of people is researched, noticed and evaluated to find its features, and then results that the people has the same characteristics and properties. *Experimental* research design is made by a research experiment includes changes of many items and noticing their impact on other items. *Simulation approach* involves making of artificial surroundings, which derives the important data and statistics. This designs aims to notice the changing role of a scheme.

Whereas *Qualitative research* methods involves considering in-based interviews (having face-to-face interactions, documenting their responses (which involves lot of time) and making relevant notes) and *focus groups* in which conversation is in the way of a discussion in a group with many respondents in a compartment and initiator starts the discussion and focuses on a topic and discussions should not deviate and emphasized on a particular points. This design is targeted when the analyst is curious in noticing and evaluating the basic objectives, wants and causes of a particular reaction of human. A study based on detecting the attitude and viewpoints for e.g. What people think and how they react to a specific area.

Research Method is an complete design to the process of research that states the complete planning of action to get a wanted results (Crotty, 1998). A research method notes that design by which an examination is

taken out. The two general research methods broadly taken by the examiners are Qualitative and Quantitative research. The research method accepted in this research is *quantitative* research. It's a design where the analyst chooses what is the research subject; asks particular, short queries; collects measurable information from respondents; evaluates these quantitative figures using facts; and handles the analysis in an impartial, multiple way (Malhotra, 2007). Additionally, the research targets at developing the link between items in the issue. The questionnaire survey method is considered to be apt to gather data from the sample. The questionnaire was made and pre-checked before providing to the participants. On the basis of the theoretical model made through previous studies, assumptions were made and analyzed factually using multivariate analysis. The multivariate statistical tool, Structural Equation Modeling is used to search the impact of product innovation on the financial performance of the selected organizations. The survey method was seemed correct for this type of issue as it is simple to understand and the data generated is taken trustworthy since the feedback are finite to the options given (Malhotra, 2010).

### **CONCEPTUAL VS. EMPIRICAL RESEARCH**

*Conceptual Research* is linked to some vague model or an idea. It is also defined as conceptual and previous studies based. It takes choice and interaction of conceptual methods and linked descriptive methods, and detailed evaluations of models in way of their usability. The emphasis is not on generating anything about the society but to reach an intuition about the worth of the important models or concepts. In other way, *Empirical research* depends on experimental or examination of a specific society, firm or groups of similar people. This research is dependent on Empirical research approach. It is information-based study, generates outcomes that are competent of being authenticated by examination and experience. It is usually defined as experimental research. In this design a functioning theory with an axiom to the transparent inferred outcomes is foremost achieved and then task has to be taken out to gather most statistics and numeric values in way of information to substantiate the assumption made in starting. Lastly, the analyst made the experimental methods to take the expected data. Experimental study is correct when distinct research items are interlinked and we required asserting it with proof in the way of information.

### **DEDUCTIVE VS. INDUCTIVE RESEARCH**

*Deductive Research* is concept checking and *inductive research* is concept deriving. This research is dependent on deductive research method. Deductive research is mainly related to information, surveys and measureable experiments. This method follows from top to bottom method. It starts with making a wide concept around the study area and then limits it down into more particular assumptions, which can be checked. It is more condensed and cutback by collecting data to match the assumptions. In comparison, inductive research is related with subjective conversations or ethnographic task. It follows from bottom to top method, which starts with particular information; searching same arrangement and uniformities in them and taking more common and wider theory, lastly leading to some general outcomes.

## **3.5 RESEARCH PROCESSES**

Research process is classified into distinct stages including identifying, observing, evaluating, analyzing and then making and communicating our theories to reach to the final results. Below are the widely divided stages in the overall research process.

### **3.5.1. IDENTIFY THE RESEARCH TOPIC**

The initial step in the research process is to state the research issue and search foremost assumptions. In this stage, research field was searched as "Impact of product innovation on the financial performance of the selected organizations". The research field has been taken in detail with the expert and a rough draft made on research proposal has been given to the academic committee.

### **3.5.2. REVIEW THE LITERATURE**

During this stage initial identification has been taken which includes collection of basic data and searching main theories linked to subject under research. The target of initial identification is to get basic information about the issue field.

The literature review also informs the analyst about what researches have been taken in the past, how these researches were taken, and the outcomes in the issue field. Previous studies review has been taken through

books on product innovation, internet search engines, published journals and bank websites.

### 3.5.3. CLEARLY DEFINE TERMS AND CONCEPTS

Terms and concepts are definitions or statements used in the objective of the research or the writing of the research. These variables require to be particularly described as they use to the research. Terms or theories usually have distinct words based on who is studying the topic. By explaining the definitions or theories more precisely, the boundary of the research is more controllable for the researcher, making it simpler to gather the required information for the research.

### 3.5.4. DEFINE THE POPULATION AND SELECT A SAMPLE

Research studies can emphasize on a particular set of population, expertness, estate making, staff assessments, plans, monetary health, promotional attempts, or the involvement of automation into the production operations. For instance, if a analyst wants to check a particular set of population in the society, the research could check a particular group of age, gender- male or female, people living in a particular geographic location or a particular cultural association. The study issue and the target of the research help the analyst in searching the team to include in the research. In research definitions, the association to include in the research is called the population. Initially, it finites the boundary of the research from a big population to one that is controllable. Secondly, the people searches the association that the analyst attempts will be emphasized within the research.

### 3.6 PARTICIPANTS OF THE STUDY

- The population means the total units from which the sample is to be taken. It may be infinite or finite. A finite population is the one in which the quantity of things is limited, while an infinite population is the one in which quantity of things cannot be measurable. For this research, firms who are market leaders in the Automobile sector in Delhi-NCR Region are taken as population based on facts that shows the passenger car market share in India in the fiscal year of 2014 (Source: SIAM- Society of Indian Automobile Sectors). **This statistic shows the passenger car market share in India in the fiscal year of 2014 (Source: SIAM- Society of Indian Automobile Sectors) in Table 3.1.**

Company Name	Market Share (%)
Maruti Suzuki	42.08%
Hyundai	15.18%
M&M	9.15%
Tata Motors	5.59%
Honda Cars	5.36%
Toyota	5.16%
Ford	3.37%

Source: <http://www.statista.com/statistics/316850/indian-passenger-car-market-share/>

#### 3.6.1 Sample Frame

This states to the origin from which the sample were to be taken. For this research, firms in Delhi/NCR, India were the respondents. The participants were selected based on the theory of based on the Theory of Vijay Sathe (2005), where Market share and Performance such as sales turnover, Profitability etc. is considered in the Auto sector. (SIAM- Society of Indian Automobile Sector. Four major players were selected: Maruti Suzuki, Hyundai, Mahindra & Mahindra and Tata Motors.

**Table-3.2: Respondent Profile for final data collection**

Level of Managers/ executives	Average Experience in Current Positions (Years)	No. Of Persons
Senior Management	8	94
Middle Management	10	219
Operational Management	12	110

**Table-3.3: Respondent Profile for Pilot Study**

Level of Managers/ executives	Average Experience in Current Positions (Years)	No. Of Persons
Senior Management	8	14

Middle Management	10	37
Operational Management	12	49

**3.6.2 Sampling Design**

Sampling design is the design that is selected by the analyst to choose upon the sampling aims from the sampling framework. There are two of sampling techniques used: Probability Sampling and Non-probability Sampling Technique. Probability Sampling is one in which every part has an equidistant probability of being chosen whereas in non-probability sampling, the analyst uses his own observation in choosing the samples and every part does not have an equal probability of getting chosen.

**3.6.3 Sampling Technique**

For this research, Non-random Purposive/Judgmental and Snowball Random Sampling were used. It is an inspecting method in which the sample is taken by choosing advantageous population units. With the final target of research, important data was collected with the help of a commonly made questionnaire provided to staff in the chosen firms. Additionally, Judgmental or purposive inspecting method was used taking into consideration that the participant’s selection will have enough general information of innovation since they happen to be using many innovation practices. As the knowledge regarding the populace or the total units was not completely feasible, the questionnaire research was also taken out using snow ball random sampling method.

**3.6.4 Sample Estimate**

Sample estimate: A sample of 423 top and middle executive from various automobile firms were selected for the purpose of study. This sample size was determined keeping in mind the following criteria:

Statistical Analysis	Minimum Sample Size
Structural Equation Model (SEM)	<ul style="list-style-type: none"> <li>Sample size as small as 50 found to provide valid results (Hair et al. 2006).</li> </ul>
	<ul style="list-style-type: none"> <li>Recommended minimum sample sizes of 100-150 to ensure stable Maximum likelihood estimation (MLE) solution (Hair et al. 2006).</li> </ul>
	<ul style="list-style-type: none"> <li>Sample size in a range of 150-400 is suggested (Hair et al. 2006).</li> </ul>

Also, Number of factors \* 25 (Hair et al,1999).

9X25= 225 Sample Size

Number of statements \*5 (General thumb-rule)

32X5= 160 Sample Size

For factor analysis, 330 sample size is adequate (Nunally 1976; Fiedel 2001)

Hence, after the final questionnaire, the sample size was considered to be 400 to 450 respondents to fulfil the above objectives.

The table below shows the research methods and the sampling techniques used for pilot study and questionnaire study.

**Table-3.4: Description of Research Methods and Sampling Techniques Used**

Study stages	Aim of the study	Research Method Used	Sampling Technique Used
Pilot Study	To ensure affirmation of the questionnaire	Questionnaire Survey Method	Purposive Sampling
Questionnaire Study	To bring out the linkages among different items under research	Questionnaire Survey Method	Purposive Sampling & Snow-ball Random Sampling

**3.7 DATA COLLECTION**

Data collection is the method of gathering information from the targeted universe in order to check the assumptions derived for the research. There are two designs by which data can be gathered. They are primary

sources and secondary sources. Primary sources are the origins used by the analyst to collect the raw data from the targeted people. On the other hand, secondary sources involve data which have been gathered initially for some other examinations by some other examiners.

The primary data for the research was collected by way of organized statements and uses data linked to the factors of the research. Each factor is calculated using a 5-point Likert scale. The research targeted at gathering information from 450 participants but the main data, except the omitted data and questionnaire which are not complete came out to be 423 giving an entire feedback rate of 96% roughly. The information was gathered through firms, in Delhi/ National Capital region of India, practicing product innovation.

### **3.7.1 Design of Questionnaire**

The questionnaire is “mainly accumulation of inquiries that suit the study area and its targets, and the solutions to which will give the information necessary to check the assumptions made for the research” (Kothari, 1985). The bases of all questionnaires are the inquiries or definitions for which the analyst wants to search answer or viewpoint in ways of compliance (Nachmias and Nachmias, 1981). The making of questionnaire is an task that includes many stages beginning from clear meaning of the study area, problem search and links of items. Making of questions, require a in depth consideration of the area under study (Yin, 2002). Thus, the questionnaire has been made on the basis of the theoretical model made in chapter two, using research items searched through the previous studies survey and enhanced through the pilot study. It uses organized questions where the participants do not have to pen down their feedback, but have to choose one of the given choices (given in the questionnaire), which syncs with their opinion/ past experience. The questions have been made in simple language usually used by the participants so that these are simply known. The questions have been made in a sense that the question tells only one ‘logic’ at a time. The language used is detailed and links as much as possible to the thoughts of innovators. The arrangement of the questions in the questionnaire have been seen anxiously, beginning with common and simple questions, gradually moving to more particular questions asking for participants opinion on deep circumstances linking to the research.

Questionnaire also targets to calculate the study items to evaluate checking of the assumptions. The research includes subjective items. Thus, the idea of calculation is based on subjective evaluation of the size of the items on relative bases. Likert type scale has been made for calculation of items where a participant is demanded to convey his/her viewpoint on a measurement scale, with choices involving ‘5=strongly agree’ to ‘1=strongly disagree’. With the hypotheses that equivalent pauses on the scale states equivalent measurement of the items /variables, the measurable scale may be considered to be roughly nearer to the ‘interval scale’ (Kothari, 1985 and Thakur, 1993). The interval scale provides use of factual measurements like mean and standard deviation. Product moment correlation technique, t-test and F-test are also suitable in the case of interval scale (Kothari 1985).

During communication with the staff practicing product innovation (during snowball inquiry, pilot study, questionnaire validation and pre-testing stages), it observes that product innovation as a term was still unclear to the staff and most of the population belief that this word is linked with FMCG sector only. Hence, keeping in mind the targets of the research, the group of questions in many ranges has been made in independent study fields. Questions have been made to calculate the items in the specific study area and their impact on financial performance.

The questionnaire also contains some under control questions, which may state the trustworthy of the participants. Few questions same to those asked in previous studies are demanded again in distinct sense context(s) to launch cross-check(s) on the participant’s trustworthiness. Short depiction of the aim of the research and briefing with respect to writing up the questionnaire are given along with the questionnaire.

### **3.7.2 Questionnaire Format**

Data has likewise been collected from some firms practicing product innovation i.e. survey and to a few experts poll was circulated either by means of email or commonly. Major portion of reaction taken through email. A self- administered survey was provided to staff in Delhi/NCR. Cautions were taken to reduce duplication in the sample. The questionnaire provided to staff measured the following items:

Dependability/ Delivery, Quality, Marketing support of the product, Intelligence generation, Intelligence Dissemination, Flexibility, Technology Selection and Product-Process Innovation and their impact on the financial performance of the selected organizations. Variables to measure these items were taken from previous studies.

The Questionnaire contains 2 sub-sections first the determinants of product innovation containing 28 statements and second had 4 statements revolving around financial factors.

The questionnaire used for the target of the study is classified into eight independent study parts for different variables namely- Dependability/ Delivery, Quality, Marketing support of the product, Intelligence generation, Intelligence Dissemination, Flexibility, Technology Selection and Product-Process Innovation and their impact on the financial performance of the selected organizations.

**Table-3.5: Study Variable Areas and Corresponding Parts of the Questionnaire**

S. No.	Study Variable Areas	Number of Question
1.	Intelligence generation	Part I Q.1 to Q.4
2.	Intelligence Dissemination	Part I Q.5 to Q.8
3.	Technology Selection	Part I Q.9 to Q.13
4.	Flexibility	Part I Q.14 to Q.17
5.	Dependability/ Delivery	Part I Q.18 to Q.22
6.	Quality	Part I Q.23 to Q.24
7.	Marketing support of the product	Part I Q.25 to Q.26
8.	Product-Process Innovation	Part I Q.27 to Q.28
9.	Financial Performance	Part II Q.29 to Q.32

The table states study areas, questionnaire section parts and number of question in various sub-sections/portions. The questionnaire has 32 statements to which feedback were taken.

### **3.7.3 Questionnaire Testing**

On completing the questionnaire affirmation, it was administered to testing through a pilot survey given to a small sample of participants (100 participants). In testing, participants are chosen from total universe from which the main survey studies to be taken and the questionnaire is used on it (Thakur, 1993).

### **3.8 PILOT STUDY**

The aim of the testing the questionnaire was to assure that the questionnaire was simple to accept to the participants, and to avoid the potentialities of misinterpretation, distraction and partiality. In the process of testing, 100 participants were provided the questionnaire. Therefore, each participant was asked based on questionnaire, with an target to establish the fragile areas of the questionnaire. Each participant was asked to convey the challenges confronted in writing the questionnaire and potentialities for more enhancements for simpler acceptance of the participants. The recommendations regarding dialectics, making of questions, organizing, arranging etc. were observed. The distracting and issue questions were reframed in connection with the particular participants and reassessed with all participants jointly. Therefore, the questionnaire was changed to assure that the matter, shape, organization of questions, spacing, sequencing and overall picture of the questionnaire are tested for getting the wanted feedback from participants writing the questionnaire. The final part of the questionnaire is given at appendix-II.

### **3.9 RELIABILITY ANALYSIS**

Reliability is the amount to which a group of measurable variables would give similar outcomes if gathering of information were duplicated (Malhotra, 2007) and is checked by considering the amount of organized change in a measurement scale. Measuring the Cronbach alpha coefficient of a measurement scale is the main generally barometer of internal similarity (Pallant, 2007), with the fair Cronbach Alpha co-efficient being over 0.7 (Hair et al. 2010). A value of below 0.7 is taken to state uncontented internal similarity reliability (Malhotra, 2007). The following table summarizes the Cronbach’s coefficient alpha for the pilot study of nine constructs with 32 statements.

**Table-3.6: Summary of Overall and Individual Constructs Reliability analysis for the Pilot Study**

Cronbach's Alpha		N of Items	
.905		39	
Constructs	Items	Cronbach Alpha	Inter-item Correlation
Intelligence generation	4	0.711	0.366- 0.907
Intelligence Dissemination	4	0.859	0.284- 0.876
Technology Selection	6	0.884	0.202 - 0.956
Flexibility	4	0.911	0.499 - 0.864
Dependability/ Delivery	5	0.686	0.454 - 0.982
Quality	3	0.736	0.454 - 0.998
Marketing support of the product	5	0.708	0.202 - 0.956
Product-Process Innovation	4	0.715	0.499 - 0.864
Financial Performance	4	0.819	0.454 - 0.982

Other than Cronbach' Alpha, second measurement to check internal consistency is the inter-item correlation (the correlation among items) (Hair et al. 2006). For the pilot study, all inter-item correlation values exceed 0.3. This states the reliability of the measurement instrument. The Cronbach alpha values of all the factors were greater than 0.7, which is taken to be fair and adequate. This states high internal consistency amongst each item.

### 3.10 VALIDITY OF THE QUESTIONNAIRE

Validity of a questionnaire indicates to the extent to which it calculates what the analyst wants to measure. Inadequate validity defines a research failure when the research method is not capable to achieve what is meant to achieve. High intensity of affirmation shows the correct nearness to the actual worth.

#### 3.10.1 Face Validity

Face validity indicates to the intensity of fit/suitability between the analyst's approach and the notion of the items, which are functioning through the questionnaire. The functional terms looks on the front of the questionnaire as though it calculates the theory research. To set face validity of the questionnaire, higher professional analysts was demanded to state his/her attitude of the research items and also state whether the functional terms of the items coincide to the theories. As a conclusion, the dialectic of the questions involved in the questionnaire was amended as per the recommendations and advices of the seniors.

#### 3.10.2 Criterion Related Validity

Criterion related validity indicates to the intensity to which the calculations with the questionnaire are sense fully linked to the targets of the questionnaire. This affirmation was taken with the closed interaction of higher experts and analysts. Their recommendations for enhancements were taken into the tool/ questionnaire. Wherever needed, the dialectics/ wording of the inquiries was rectified/ amended.

#### 3.10.3 Content Validity

Content validation is explained by the question: "Is the meaning of this measure represents the population of content of the sample being calculated?" (Kerlinger, 1973). Content validation contains necessity in judgment. For this objective, senior higher professional/analysts were provided the questionnaire along with the targets of the research and the functional terms of the items. The examiners gave their skilled opinions on two forms, firstly, which questions calculates which item; and secondly, which purposes were being considered in the questionnaire and which forms of the purposes were uncovered in the questionnaire. Wherever such issues were observed, the matter of the question(s) was changed. Some questions were altogether reframed, and some were divided into two questions for the objective of understanding and/or to avoid the confusion in measurement. The examiners also explained in re-organising of the questions and in making of the control questions for crosschecking the trustworthiness of the participants.

#### 3.10.4 Construct Validity

Construct validation and experimental logical audit are firmly linked. It does not search to affirm the check, but targets to affirm the concept behind the check (Kerlinger, 1973). A measure is said to have construct

validity to the extent that it leads to find inter-relation with other conceptual prepositions. Almost all the variables for many factors for firm's practices have been picked from measurement scale made by many researchers. Although, some of the items have been taken for the research target. Thus, the construct validity is being tested for the research items.

Factor analysis is a way for considering the number and description of the basic items among bigger set of measurements (Kerlinger, 1973). It provides clear thought of the arrangement of a correlation table. In specific, it permits studying the inter-relation among a major set of correlated numeric items by dividing the items into new constructs. The items within each construct are more highly linked with items in that construct than the items in other factors.

The factorial affirmation assists in approving whether the information gathered for a specific group of measurements does or does not show the hidden factors. Principal component factor analysis takes only the general deviation linked with a group of items (Kerlinger, 1973). Generally, the first construct taken does not provide meaningful constructs. Rotation makes higher loading even higher and less loadings even lesser. Thus, procedure of rotation gives constructs that can be labeled and analyzed. Varimax rotation has been used as it gives fairer division of constructs (Dhillon and Goldstein, 1984). While doing the construct affirmation, loading for overall factor has been tested.

### **3.10.5 Road Map**

**This design stage involves searching explanations to 3 major questions.**

1. **How to collect the data:** Analysts requires searching whether the research is an appraisal, a measurable research or a subjective research. This assists in considering how to gather information. For this research, the information was gathered through numeric information gathering designs. Information was majorly collected through self explanatory questions in which a compact copy of fairly stated and affirmed questionnaire was shared to research sample and was needed to meet in their selections. A part of whole information gathering was also gathered through the organized conversations in which the inquiries were read out personally to the participant and their selection was observed individually. Some of the samples of information were also collected through dispatching the questionnaire through emails. Another way of internet browsing survey was also accepted for the information gathering process.
2. **Where to collect the data:** The information has been gathered from New Delhi and National Capital Region (which included the samples from Noida, Faridabad and Gurgaon).
3. **How to evaluate the data:** The type of evaluation used with information is considered by whether the information gathering method accepted is subjective or objective information. Because in this research, the information is considered to gathered through numeric survey designs, information evaluation of the collected numeric information has been taken out using factual analysis instrument *Statistical Package for the Social Sciences (SPSS)*, *Structural Equation Modeling using AMOS(4.0)*, *t-test* and *one-way ANOVA*.

### **3.11 DATA ANALYSIS**

The information was checked using The Statistical Package for the Social Sciences (SPSS v 21.0) and by Structural Equation Modelling using AMOS (4.0). A multivariate approach was taken to find links between Dependability/ Delivery, Quality, Marketing support of the product, Intelligence generation, Intelligence Dissemination, Flexibility, Technology Selection and Product-Process Innovation and their impact on the financial performance of the selected organizations. Data analysis by using questionnaire survey was demanded to give important data to meet the targets of this study.

#### **3.11.1 Statistical Tools Used**

The factual instruments used for this research were Structural Equation Modelling (SEM). Structural Equation Modeling (SEM) was used to set multiple dependent links among items (Malhotra, 2007). SEM is common way used to describe any two computer based arithmetical packages like PLS-PA and LISREL/AMOS software. These methods are the alternatives of regression equation methods (Westland & Christopher 2010)

## **STRUCTURAL EQUATION MODELLING (SEM)**

The major aim of the study was to make a behavioral concept that states the impact of product innovation on the financial performance of the selected organizations. So, in order to accomplish the target, Structural Equation Modeling was taken appropriate. Structural Equation Modeling is a multivariate analysis that joins facets of factor analysis and multiple regressions and enables the analysts to find the correlation among items (Hair et al. 2009). SEM includes the checking of two concepts: a measurement model and a path model (Lei & Wu, 2007).

A measurement model symbolizes the links between the measured items and their factors whereas the path model or the path diagram symbolizes the multiple dependence links between the items (Hair et al. 2009). The assumptions taken will be checked factually by using SEM to ensure how far the theory is similar to the information. The results will be dependent on goodness of fit indices (GOF). The goodness of fit indices are the measures that states the similarity of the theory with the group of data points (Maydeu-Olivares & Garcí'a-Forero, 2010). On the other hand, the indices represent the differences between detected and anticipated figures under the theory (Hair et al. 2009). The analyst model is said to be appropriate, if the detected and anticipated figures are similar.

For the research in specific, a theory was discovered to anticipate the impact of product innovation on the financial performance of the selected organizations. The relationship between the variables (Dependability/Delivery, Quality, Marketing support of the product, Intelligence generation, Intelligence Dissemination, Flexibility, Technology Selection and Product-Process Innovation and their impact on the financial performance) was regressed on various combinations. Thus, SPSS version 21.0 and AMOS version 4.0 was used to administer analysis and discover the behavioral theory of the study

### **3.12 DATA SCREENING**

In order to continue more for evaluating the information, it is required to assure that the information meets the hypothesis of multivariate analysis and is handy, clear and useful for more evaluation. The following challenges were considered to assure the effectiveness of the information.

#### **3.12.1 Missing Data**

Missing data is the information where authentic figures on one or more items are not seen for evaluation (Hair et al., 2010). The missing data may generate many issues for the analyst in analysis. Hair et al (2010) found that the common effect of omitted information is decrease of sample size, thus, any factual outcome, which is dependent on exact number of information to calculate approximation, will not start. Additionally, the missing data also results in partial challenges. A factual outcome based on non-random missing data will result in wrong conclusions. The below four-step process is seemed suitable in searching missing data and using solutions (Hair et al., 2010):

1. Consider the form of missing data
2. Consider the degree of missing data
3. Find the volatility of the missing data processes
4. Chose the assignment method

The missing data evaluation was taken using SPSS and it was seen that the percentage of item as missing data is less than 10%- around 7% and can be avoided (Hair et al., 2010). Additionally, no particular non-random arrangements in missing values were seen. Another step includes assigning the figures of missing information. According to Hair et al (2010), if the omitted information is under 10%, any of the assignment methods can be used. Assignment indicates to the procedure of approximating the omitted figures dependent on the information accessible and assuming the feedback the participant would have provided if he had respond the inquiry (Malhotra, 2010). Because the degree of omitted information was too less, Mean replacement process was taken to assign figures. Average substitution changes the omitted figures for a item with the average figure of that item measured from all correct feedbacks (Hair et al., 2010). Lastly, the information was available to be more evaluated.

### 3.12.2 Multivariate Outliers

Another condition to be satisfied before evaluating the information is observed outliers. Outlier features the anomalous behavior of the information i.e. the information set which are diverging far away from the routine data changes (P.Filzmoser, 2003). Outliers are the data points that are taken distinct from another data points on one or more features (Hair et al., 2010). In other way, they are different instances with uncommonly higher or lower figures or a jointly of figures across many items that make the data points distinct from others. It indicates the information set those considered to be importantly distinct from the bulk of the information sets in the dissemination of information. These outliers can importantly alter information from a routine dissemination and considers how suitably a sample indicates the universe. These can have major impact the exact of the factual evaluation methods and importantly impact the outcomes produced from them (RMouph, 2012).

**There are five major causes of the existence of the outliers.**

- a) Information feeding mistakes or out of order information.
- b) Unsuitably searching the omitted figures in the information set.
- c) Information point not linked to the calculated sample, i.e. sample could be partial.
- d) There is a measurement mistake or information is partial.
- e) Sample dissemination of information for a specific item does not follow the routine dissemination (<http://www.statisticssolutions.com/>)

Outliers may be advantageous or problem creating based on the manner in which they give the data. Advantageous outliers may state a distinct feature of a universe which differently would not have been seen in the normal routine of the evaluation, whereas problem creating outliers states features which does not indicates universe and may deceive the factual outcomes as they are against the targets of the evaluation (Hair et al., 2010).

The outliers were observed using AMOS. In order to observe multivariate outlier, *Mahalanobis d-squared  $D^2$*  is measured. *Mahalanobis distance* states to the gap of each data or information set from the average center of all data points giving a individual figure for each dataset (Hair et al., 2010). The average center is taken as the crossing of the average of the items being taken.

Multivariate outliers are observed by correctly considering the significant criterions of Mahalanobis distance and matching them with respective critical figures of Chi-Square ( $\chi^2$ ) distribution (Rousseeuw and Van Zomeren, 1990). The critical value of Chi-Square ( $\chi^2$ ) is considered from a table with respective extent of freedom (*df=number of variables or predictors*) with p value (probability) <0.001. If the *Mahalanobis distance* of an observation eclipses the critical Chi-Square ( $\chi^2$ ) value, the information set (data point) is taken as an outlier.

Degrees of freedom (df)	Critical $\chi^2$ values
1	10.83
2	13.82
3	16.27
4	18.47
5	20.52
6	22.46
7	24.32
8	26.12
9	27.88
10	29.59
p value (Probability)	0.001

To observe Multivariate outliers using SPSS AMOS, data points with p1 value falls 0.05 are taken affecting outliers i.e. the link between the items for these feedback are anomalous and importantly peculiar comparatively to the remaining sample (James Gaskin, 2015)

The opening figure for making as an outlier, an data point having a  $D^2/df$  value eclipsing 2.5 in minor sample and 3-4 in bigger sample is taken to be potential outlier (Hair et al., 2010). For the research, though some instances explained the features of outliers but because they were not acute, it was not taken required to remove them. The outcomes for the outliers are given in the table 3.7 below:

**Observations farthest from the centroid (Mahalanobis distance) (Group number 1)**

Observation number	Mahalanobis d-squared	p1	p2
52	6.215	.047	.269
57	6.119	.056	.362
41	5.703	.072	.424

**There are two solutions to face these outliers.**

- 1. Trimming:** This method includes escaping the information set (influential outliers) from evaluation and is taken when 1) The information is out of order due to any information feeding mistake or 2) The information or sample is partial.
- 2. Winsorizing:** This procedure includes giving the outliers or changing them with the approximate higher of lower information figure in the sample that is not the outlier. This method is taken when less numbers of values are certain outliers. (Alan Reifman & Kristina Keyton, 2010)

### 3.12.3 Multi-Collinearity

Multi-collinearity is an explanation of linkages of an independent item with a group of dependent items (Hair et al., 2010). Multi-collinearity decreases the independent items authority to anticipate the deviation in dependent items to the degree of its connection with another independent item. The main suitable condition for any research would be to involve independent items which are highly inter-related with the dependent variable but have lesser inter-relation among them (Hair et al., 2010). In order to check multi-collinearity two tools are most generally used; Tolerance and Variance Inflation Factor (VIF). The tolerance is stated as the quantity of deviation of the chosen independent variable not elucidated by the other independent variables. The more the amount of tolerance, the less is multi-collinearity. On the other side, the VIFs calculate how much the deviation of an approximated regression coefficient moves up increases if predictors are interrelated (Minitab, n.d.).

In significance to the research, multi-collinearity test was taken for items. The fact is that  $VIF > 4.0$  when multi-collinearity is a issue. Some researchers authors use the more easy cut-off of  $VIF \geq 5$  when multi-collinearity is a issue (Garson, 2012). The table following indicates that all VIF values were below 3 and thus, there was no multi-collinearity.

**Table-3.8: Multi-collinearity Results (VIFs)**

Dependent Variable	Independent Variables	Variance Inflation Factor (VIF)
<b>Financial Performance</b>	Dependability/ Delivery	1.102
	Quality	1.068
	Marketing support of the product	1.087
	Intelligence generation	1.057
	Intelligence Dissemination	1.292
	Flexibility	1.309
	Technology Selection	1.301
	Product-Process Innovation	1.351
<b>Dependability/ Delivery</b>	Financial Performance	1.126
	Quality	1.136
	Marketing support of the product	1.137

<b>Dependent Variable</b>	<b>Independent Variables</b>	<b>Variance Inflation Factor (VIF)</b>
	Intelligence generation	1.074
	Intelligence Dissemination	1.176
	Flexibility	1.452
	Technology Selection	1.236
	Product-Process Innovation	1.089
<b>Quality</b>	Dependability/ Delivery	1.123
	Marketing support of the product	1.054
	Intelligence generation	1.367
	Intelligence Dissemination	1.421
	Flexibility	1.534
	Technology Selection	1.098
	Product-Process Innovation	1.124
<b>Marketing support of the product</b>	Financial Performance	1.654
	Financial Performance	1.896
	Dependability/ Delivery	1.341
	Quality	1.037
	Intelligence generation	1.832
	Intelligence Dissemination	1.753
	Flexibility	1.085
	Technology Selection	1.146
Product-Process Innovation	1.721	
<b>Intelligence generation</b>	Financial Performance	1.297
	Dependability/ Delivery	1.138
	Quality	1.126
	Marketing support of the product	1.289
	Intelligence Dissemination	1.034
	Flexibility	1.754
	Technology Selection	1.085
Product-Process Innovation	1.136	
<b>Intelligence Dissemination</b>	Financial Performance	1.297
	Dependability/ Delivery	1.721
	Quality	1.074
	Marketing support of the product	1.134
	Intelligence generation	1.289
	Flexibility	1.037
	Technology Selection	1.832
Product-Process Innovation	1.753	
<b>Flexibility</b>	Financial Performance	1.085
	Dependability/ Delivery	1.146
	Quality	1.721
	Marketing support of the product	1.297
	Intelligence generation	1.138
	Intelligence Dissemination	1.126
	Technology Selection	1.289
Product-Process Innovation	1.034	
<b>Technology Selection</b>	Financial Performance	1.124
	Dependability/ Delivery	1.654
	Quality	1.896
	Marketing support of the product	1.341

Dependent Variable	Independent Variables	Variance Inflation Factor (VIF)
	Intelligence generation	1.297
	Flexibility	1.138
	Intelligence Dissemination	1.126
	Product-Process Innovation	1.289
<b>Product-Process Innovation</b>	Financial Performance	1.034
	Dependability/ Delivery	1.754
	Quality	1.085
	Marketing support of the product	1.054
	Intelligence generation	1.367
	Flexibility	1.421
	Intelligence Dissemination	1.534
	Technology Selection	1.121

Once the hypotheses for Multivariate analysis are tested, the information can more be evaluated using SPSS and AMOS.

### 3.13 ETHICS IN BUSINESS RESEARCH

Ethics are the criterions of charge and codes of behavior that separates between acceptable and unacceptable behavior (Resnik, 2011). These benchmarks should be shown in the behavior of many members of survey i.e. the investigator, the participants, the analysts. The aim of understanding the research ethics is to assure that no one is hurted or affected due to conflicting post-effects from research actions.

The investigator should always focus on peculiar areas of ethical attention; the main significant being the confidentiality of the participants. The data given by the participant should be kept closely private and should not be used for objectives other than exploration. This is to establish the self-respect and self-esteem of the participants. Additionally, the participants should not be pressurized to answer, they should be provided honor to quit at any point of time from research. Lastly, the analyst has to establish impartial survey of the information gathered (Sekaran, 2000).

This analysis has been taken considering the important cautions and without breaking any ethical rules. Other than the above stated areas, other ethical attentions as given by Cooper & Schindler (2014) were also accepted like establishing that the benefactor receives ethically organized survey; considering ethical codes when making survey; establishing that the study group follows the proper arrangement.

During this overall research, a due attention has been provided to all the ethical rules and basic research policies.

- a) Analysts have made known himself to the participants and other members of the survey.
- b) Respondents were provided a short description of the study area.
- c) Respondents in this research were completely spontaneous and entirely known about aim and purpose of the research. Participants were elucidated about the advantages wanted from the study.
- d) Respondents were made knowledgeable about their fundamental rights and privacy and were assured that their rights and data will be appropriately covered.
- e) Participants in the research were assured obscurity and an knowledgeable acceptance were taken from all the respondents in the research.

Few of the basic ethical norms that should be considered in the overall research method are

1. **Do Not hurt those individual who are under research study:** The main determination is to assure that the respondents of study are covered against any risk that might come from their taking part in research. A sincere consideration is required to know the harms and likely risks to any person while the study is taken and to take sufficient precautions to avoid any risk of suffering. Risk could be in the way of

physical suffering or mental affect. It is accepted as a norm of professional code of conduct like the Hippocratic Oath (“First of all, do not harm”) (David B. Resnik).

2. **Integrity:** Integrity and honesty is the initial rules of research ethics. Analysts should mitigate taking any measure that separates the honesty of the study. It should be shown in every area of the study from information gathering to method and interpretation. Study should be seriously taken by regarding all consents between the members of the research.
3. **Plagiarism:** Plagiarism (basically derived from Latin word “*plagiare*” which means kidnap) is an act of dishonesty. It states burglary or mugging of words, ideas, logics or explanation of another researcher and then showing it in your name. It’s a sincere ethical crime in the research area. It is taken as a break-in of research rules. In scholarly area it is subject to fines, lay-off or even banishment. It is required to know the process to use referencing in the survey area.
4. **Validity:** It’s the major important condition of the survey ethics. Validity shows how intact, consistent, meaningful and strong the survey is. It is used to both the method and the survey designs taken in the research. A valid information collection aspect that is affirmed.
5. **Data Security:** While taking survey study, it is important to understand the rules set under *Data Protection Act 1998* and to establish that information protection has been consigned with sufficient precautions. This action saves every person member of the researches whose individual or recognizable information are registered in any form; paper documents (hard copies of filled questionnaires or interview notes), computer files and records, audio or visual tape recording. ([www.ethicsguidebook.ac.uk](http://www.ethicsguidebook.ac.uk)). This action provides rights to person (research participants) and puts lawful duties on those who register their private confidential information and hold them responsible for the safety of that information ([www.le.ac.uk](http://www.le.ac.uk))

Many principles and directions have been established in order to save individual information from being sacrificed or burglary. These directions are set around

- a) How to store the information.
- b) Who is designate to access the information?
- c) How will the information be accessed?

Any private or attributable information such as contact information, mobile numbers, and email addresses recorded on hard drives or in computer files should be deleted or saved confidentially. Only the entitled and recognized persons should have the right to use information. Authorized virus protection software should be set on personal computers where the research information is kept. Hard copies files or papers should be saved in safe cupboards. Due attention should be considered while distributing and communicating the information ([www.nottingham.ac.uk](http://www.nottingham.ac.uk))

6. **Objectively & Transparency:** Research equality leads to showing the indifferent and impartial acumen and test of the research study. To ensure equality and openness in research method, information interpretation and analysis and other research areas, researchers must consider proper reliable origins and citations of data collected (A.D.Singh [www.springer.com](http://www.springer.com)). Conclusions should not be shown in a way that is out of situation or attempts to cheat the users. Claims should be dependent on real notifications and should not attempt to spoil or change the real outcomes (Louis Kroeck)
7. **Respect for Intellectual Property:** Intellectual Property leads to any creations, launches, trademarks, patents, methods, copyrights, signs, theory and pictures. It is required to understand and recognize Intellectual property while taking business research and to avoid from using publication of another author, unpublished information, outcomes or designs for getting summaries and results of our research. Intellectual property is protected under patent laws and copyright laws.

**3.14 ITEMS BEFORE AND AFTER DELETION**

**3.14.1 Initial Scale**

<b>IG (Intelligence generation)</b>	
1.	IG1 In our organization, the process of Intelligence Generation is important to design new products and services.
2.	IG2 In our organization, it is critical for the companies to organize the process of intelligence generation and use it to design new products, services or systems.
3.	IG3 In our organization, the capability to generate intelligence and utilize it is most important source of a firm's sustainable competitive advantage.
4.	IG4 In our organization, the people with entrepreneurial pursuits tend to engage in greater level of information scanning activities.
<b>ID (Intelligence dissemination)</b>	
5.	ID1 In our organization, Interaction among employees is critical success factor for product innovation.
6.	ID2 In our organization, the availability of appropriate infrastructure and processes are critical for improving intelligence dissemination within the organization.
7.	ID3 In our organization, familiarity with colleagues facilitates the generation of ideas, is critical to product Innovation.
8.	ID4 In our organization, Identifying and designing Intelligence Dissemination processes are important for product innovation.
<b>TS (Technology selection)</b>	
9.	TS1 The organization selects the leading strategy in our industry.
10.	TS2 The organization place high emphasis on R&D activities.
11.	TS3 The organization selects the most advanced technology in our industry.
12.	TS4 The organization develops new products with technical specifications and functionalities totally differing from the current ones.
13.	TS5 In our organization, the product modifications have a better market response.
14.	TS6 In our organization, the technologies adapted are more advanced.
<b>F (Flexibility)</b>	
15.	F1 The organization always tries to Increase the ability of producing non-standard products.
16.	F2 The organization always tries to increase the product orders with different specifications.
17.	F3 The organization possesses the ability to change machine and equipment priorities when necessary.
18.	F4 The organization always tries to Increase the ability of flexible production.
<b>D (Dependability/ Delivery)</b>	
19.	D1 The organization always looks to Increase the delivery speed of products.
20.	D2 The organization determines and eliminates non-value adding activities in delivery related processes.
21.	D3 The organization highly focuses on increasing the ability to meet the delivery commitments.
22.	D4 The organization always look to Decrease the make span from taking the orders to the completion of delivery.
23.	D5 The organization always look to Increase the just in time delivery.
<b>Quality</b>	
24.	Q1 The organization highly focuses on Increasing the product and service quality according to customer's perception.
25.	Q2 The organization highly focuses on Increasing the product and service quality compared to rivals.
26.	Q3 The organization offer high quality products to decrease the customer complaints.
<b>MS (Marketing Support of the Product)</b>	
27.	MS1 The organization renews the design of the current and/ or new products
28.	MS2 The organization renews the distribution channels without changing the logistics processes

		related to the delivery of the product.
29.	MS3	The organization renews the product promotion techniques employed for the promotion of the current and/ or new products.
30.	MS4	The organization renews the product pricing techniques employed for the pricing of the current and/ or new products.
31.	MS5	The organization develops newness for current products leading to improved ease of use for customers and to improved customer satisfaction.
<b>PI (Product- Process Innovation)</b>		
32.	PI1	The organization determines and eliminates non value adding activities in production processes.
33.	PI2	The organization decrease manufacturing cost in components and materials of current products
34.	PI3	The organization increase manufacturing quality in components and materials of current products.
35.	PI4	The organization develops new products with components and materials totally differing from the current ones.
<b>FN (Financial Factors)</b>		
36.	FN1	There is an increase in the ratio of Return on sales (profit/total sales).
37.	FN2	There is an increase in the ratio of Return on assets (profit/total assets).
38.	FN3	There is an increase in the General profitability of the firm.
39.	FN4	There is an increase in the Cash flow of the firm excluding investments.

The items were finalized on the basis of item-total statistics by deleting the items whose corrected item total correlation is less than 0.5, which will lead to increase in overall Cronbach Alpha (Nunnally, 1978).

### 3.14.2 Finalized Items

<b>IG (Intelligence generation)</b>		
1.	IG1	In our organization, the process of Intelligence Generation is important to design new products and services.
2.	IG2	In our organization, it is critical for the companies to organize the process of intelligence generation and use it to design new products, services or systems.
3.	IG3	In our organization, the capability to generate intelligence and utilize it is most important source of a firm's sustainable competitive advantage.
4.	IG4	In our organization, the people with entrepreneurial pursuits tend to engage in greater level of information scanning activities.
<b>ID (Intelligence dissemination)</b>		
5.	ID1	In our organization, Interaction among employees is critical success factor for product innovation.
6.	ID2	In our organization, the availability of appropriate infrastructure and processes are critical for improving intelligence dissemination within the organization.
7.	ID3	In our organization, familiarity with colleagues facilitates the generation of ideas, is critical to product Innovation.
8.	ID4	In our organization, Identifying and designing Intelligence Dissemination processes are important for product innovation.
<b>TS (Technology selection)</b>		
9.	TS1	The organization selects the leading strategy in our industry.
10.	TS2	The organization place high emphasis on R&D activities.
11.	TS3	The organization selects the most advanced technology in our industry.
12.	TS4	The organization develops new products with technical specifications and functionalities totally differing from the current ones.
13.	TS5	In our organization, the product modifications have a better market response.

<b>F (Flexibility)</b>	
14.	F1 The organization always tries to Increase the ability of producing non-standard products.
15.	F2 The organization always tries to increase the product orders with different specifications.
16.	F3 The organization possesses the ability to change machine and equipment priorities when necessary.
17.	F4 The organization always tries to Increase the ability of flexible production.
<b>D (Dependability/ Delivery)</b>	
18.	D1 The organization always looks to Increase the delivery speed of products.
19.	D2 The organization determines and eliminates non-value adding activities in delivery related processes.
20.	D3 The organization highly focuses on increasing the ability to meet the delivery commitments.
21.	D4 The organization always look to Decrease the make span from taking the orders to the completion of delivery.
22.	D5 The organization always look to Increase the just in time delivery.
<b>Q (Quality)</b>	
23.	Q1 The organization highly focuses on Increasing the product and service quality according to customer's perception.
24.	Q2 The organization highly focuses on Increasing the product and service quality compared to rivals.
<b>MS (Marketing Support of the Product)</b>	
25.	MS1 The organization renews the design of the current and/ or new products
26.	MS2 The organization renews the distribution channels without changing the logistics processes related to the delivery of the product.
<b>PI (Product- Process Innovation)</b>	
27.	PI1 The organization determines and eliminates non value adding activities in production processes.
28.	PI2 The organization decrease manufacturing cost in components and materials of current products
<b>FN (Financial Factors)</b>	
29.	FN1 There is an increase in the ratio of Return on sales (profit/total sales).
30.	FN2 There is an increase in the ratio of Return on assets (profit/total assets).
31.	FN3 There is an increase in the General profitability of the firm.
32.	FN4 There is an increase in the Cash flow of the firm excluding investments.

### 3.15 SUMMARY

This chapter considers the many designs and methodology used for undertaking the research including the aim of choosing these designs, making of questionnaire, its legislation, reliability of the tool, trustworthy of the tool, data checking and data interpretation process. The information gathering involves the population, sample size, sample size determination and sources of information gathering. The sampling methods and its process was considered in reference to the research. The questionnaire was assessed by taking a pilot-study which assured the reliability and trustworthy of the tool. Additionally, the statistical methods taken for information interpretation were also taken in detail. Data was tested for any omitted figures and deviations followed by assessment of many hypothesis underlying Multivariate analysis like Multivariate Normality, Multicollinearity. Lastly, challenges links to ethics in business research were taken up. The outcomes of the information interpretation are taken in next chapter.

# **CHAPTER-4**

# **DATA ANALYSIS AND RESULTS**

This chapter discusses the analysis taken on the researching data. The aim of this study was to appraise the impact of determinants of product innovation on the financial performance of the selected organizations. The initial step of the data analysis following arranging was to test the feedbacks and delete any questionnaires that were incomplete to be a part of the analysis. Participants who did not filled at least 90% of the research questions were deleted from the sample in advance to statistical analysis. Lastly, detailed analysis including averages and frequencies were taken to appraise the features of the sample. Structural equation modeling was taken to consider the research purposes as shown in the assumptions. Statistics linked with each theory were analyzed with in the area of the study.

#### 4.1 PRELIMINARY DATA ANALYSIS

The preliminary data analysis is done to present the results of : (1) Reliability of the instrument by testing Cronbach's Alpha; (2) Determinants of product innovation ; (3) Impact of product innovation on the financial performance . The analysis will be done by using descriptive statistical techniques such as factor analysis and structural equation modeling. The analysis will fulfill the following objectives:

- d) To analyse the factors that lead to product innovation in Automobile sector
- e) To analyze the impact of Product Innovation on the financial position of the Co. through impact on revenue, costs and ratios.
- f) To find the innovations and development in the automobile sector, by gathering the experience of people directly linked with the innovation process in the company and from the customers.

There are comprehensively two sorts of tests utilized as a part of facts for information examination – parametric tests and Multivariate analysis. Information gathered was procedure with SPSS.

Parametric tests are based on the hypothesis that the samples were taken from normally distributed population, or more correctly that the sample averages were normally distributed. Since the assessment process needs hypothesis about the category of population or criterions i.e. the population values, these assessments are termed as known as parametric tests.. The researcher used Multivariate analysis for data analysis. Factor analysis was used to draw the results. And Finally Structural equation modeling was used to confirmatory factor analysis and model development.

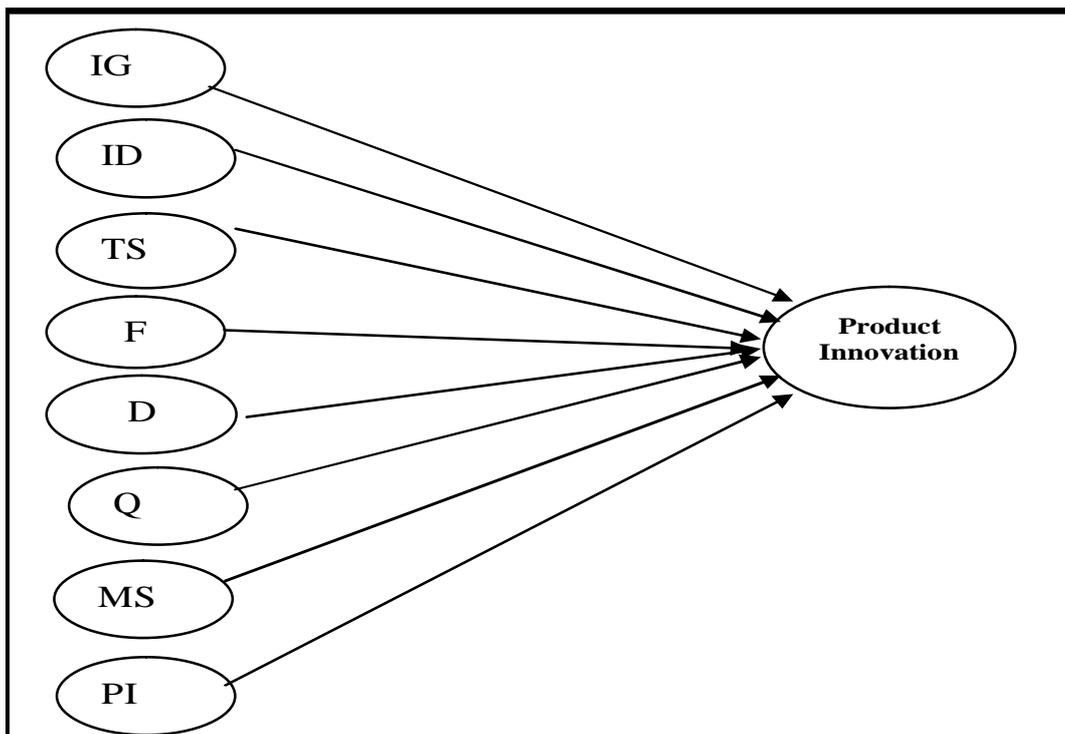


Figure-4.1: Proposed model-1

Codes	Factor Name
IG	Intelligence generation
ID	Intelligence dissemination
TS	Technology selection
F	Flexibility
D	Dependability/ Delivery
Q	Quality
MS	Marketing Support of the Product
PI	Product- Process Innovation

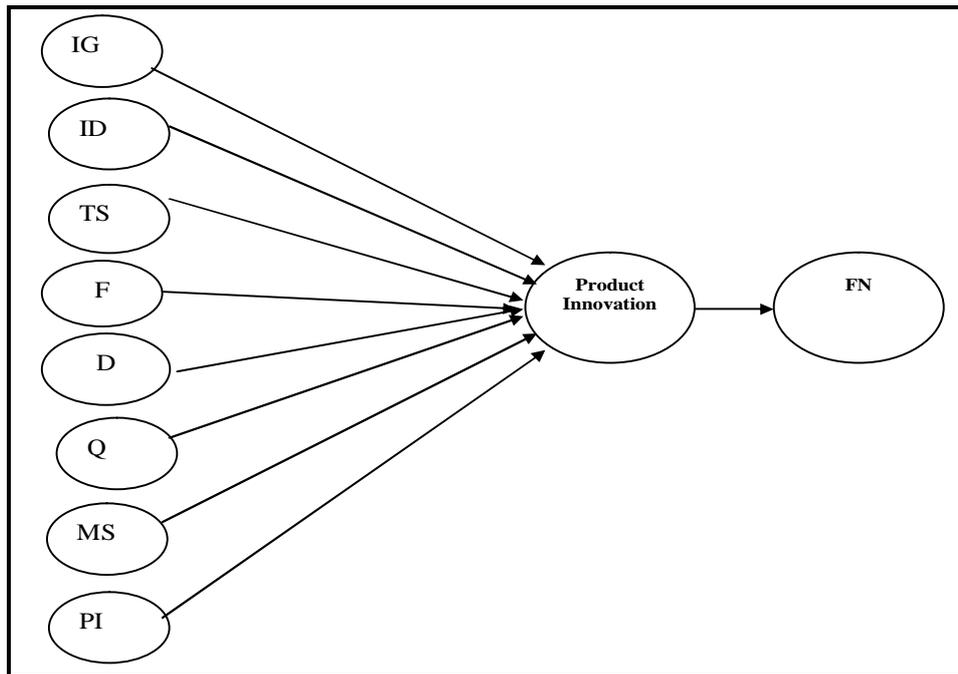


Figure-4.2: Proposed Model-II

Codes	Factor Name
IG	Intelligence generation
ID	Intelligence dissemination
TS	Technology selection
F	Flexibility
D	Dependability/ Delivery
Q	Quality
MS	Marketing Support of the Product
PI	Product- Process Innovation
FN	Financial Performance

**4.2 METHODS OF DATA ANALYSIS**

Methods of data analysis are mainly taken by the assumptions to be assessed or research inquiries to be written (which also consider the scheme of the tool and how the information was collected). In context of this research, the statistical software package SPSS is being used for data analysis.

**4.2.1 Reliability Test: - Cronbach’s alpha**

A reliability analysis was done to check the internal consistency of the variables. Cronbach Alpha coefficient, commonly used indicator, was assessed for all the variables. The alpha coefficient for all the variables was sufficiently high and acceptable (above 0.9) as seen in the table below. It was better than the

one obtained under pilot survey. The reliability tests indicate that the variables would give similar results if information gathering were duplicated (Malhotra, 2007).

Alpha was developed by Lee Cronbach in 1951 to give a measure of the internal similarity of a assessment or measurement; it is termed as a number between 0 and 1. Internal consistency states the limit to which all the variables in a assessment convey the similar theory or factor and therefore it is required but not enough requirement for scaling similarity in a sample of assessed variables. The reliability tests indicate that the variables would give similar outcomes if information gathering were copied (Malhotra, 2007). Measuring Cronbach alpha coefficient of a measurement scale is the main generally accepted barometer of internal consistency with the fair cronbach alpha co-efficient being over 0.07.

#### **4.2.2 Factor Analysis**

Factor Analysis is a data condensing statistical method that permits simplifying the interrelation linkages between numbers of repeated items. Factor analysis is a common term stating a group of processes taken for information decreasing and conclusions. Factor analysis permits analysts to reduce a big group of items or measurement variables down into a small, more organized- number of constructs or factors. Principle Component Analysis (PCA) is a important way in the Factor Analysis procedure taken to search the factors influencing product innovation and their correlations in the data obtained.

#### **4.2.3 Confirmatory Factor Analysis**

Factor Analysis is a data condensed statistical method that permits organizing the inter-relation linkages between many repeated items. Confirmatory factor analysis (CFA) is a particular category of factor analysis, main generally used in social research. It is taken to assess whether scales of a factor are similar with a analysts knowledge of the type of that factor (or construct). As such, the aim of confirmatory factor analysis is to assess whether the information sets a assumed measurable theory. This assumed theory is dependent on concept and/or previous literature review.

#### **4.2.4 Structural Equation Modeling**

SEM is an expansion of the general linear model (GLM) that facilitates a analysts to assess a group of regression equations continuously. SEM software can assess old theories, but it also allows inspection of more typical linkages and theories, such as confirmatory factor analysis and time series analyses.

#### **THE FUNDAMENTAL WAY TO TAKE A SEM ANALYSIS IS AS FOLLOWS**

The analysts initially states a theory dependent on model and then considers how to scale factors, gathers information and then feeds the information into the SEM software package. The package sets the information to the particular theory and provides the outcomes, which involve entire theory fit statistics and criterion estimation. The feed to the analysis is generally a Co variance matrix of measurable items such as research variable counts, although at times matrices of correlations or matrices of covariances and averages are taken. In general, the research analyst generally provides SEM programs with unprocessed information and software transfer this information into Co variances and averages for its own usages. The theory contains a group of linkages among the measurable items. These linkages are thereafter termed as constraints on the entire group of potential linkages. The outcomes characterize entire indices of theory fit as well as specification approximation, standard errors, and assess figures for each free specification in the model.

#### **4.3 RELIABILITY TEST: CRONBACH'S ALPHA FOR THE FINAL STUDY**

Reliability is the degree to which a group of measurable variables would give similar outcomes if information gathering were duplicated (Malhotra, 2007) and is tested by considering the ratio of organized change in a scale. Measuring the Cronbach Alpha coefficient of a scale is the main generally accepted barometer of internal consistency (Pallant, 2007), with the fair Cronbach Alpha coefficient being over 0.7 (Hair et al. 2010). A figure of less than 0.7 is taken to state uncontented internal consistency reliability (Malhotra, 2007). Cronbach's Alpha is taken in this study to test internal consistency reliability of the 32 measurable variables of the questionnaire.

Inter-item correlation is also sometimes used to check the internal consistency of the measures. Values of inter-item correlation exceeding 0.30 or more are considered better (Robinson, Shaver, & Wrightsman,

1991). The correlation was large in all the cases ( $r = 0.5$  to  $1.0$ ) but it is medium if ( $r = 0.30$  to  $0.49$ ). The correlation is said to be small when  $r = 0.10$  to  $0.29$  (Cohen, 1988). The results of the study support the minimum values required to prove the internal consistency test.

**Table-4.1: Summary of Overall and Individual Constructs Reliability analysis for the Main Study**

Constructs	Items	Cronbach Alpha Coefficient	Reliability Results	Inter-item Correlation
Intelligence generation	4	0.811	Good	0.565- 0.893
Intelligence Dissemination	4	0.751	Good	0.439-0.989
Technology Selection	5	0.784	Good	0.680-0.991
Flexibility	4	0.811	Good	0.516- 0.750
Dependability/ Delivery	5	0.781	Good	0.521- 0.957
Quality	2	0.736	Good	0.454- 0.998
Marketing support of the product	2	0.708	Good	0.202 - 0.956
Product-Process Innovation	2	0.715	Good	0.499 - 0.864
Financial Performance	4	0.819	Good	0.454 - 0.982
Overall	32	0.893	Good	

The Cronbach Alpha coefficient of the ‘Impact of product innovation on the financial performance of the organizations’ measurement scale of the research, as shown in Table above is 0.893. Because this value is above the required 0.7 Cronbach Alpha fair, the measurable variables used have a contented internal consistency and can be termed as reliable statistically.

**4.4 DATA SUITABILITY**

The initial data analysis in the Factor Analysis process (Pallant, 2007) is the testing of its appropriateness (factorability). Two statistical measures: Bartlett’s Test of Sphericity and Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) can be taken to examine the factorability of the information.

**Bartlett’s Test of Sphericity**

The Bartlett’s Test of Sphericity should be important ( $p < 0.05$ ) for the factor analysis to be taken suitable (Tabachnick and Fidell, 2007; Malhotra, 2007). Because, as shown in following figure, the importance of Bartlett’s Test of Sphericity in this study is  $p = 0.000$ , Factor Analysis is suitable, based upon the results of the KMO sampling adequacy.

- Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) for individual variance was learned. It showed enough relationship between all the items.
- To test the sampling adequacy, Kaiser-Meyer-Olkin MSA was checked which is estimated to be 0.761. It is tested that that the sample is good sufficient for sampling.
- The entire importance of correlation matrices is assessed with Barlett Test of Sphericity provided support for the suitability of the factor analysis of the information group.

KMO is a sampling adequacy index (range from 0 to 1), with greater values (between 0.6 and 1.0) stating that Factor Analysis is suitable (Tabachnick and Fidell, 2007). Because, the KMO sampling adequacy of this study information is greater at 0.761 and the importance of Bartlett’s Test of Sphericity is suitable, thus the assessment outcomes gives enough proofs to manage the correct usage of Factor Analysis on the impact of product innovation measurable variables.

**Table-4.2: KMO and Bartlett's Test**

<b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</b>	.761
Bartlett's Test of Sphericity	17395.719
	496
	.000

After the information was checked for its appropriateness for factor analysis, Factor analysis was taken to obtain the general factors from among the variables based on links between them (DeCoster, 1998). Factor analysis is made for the condition where linkages between the detected and hidden items are unclear or vague. The analysis therefore moved in an experimental way to see how, and to what degree, the detected items are related to their basic constructs. Generally, the analyst's wish to check the minimum number of constructs that accounts for co-variation among the detected items. For instance, presume a analyst made a new tool made to see five angles of physical self-concept (e.g., Health, Sport Competence, Physical Appearance, Coordination, and Body Strength). Following the making of questionnaire variables made to measure these five latent constructs, he or she would then conduct a factor analysis to consider the degree to which the variable assessments (the detected items) were linked to the five hidden factors. In factor analysis, these linkages are shown by factor loadings. The analysts would hope that variables made to measure health, for instance, presented high loadings on that construct, and low or negligible loadings on the other four constructs. This construct analytic method is taken to be introductory in the manner that the analysts have no advance information that the variables do, absolutely, sees the engaged constructs.

#### **4.5 FACTOR ANALYSIS**

Factor Analysis is a data condensing statistical method that permits simplifying the interrelation linkages between numbers of repeated items. Factor analysis is a common term stating a group of processes taken for information decreasing and conclusions. Factor analysis permits analysts to reduce a big group of items or measurement variables down into a small, more organized- number of constructs or factors. After the information has been gathered from 100 respondents, Factor Analysis was taken to obtain the general constructs from among the variables based on the linkages between them (DeCoster, 1998).

Factor Analysis is a way for considering the number and nature of the basic items among greater number of measures (Kerlinger, 1973). Factor analysis identifies the nature of constructs that underlie responses given in the questionnaire, determine sets of items that interconnect, demonstrate the depth and breadth of measurement scales, classify the most important features of a group of items, and generate factor scores that represent the underlying constructs (DeCoster, 1998). Factor analysis is generally used to develop and validate an instrument in case where measures are assessed by the researcher from literature or other sources (Ruscio & Roche, 2012). It enables knowledge of the arrangement of a correlation matrix. In specific, it permits studying the inter-relations among a greater number of inter-linked numeric items by dividing the items into main constructs. The items within each construct are more eminently inter-related with items in that construct than the items in other constructs.

The factorial reliability assists in deciding whether the information gathered for a fixed group of measures do or do not show the hidden factors. Principle Axis Factoring, a main way in the factor analysis process was taken to search the constructs affecting product innovation practices and their interrelations in the information extracted. Generally, the first factor extraction does not provide meaningful constructs. Rotation makes higher loading even higher and small loadings even smaller. Thus, procedure of rotation gives constructs that can be labeled and analyzed. Varimax rotation has been taken as it gives transparent division of constructs (Dhillon and Goldstein, 1984).

After the standards state that data is appropriate for factor analysis, Principal Components Analysis (PCA) was used for obtaining the information, which permits considering the constructs underlying the links between numbers of items. The total variable Explained box was recommending that it obtains one construct detailed for 65.73% of the variance of the link between items. In order to 'obtain' constructs from the information, items that have an eigenvalue of 1 or more have to be searched from the Total Variance Explained obtained using Principle Component Analysis (Pallant, 2007). This considers the number of constructs obtained from the information (Kaiser, 1960). The scree plot is the next best way of searching the number of constructs to obtain through factor analysis (Cattell, 1966) as it shows the highest fall in the eigen values of the constructs, which reflects that more constructs would not interpret a important amount of the deviation of measurable variables. Generally, the initial factor extraction doesn't give meaningful constructs. Rotation makes greater loading even greater and smaller loadings even smaller. Thus, process of rotation gives constructs that can be labelled and analyzed. Varimax rotation has been taken as it provides clearer division of constructs (Dhillon and Goldstein, 1984). Rotation is

required when extraction method recommends there are two or more constructs. The rotation of factors is measured to provide an clue of how the constructs initially obtained distinct from each other and to give a transparent view of which variable load on which construct. In the extraction process, Nine factors with Eigen values higher than 1.0 collectively explaining 65.73% of variance have been retained after Varimax rotation.

There were 39 items in the study labeled as V1, V2 ...V39. The variable loading value of above 0.50 is considered significant (Hair et. al., 2010). The Factor analysis was run using Principal Axis factoring and Varimax Rotation. The variables with factor loading less than 0.50 were dropped. The 39 items scale was then reduced to 32 items. In the extraction process, six factors with *Eigen* values greater than 1.0 collectively explaining 65.73 per cent of variance have been retained.

There are just nine constructs, each having Eigen value greater than 1. The Eigen values for nine constructs were 8.557, 2.259, 1.964, 1.692, 1.489, 1.426, 1.334, 1.205 and 1.109, correspondingly. (Table 4.4) The percentage of total variance is taken as a basis to consider how well the total construct solution details for what the items combingly presents. The basis for present solution detailed for 65.73% of the overall deviations for paternal approach. It is really excellent extraction as it can be conserve on the number of constructs (from 32 it has decreased to 6 constructs) while we have missed 34.27% data matter for constructs for impact of product innovation in Financial performance. The percentage of deviation given by construct one to nine for factors for impact of product innovation are 9.862, 9.772, 9.224, 8.104, 7.858, 7.440, 5.012, 4.410 and 4.047 respectively (Table 4.4). Table 4.3 shows us that after nine factors are obtained and maintained, the communality is 0.316 for variable 1, 0.312 for variable 2 and so on. It shows 65% of the deviation of variable 1 is being given by the nine extracted constructs jointly. The ratio of deviation in any one of the real items, which is being grabbed by the obtained construct, is known as communality (Nargundkar, 2002).

**Table-4.3: Communalities**

		<b>Initial</b>	<b>Extraction</b>
D1	The organization always looks to Increase the delivery speed of products.	1	0.66
D2	The organization determines and eliminates non-value adding activities in delivery related processes.	1	0.628
D3	The organization highly focuses on increasing the ability to meet the delivery commitments.	1	0.572
D4	The organization always look to Decrease the make span from taking the orders to the completion of delivery.	1	0.85
D5	The organization always look to Increase the just in time delivery.	1	0.592
F1	The organization always tries to Increase the ability of producing non-standard products.	1	0.701
F2	The organization always tries to increase the product orders with different specifications.	1	0.757
F3	The organization possesses the ability to change machine and equipment priorities when necessary.	1	0.919
F4	The organization always tries to Increase the ability of flexible production.	1	0.564
FN1	There is an increase in the ratio of Return on sales (profit/total sales).	1	0.683
FN2	There is an increase in the ratio of Return on assets (profit/total assets).	1	0.688
FN3	There is an increase in the General profitability of the firm.	1	0.66
FN4	There is an increase in the Cash flow of the firm excluding investments.	1	0.875
ID1	In our organization, Interaction among employees is critical success factor for product innovation.	1	0.666
ID2	In our organization, the availability of appropriate infrastructure and processes are critical for improving intelligence dissemination within the organization.	1	0.693
ID3	In our organization, familiarity with colleagues facilitates the	1	0.566

		Initial	Extraction
	generation of ideas, is critical to product Innovation.		
ID4	In our organization, Identifying and designing Intelligence Dissemination processes are important for product innovation.	1	0.693
IG1	In our organization, the process of Intelligence Generation is important to design new products and services.	1	0.619
IG2	In our organization, it is critical for the companies to organize the process of intelligence generation and use it to design new products, services or systems.	1	0.685
IG3	In our organization, the capability to generate intelligence and utilize it is most important source of a firm's sustainable competitive advantage.	1	0.748
IG4	In our organization, the people with entrepreneurial pursuits tend to engage in greater level of information scanning activities.	1	0.925
MS1	The organization renews the design of the current and/ or new products	1	0.667
MS2	The organization renews the distribution channels without changing the logistics processes related to the delivery of the product.	1	0.66
PI1	The organization determines and eliminates non value adding activities in production processes.	1	0.579
PI2	The organization decrease manufacturing cost in components and materials of current products	1	0.513
Q1	The organization highly focuses on Increasing the product and service quality according to customer's perception.	1	0.577
Q2	The organization highly focuses on Increasing the product and service quality compared to rivals.	1	0.661
TS1	The organization selects the leading strategy in our industry.	1	0.593
TS2	The organization place high emphasis on R&D activities.	1	0.678
TS3	The organization selects the most advanced technology in our industry.	1	0.584
TS4	The organization develops new products with technical specifications and functionalities totally differing from the current ones.	1	0.536
TS5	In our organization, the product modifications have a better market response.	1	0.541

**Table-4.4: Total Variance Explained**

Factor	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.557	26.742	26.742	8.557	26.742	26.742	3.156	9.862	9.862
2	2.259	7.058	33.800	2.259	7.058	33.800	3.127	9.772	19.635
3	1.964	6.139	39.939	1.964	6.139	39.939	2.952	9.224	28.858
4	1.692	5.286	45.225	1.692	5.286	45.225	2.593	8.104	36.963
5	1.489	4.652	49.877	1.489	4.652	49.877	2.515	7.858	44.821
6	1.426	4.457	54.333	1.426	4.457	54.333	2.381	7.440	52.261
7	1.334	4.167	58.501	1.334	4.167	58.501	1.604	5.012	57.273
8	1.205	3.765	62.265	1.205	3.765	62.265	1.411	4.410	61.683
9	1.109	3.465	65.730	1.109	3.465	65.730	1.295	4.047	65.730
10	.981	3.065	68.795						

Extraction Method: Principal Axis Factoring.

Therefore, the factor analysis ensures the reliability of these constructs. Therefore, these variables have been involved in the final questionnaire for main survey.

The Components Matrix is the result of the Factor Analysis method that gives the loadings of individual variables on individual nine factors. Accurate factors are having scale variable loadings of 0.5 and higher (Hair et al. 2010) and measurable variables with the largest loading on that factor (Wixom and Todd, 2005). This Components Matrix is finally rotated using Varimax Rotation to help explanation of its outcomes (Malhotra, 2007), displaying only loadings of 0.5 and above in the table 4.5 below.

**Table-4.5: Component Transformation Matrix**

Component	1	2	3	4	5	6	7	8	9
1	.440	.571	.564	.573	.498	.543	.568	.571	.560
2	.566	.575	.835	.625	.538	.483	.562	.558	.670
3	.673	.542	.727	.537	.538	.667	.612	.672	.743
4	.467	.663	.650	.569	.537	.616	.522	.551	.512
5	.392	.532	.655	.476	.563	.523	.498	.627	.548
6	.566	.486	.541	.534	.494	.619	.631	.516	.488
7	.533	.568	.493	.608	.620	.568	.537	.536	.489
8	.533	.611	.550	.497	.506	.558	.617	.536	.506
9	.498	.651	.512	.560	.567	.578	.668	.539	.612

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.

**4.6 INTERPRETATION OF FACTORS**

Each construct requires to be given a logo or label to featurise it and help its explanation (Tabachnick and Fidell, 2007). Each of the product innovation factors that have been obtained through Principle Component Analysis in the Exploratory Factor Analysis process of this study information is shown. The labels given to each construct are the outcome of the explanation of its product innovation construct scale variables and are analyzed in the below sub-sections.

**4.6.1. Dependability/ Delivery**

The first construct with the largest Total Variance Explained percentage, 9.862%, has been explained as *dependability/delivery* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of dependability/delivery. Table 4.6 below displays the scale variables that load onto the construct 1.

**Table-4.6: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
1	<u>Dependability/ Delivery</u>	The organization always looks to Increase the delivery speed of products.	26.742	9.862	0.753	0.781
		The organization determines and eliminates non-value adding activities in delivery related processes.			0.662	

		The organization highly focuses on increasing the ability to meet the delivery commitments.			0.693	
		The organization always look to Decrease the make span from taking the orders to the completion of delivery.			0.771	
		The organization always look to Increase the just in time delivery.			0.567	

#### 4.6.2 Technology selection

The second factor with the largest Total Variance Explained value, 9.772%, has been explained as *technology selection* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of *technology selection*. Table 4.7 below displays the scale variables that load onto the construct 2.

**Table-4.7: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
2	<b><u>Technology selection</u></b>	The organization selects the leading strategy in our industry.	7.058	9.772	0.635	0.784
		The organization place high emphasis on R&D activities.			0.73	
		The organization selects the most advanced technology in our industry.			0.658	
		The organization develops new products with technical specifications and functionalities totally differing from the current ones.			0.667	
		In our organization, the product modifications have a better market response.			0.675	

#### 4.6.3 Financial Performance

The third factor with the largest Total Variance Explained value, 9.224%, has been explained as *financial performance* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of *financial performance*. Table below 4.8 displays the scale variables that load onto the construct 3.

**Table-4.8: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
3	<b><u>Financial Performance</u></b>	There is an increase in the ratio of Return on sales (profit/total sales).	6.139	9.224	0.731	0.819
		There is an increase in the ratio of Return on assets (profit/total assets).			0.801	
		There is an increase in the General profitability of the firm.			0.747	
		There is an increase in the Cash flow of the firm excluding investments.			0.807	

**4.6.4 Intelligence Generation**

The fourth factor with the largest Total Variance Explained value, 8.104%, has been explained as *intelligence generation* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of *intelligence generation*. Table 4.9 below displays the scale variables that load onto the construct 4.

**Table-4.9: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
4	<b><u>Intelligence Generation</u></b>	In our organization, the process of Intelligence Generation is important to design new products and services.	5.286	8.104	0.502	0.811
		In our organization, it is critical for the companies to organize the process of intelligence generation and use it to design new products, services or systems.			0.68	
		In our organization, the capability to generate intelligence and utilize it is most important source of a firm’s sustainable competitive advantage.			0.786	
		In our organization, the people with entrepreneurial pursuits tend to engage in			0.854	

		greater level of information scanning activities.				
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**4.6.5 Flexibility**

The fifth factor with the largest Total Variance Explained value, 7.858%, has been explained as *flexibility* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of *flexibility*. Table 4.10 below displays the scale variables that load onto the construct 5.

**Table-4.10: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
5	<b><u>FLEXIBILITY</u></b>	The organization always tries to Increase the ability of producing non-standard products.	4.652	7.858	0.654	0.811
		The organization always tries to increase the product orders with different specifications.			0.78	
		The organization possesses the ability to change machine and equipment priorities when necessary.			0.847	
		The organization always tries to Increase the ability of flexible production.			0.643	

**4.6.6 Intelligence Dissemination**

The sixth factor with the largest Total Variance Explained value, 7.440%, has been explained as *intelligence dissemination* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of *intelligence dissemination*. Table 4.11 below displays the scale variables that load onto the construct 6.

**Table-4.11: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
6	<b><u>Intelligence Dissemination</u></b>	In our organization, Interaction among employees is critical success factor for product innovation.	4.457	7.44	0.744	0.751
		In our organization, the availability of appropriate			0.648	

		infrastructure and processes are critical for improving intelligence dissemination within the organization.				
		In our organization, familiarity with colleagues facilitates the generation of ideas, is critical to product Innovation.			0.644	
		In our organization, Identifying and designing Intelligence Dissemination processes are important for product innovation.			0.718	

**4.6.7 Quality**

The seventh factor with the largest Total Variance Explained value, 5.012%, has been explained as *quality* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of *quality*. Table 4.12 below displays the scale variables that load onto the construct 7.

**Table-4.12: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
7	<b><u>Quality</u></b>	The organization highly focuses on Increasing the product and service quality according to customer’s perception.	4.167	5.012	0.649	0.736
		The organization highly focuses on Increasing the product and service quality compared to rivals.			0.771	

**4.6.8 Linking Product- Process Innovation**

The eighth factor with the largest Total Variance Explained value, 4.410%, has been explained as *Product-Process Innovation* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of *Product- Process Innovation*. Table 4.13 below displays the scale variables that load onto the construct 8.

**Table-4.13: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
8	<b><u>Product-</u></b>	The organization determines	3.765	4.41	0.61	0.715

	<b>Process Innovation</b>	and eliminates non value adding activities in production processes.				
		The organization decrease manufacturing cost in components and materials of current products			0.674	

**4.6.9 Marketing Support of the Product**

The ninth factor with the largest Total Variance Explained value, 4.047%, has been explained as *Marketing Support of the Product* due to its incorporation of scale variables searched and adopted from previous studies surrounding impact of product innovation relating to relational aspect of *Marketing Support of the Product*. Table 4.14 below displays the scale variables that load onto the construct 9.

**Table-4.14: Summary of Rotated Component Matrix, Cronbach’s Alpha and Variance**

Factor No.	Name of the dimension	Variables	% of Variance Explained		Factor Loadings	Cronbach Alpha
			Extraction sums of squared loadings	Rotation sums of squared loadings		
9	<b>Marketing support of the product</b>	The organization renews the design of the current and/ or new products	3.465	4.047	0.774	0.708
		The organization renews the distribution channels without changing the logistics processes related to the delivery of the product.			0.698	

Hence, Hypotheses for the variables is as follows:

Variables	Hypotheses accepted or Rejected	Hypotheses code
Intelligence generation	It is a vital factor affecting product innovation <b>Accepted</b>	H1
Intelligence dissemination	It is a vital factor affecting product innovation <b>Accepted</b>	H2
Technology selection	It is a vital factor affecting product innovation <b>Accepted</b>	H3
Flexibility	It is a vital factor affecting product innovation <b>Accepted</b>	H4
Dependability/ Delivery	It is a vital factor affecting product innovation <b>Accepted</b>	H5
Quality	It is a vital factor affecting product innovation <b>Accepted</b>	H6
Marketing Support of the Product	It is a vital factor affecting product innovation <b>Accepted</b>	H7
Product- Process Innovation	It is a vital factor affecting product innovation <b>Accepted</b>	H8

**4.7 STATISTICAL MODELING**

This part of analysis explains the relationship between variables diagrammatically. The causal relationship between variables (Latent and Observed) has been determined by using Structural Equation Modeling (SEM) (Hair et. al., 2010). Latent variables are factors that cannot be observed directly i.e. they cannot be measured whereas the

observed variables are the factors that can be measured directly. The latent variable is thus linked to an observed variable thereby making its measurement possible (Byrne, 2010).

**4.7.1 Latent versus Observed Variables**

Latent variables are not seen straight, thus they cannot be measured straight. Therefore, the analyst must functionally state the hidden item of importance in conditions of behavior believed to display it. As such, the unhidden items are related to one that is noticeable, thereby making its scalability possible. Test of the behavior; later, forms the straight measurement of an unhidden item, even though along the calculation of an unhidden item (i.e. the basic factor). Observed or manifest item played as barometer of the basic factors which they are assumed to display. Given this required connecting process between manifest items and hidden items, it should now be transparent why methodologists urge analyst to be situation based in their choice of test measures.

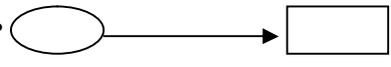
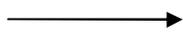
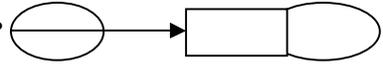
**Table-4.15: shows the Latent and observed variables for the study**

<b>Code</b>	<b>Latent Variable</b>	<b>Observed Variable</b>
<b>IG</b>	<b>Intelligence Generation</b>	a) Process of intelligence generation
		b) Design of new products, services or systems.
		c) Capability to generate intelligence and utilize it
		d) Capability to engage employees in innovative activities.
<b>ID</b>	<b>Intelligence Dissemination</b>	a) Interaction among employees
		b) Availability of appropriate infrastructure and processes
		c) c)Familiarity with colleagues
		d) Identifying and designing intelligence dissemination processes.
<b>TS</b>	<b>Technology selection</b>	a) Selection of leading strategy
		b) High emphasis on R&D activities
		c) Selection of advanced technology in industry.
		d) Develops new products totally different from the current ones.
		e) Product modifications have a better market response.
<b>F</b>	<b>Flexibility</b>	a) Increase the ability of producing non-standardized products.
		b) Increase the product orders with different specifications.
		c) Ability to change machine and equipment priorities.
		d) Increase the ability of flexible production.
<b>D</b>	<b>Dependability/ Delivery</b>	a) Increase the delivery speed of products
		b) Determines and eliminates non-value adding activities in delivery related processes.
		c) Increasing the ability to meet the delivery commitments
		d) Decrease the make span from taking the orders to the completion of delivery
		e) Increase the just in time delivery.
<b>Q</b>	<b>Quality</b>	a) Increasing the product and service quality according to customer’s perception.
		b) Increasing the product and service quality compared to rivals.
<b>MS</b>	<b>Marketing support of the product</b>	a) Renews the design of the current and new products
		b) Renews the distribution channels without changing the logistics processes.
<b>PI</b>	<b>Product-Process Innovation</b>	a) Determines and eliminates non-value adding activities in production processes.
		b) Decrease manufacturing cost in components and materials of current products.
<b>FN</b>	<b>Financial performance</b>	a) Increase in the ratio of return on sales
		b) Increase in the ratio of return on assets

		c) Increase in the general profitability of the firm
		d) Increase in the cash flow of the firm.

### 4.7.2 Symbol Notation

Structural equation models are systematically depicted using specific compositions of four geometric figures—a circle (or ellipse), a square (or rectangle), a single-headed arrow, and a double-headed arrow. By convention, circles (or ellipses; ) shows hidden constructs, squares (or rectangles; ) shows represent manifest items, single-headed arrows ( $\rightarrow$ ) shows the effect of one item on another, and double-headed arrows ( $\leftrightarrow$ ) shows covariances or inter-relations between two sets of items. In making a theory of a specific arrangement under research, analysts use these figures within the scheme of four fundamental compositions, each of which shows an significant configuration in the analysis process. These compositions, each connected by a short report, are as follows:

-  Path coefficient for regression of an manifest item onto an unhidden item (or construct)
-  Path coefficient for regression of one construct onto another construct
-  Measurement mistake related with an manifest item
-  Residual mistake in the estimation of an unhidden construct

## 4.8 STRUCTURAL EQUATION MODELLING

SEM assesses the straight and implied linkages among the items under research by constructing two models: structural Model and measurement Model (Anderson & Gerbing, 1988). Measurement Model is represented by Confirmatory factor Analysis (CFA) which is concerned only with the extent of relationship between observed variables and their latent constructs. It assumes that the observed variables will fully load on their constructs and will have zero loadings on the other factors (Byrne, 2010). On the other hand, Structural Model represents the relationship between latent constructs i.e., impact of change in one latent variable on another. The proposed hypotheses are tested statistically to determine whether the variables are consistent with the data or not. The adequacy of goodness-of-fit proves the existence of relationship between variables under study. It is believed that, it is highly unlikely to get a perfect-fit between the hypothesized model and the observed data, the discrepancy is known as residual (Byrne, 2010). Linked with each manifest item is an mistake definition, and with the construct being estimated, a residual definition, there is an significant difference between the two. Mistakes linked with manifest items shows measurement error, which shows on their sufficiency in calculating the linked basic constructs. Measurement error comes from two origins: random measurement error (in the psychological manner) and error uniqueness, a definition used to convey error variance resulting from some features that is taken to be particular (or unique) to a specific barometer item. Such mistakes usually show nonrandom (or systematic) measurement error. Residual definition show error in the estimation of endogenous constructs from exogenous constructs.

SEM is an expansion of the general linear model (GLM) that facilitates a analysts to assess a group of regression equations continuously. SEM software can assess old theories, but it also allows inspection of more typical linkages and theories, such as confirmatory factor analysis and time series analyses.

The analysts initially states a theory dependent on model and then considers how to scale factors, gathers information and then feeds the information into the SEM software package. The package sets the information to the particular theory and provides the outcomes, which involve entire theory fit statistics and criterion estimation. The feed to the analysis is generally a Co variance matrix of measurable items such as research variable counts, although at times matrices of correlations or matrices of covariances and averages are taken. In general, the research analyst generally provides SEM programs with unprocessed information and software transfer this information into Co variances and averages for its own usages. The theory contains a group of linkages among the measurable items. These linkages are thereafter termed as constraints on the

entire group of potential linkages. The outcomes characterize entire indices of theory fit as well as specification approximation, standard errors, and assess figures for each free specification in the model.

**4.8.1 Confirmatory Factor Analysis**

Codes	Factor Name
IG	Intelligence generation
ID	Intelligence dissemination
TS	Technology selection
F	Flexibility
D	Dependability/ Delivery
Q	Quality
MS	Marketing Support of the Product
PI	Product- Process Innovation
FN	Financial Factors

**4.8.2 Construct Validity**

‘Construct validity leads to the extent to which assumption can accurately be made from the functionalities in your research to the theoretical factors on which those functions were dependent (Trochim, 2006). In other words, it means whether the scale measures what it claims to measure. Construct validity consists of convergent validity, discriminant validity and nomological validity (Malhotra, 2010). For the present research, convergent validity and discriminant validity will be considered. Both these validities should be considered jointly in order to get the proof for construct validity (Trochim, 2006). When there are more than one factor in a research, it is significant to contend convergent and discriminant validities in order to ensure construct validity (Agarwal, 2011).

**4.8.2.1 Convergent Validity**

Convergent validity shows the degree to which the measures of a construct are positively related to each other (Malhotra, 2010). Convergent validity is determined by comparing Cronbach alpha of the construct with Average Variance Explained by the measures (Hair et.al, 2010). The Average Variance Explained by the measures are nothing but the square of average of the factor loadings. The construct is said to be valid as far as convergent validity is concerned if:

- 1) Cronbach Alpha co-efficient is greater than 0.7
- 2) Cronbach Alpha co-efficient > Average Variance Explained
- 3) Average Variance Explained > 0.5

The following table-4.16 shows the Convergent Validity Indices for the factors in consideration

Factors	Cronbach Alpha co-efficient	Average Variance Explained
<b>Dependability/ Delivery</b>	0.781	0.574
<b>Intelligence Generation</b>	0.811	0.497
<b>Flexibility</b>	0.811	0.577
<b>Technology Selection</b>	0.784	0.550
<b>Intelligence Dissemination</b>	0.751	0.584
<b>Quality</b>	0.736	0.504
<b>Product-Process Innovation</b>	0.715	0.512
<b>Marketing support of the product</b>	0.708	0.541
<b>Financial Performance</b>	0.819	0.595

**4.8.2.2 Discriminant Validity**

Discriminant validity shows the extent to which the constructs differ from each other. It is assessed by comparing the squared correlation (R<sup>2</sup>) of the paired constructs with the AVEs of each construct (Fornell & Larcker, 1981). For this, Maximum of the two correlation coefficients is taken and squared. This is called Maximum Shared

Variance (MSV). Discriminant validity can be said to be satisfactory if MSV of a pair of constructs is less than the AVE for each corresponding construct (Hair et.al, 2010).

Discriminant Validity:  $MSV < AVE$

The following table-4.17 shows the Discriminant Validity Indices for the factors in consideration

Factors	Average Variance Explained	Maximum Shared Variance
Dependability/ Delivery	0.574	0.36
Intelligence Generation	0.497	0.31
Flexibility	0.577	0.38
Technology Selection	0.550	0.37
Intelligence Dissemination	0.584	0.25
Quality	0.504	0.44
Product-Process Innovation	0.512	0.40
Marketing support of the product	0.541	0.28
Financial Performance	0.595	0.43

The above table summarizes the reliability and validity measure values of all the constructs, namely Intelligence Dissemination, Intelligence Generation, Technology Selection, Quality, Flexibility, Dependability/ Delivery, Marketing support of the product, linking product-process innovation and financial performance. The Cronbach alpha figures for all the factors are higher than .07, i.e. greater than the necessary fair value, Cronbach (1951) represents all the factors have excellent internal consistency and reliability. Average Variance Explained too has moved above the necessary cut-off benchmark of 0.5. this represents that all barometers efficiently calculate the factor they associate to. Additionally, the MSE also is lesser than AVE which is enough proof to show that the factors are not correlated with each other.

**NOTES**

1. Cronbach value of 0.7 and above are acceptable (Nunnally, 1978)
2. Average Variance Explained of above 0.5 is considered acceptable (Hair et.al, 2010)
3. CFI & GFI value of 0.95 and above signifies good model fit (Byrne, 2013)
4. RMSEA value less than 0.05 is considered good, P-CLOSE value greater than 0.05 is acceptable and CMIN/df value between less than 3 is considered good but sometimes less than 5 is permissible (Hu and Bentler,1999)

**4.8.3 Goodness of Fit**

To estimate the goodness-of-fit of model, many measures of indices are taken as recommended by Hair et al. (1998), Iacobucci (2010), Schumacker (1992): Chi-square/degrees of freedom ( $\chi^2/df$ ) ratio, root mean-square error of approximation (RMSEA), Tuck Willis index (TLI), normed fit index (NFI), comparative fit index (CFI), incremental fit index (IFI).

**4.8.3.1 Tests of Absolute Fit**

The chi-square test of entire model fit is named variations in this result. Its figure is 3669.903 with 416 degrees of freedom, giving a probability value of less than .000 that a chi-square value this large or larger would be extracted by probability if the null hypothesis that the model fits the data is real.

The 416 degrees of freedom shows the level of over identification of the model. Since the probability value of the chi-square test is smaller than the .05 level used by conference, we would dismissed the null hypothesis that the model fits the data.

**4.8.3.2 Tests of Relative Fit**

Because the chi-square test of absolute model fit is sensitive to sample size and non-normality in the basic distribution of the input items, examiners usually move to many detailed fit indices to test the entire fit a model to the data. In this scheme, a model may be dismissed on an accurate basis, yet an analyst may still allegation that mentioned models surpass some other basic model by a consequential volume. In other words,

the fact analysts make in this manner is that their selected model is consequentially less false than a basic model, commonly the independence model. A model that is close, and yet did well in matching to other models may be of great interest. For instance, the Tucker-Lewis Index (*TLI*) and the Comparative Fit Index (*CFI*) match the absolute fit of your particular model to the absolute fit of the Independence model. The higher the difference between the entire fit of the two models, the greater the values of these detailed facts/figures. An isolated box of the result shows closed adjusted fit statistics. These fit statistics are equal to the adjusted  $R^2$  in multiple regression analysis: the close fit statistics castigate large models with many approximated criterions and few residuals degrees of freedom.

The fit result consists of a large line of model fit statistics. All are made to assess or detail entire model fit. Each analyst has his or her interested set of fit statistics to survey. Generally communicated fit statistics are the chi-square (named *Discrepancy* in the result displayed above), its degrees of freedom (*DF*), its probability value (*P*), the Tucker-Lewis Index (*TLI*), and the Root Mean Square Error of Approximation (*RMSEA*) and its lower and upper confidence interval boundaries. There is also a Standardized Root Mean Residual (*Standardized RMR*), but it is significant to observe that this fit index is only accessible for entire information (it will not be printed for data records consisting half information).

Many facts for each of these fit statistics lie. These facts variates as statisticians publish new reproduction researches that additional register the behaviour of various measures of fit. The chi-square test is an *absolute* test of model fit: If the probability value (*P*) is above .05, the model is accepted.

The other measures of fit are detailed. Hu and Bentler (1999) advised RMSEA values lower than .08 and Tucker-Lewis Index values of .95 or greater. Since the RMSEA for this model is .080 and the Tucker-Lewis Index value is .717, the model fit well according to the detailed measures of fit.

#### 4.9 INDIVIDUAL CONSTRUCT SEM MODELS- MEASUREMENT MODELS

In order to confirm the factors or the constructs identified in Exploratory Factor Analysis, Confirmatory Factor Analysis (CFA) is conducted as a next step after exploratory factor analysis. To assess the overall model fit, first of all, the model fitness of individual constructs is evaluated i.e., a zero-order CFA is constructed for all latent constructs, which is shown in the diagrams below:

##### 1. Dependability/Delivery

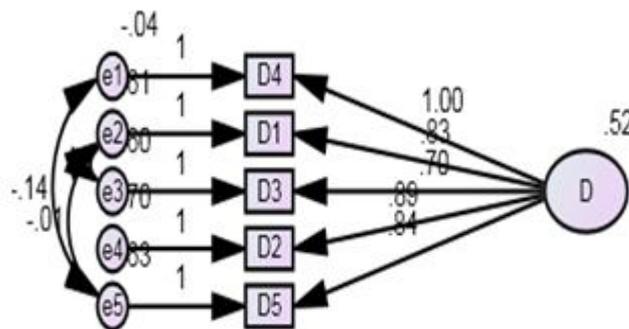


Figure-4.3: Dependability and its measured Variables

In the above figure 4.3, *Dependability/ Delivery* is the latent construct having 5 measured variables, The degree to which each of these measured variables is related to latent construct is represented by the variable's loadings or standardized estimates. Since a measured variable doesn't explain the latent variable perfectly, an error term is added. The five unidirectional arrows leading from D to each of the five observed variables (D1, D2, D3, D4 and D5) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

D = Dependability/ delivery

D1 = Increase the delivery speed of products

- D2 = Eliminates non-value adding activities
- D3 = Increasing the ability to meet the delivery commitments
- D4 = Decrease the make span from taking the orders to the completion of delivery
- D5 = Increase the just in time delivery

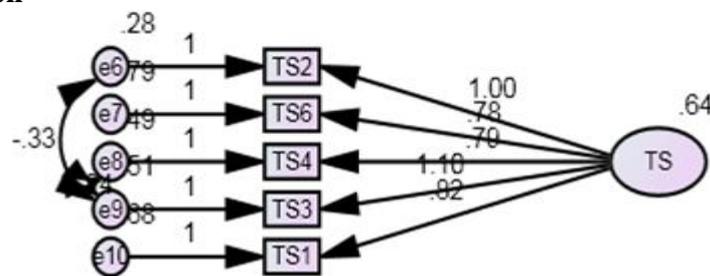
The construct “Dependability/ Delivery” with overall value of 0.52 is included in the validated model of product innovation. The items including Decrease the make span from taking the orders to the completion of delivery (1.00), Increase the delivery speed of products (.83), increasing the ability to meet the delivery commitments (.70), eliminates non-value adding activities (.89) and Increase the just in time delivery (.84) have all been included in the validated model of product innovation as suggested in conceptual model (G. Ulusoy, G. Gunday, L. Alpkon and K. Kilic, 2008; Gurhan Gunday, Gunduz Ulusoy, Kemal Kilic, Lutfi Alpkon, 2009; Matthew N. Saunders1,Carolyn C. Seepersad and Katja Hölttä-Otto, 2009). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in D4, Dependability is increased by 1 units. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf) ; for e.g., the result suggests that e2 is 0.61 which means 61% of the variance is unexplained by D4 in predicting Dependability. The lower the variance, the better it is. The figure also shows the R<sup>2</sup> value which is 0.52 and reflects the proportion of variance in the dependent variable explained by all the predictors; the results here shows that 52% of the variances in the dependability are explained by all the observed variables. The higher the R<sup>2</sup>, the better it is. ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf)). Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Dependability/ Delivery). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error1 (-.04) associated with observed variable (D4), error2 (.61) associated with observed variable (D1), error3 (.60) associated with (D3), error4 (.70) associated with observed variable (D2) and error5 (.83) associated with (D5) represents measurement error. Moreover, the two curved arrows between error1 and error5 (-.14) and between error2 and error5 (-.01) represent covariances or correlations between pairs of D4 and D5 and between D1 and D5. Apart from unstandardized regression coefficients, the output also displays the standardized regression coefficients value as shown in the table below:

**Table-4.18: Standardized Regression Weights: (Group number 1 - Default model)**

D4	<---	D	0.859
D1	<---	D	0.873
D3	<---	D	0.715
D2	<---	D	0.921
D5	<---	D	0.637

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, D4 & D2 have factor loadings of 0.859 and 0.921; this shows that they are best indicators of Dependability.

## 2. Technology Selection



**Figure-4.4: Technology Selection and its measured variables**

In the above figure 4.4, Technology Selection is the latent construct having 5 measured variables. The degree to which each of these measured variables is related to latent construct is represented by the variable's loadings or standardized estimates. Since a measured variable doesn't explain the latent variable perfectly, an error term is added. The five unidirectional arrows leading from TS to each of the five observed variables (TS1, TS2, TS3, TS4 and TS5) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

TS = Technology Selection

TS1 = Selects the leading strategy in our industry.

TS2 = Place high emphasis on R&D activities.

TS3 = Selects the most advanced technology in our industry.

TS4 = Develops new products with technical specifications and functionalities totally differing from the current ones.

TS5 = Product modifications have a better market response.

The construct "Technology Selection" with overall value of 0.64 is included in the validated model of product innovation. The items including Place high emphasis on R&D activities (1.00), Product modifications have a better market response (.78), Develops new products with technical specifications and functionalities totally differing from the current ones (.70), Selects the most advanced technology in our industry (1.1) and Selects the leading strategy in our industry (.82) have all been included in the validated model of product innovation as suggested in conceptual model (Shengbin Hao, Bo Yu, 2011; M. Torkkeli and M. Tuominen,2002; S. B. Hao and B. Y,2009 ; G. M. Bao and J. Yang,2004;J. Morone,1989; D. Cetindamar, R. Phaal and D. Probert ,2009; D. Cetindamar, R. Phaal and D. Probert ,2009). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in TS2, Technology selection is increased by 1 units. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf) ; for e.g., the result suggests that e6 is 0.28 which means 28% of the variance is unexplained by TS2 in predicting Technology selection. The lower the variance, the better it is. The figure also shows the R<sup>2</sup> value which is 0.64 and reflects the proportion of variance in the dependability are explained by all the predictors; the results here shows that 64% of the variances in the dependability are explained by all the observed variables. The higher the R<sup>2</sup>, the better it is. ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf)). Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Technology Selection). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error6 (.28) associated with observed variable (TS2), error7 (.79) associated with observed variable (TS5), error8 (.49) associated with (TS4), error9 (.51) associated with observed

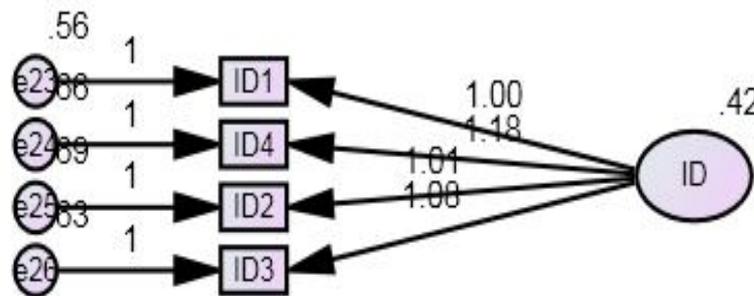
variable (TS3) and error10 (.68) associated with (TS1) represents measurement error. Moreover, the two curved arrows between error6 and error9 (-.33) represent covariances or correlations between pairs of TS2 and TS3. Apart from unstandardized regression coefficients, the output also displays the standardized regression coefficients value as shown in the table below:

**Table-4.19: Standardized Regression Weights: (Group number 1 - Default model)**

TS2	<---	TS	0.751
TS6	<---	TS	0.644
TS4	<---	TS	0.657
TS3	<---	TS	0.639
TS1	<---	TS	0.726

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, TS1 & TS2 have factor loadings of 0.726 and 0.751; this shows that they are best indicators of Technology selection.

**3. Intelligence Dissemination**



**Figure-4.5: Intelligence Dissemination and its measured variables**

In the above 4.5 figure, Intelligence dissemination is the latent construct having 4 measured variables. The degree to which each of these measured variables is related to latent construct is represented by the variable’s loadings or standardized estimates. Since a measured variable doesn’t explain the latent variable perfectly, an error term is added. The four unidirectional arrows leading from ID to each of the four observed variables (ID1, ID2, ID3 and ID4) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

- ID = Intelligence dissemination
- ID1 = Interaction among employees
- ID2 = Availability of appropriate infrastructure and processes
- ID3 = Familiarity with colleagues facilitates the generation of ideas
- ID4 = Identifying and designing Intelligence Dissemination processes

The construct “Intelligence dissemination” with overall value of 0.42 is included in the validated model of product innovation. The items including Interaction among employees (1.00), Identifying and designing Intelligence Dissemination processes (1.18), Availability of appropriate infrastructure and processes (1.01), and Familiarity with colleagues facilitates the generation of ideas (1.00) have all been included in the validated model of product innovation as suggested in conceptual model (Ruggles, 1996; Frances and Sandberg, 2000; Nonaka and Takeuchi, 1995; Sheshadri et al., 2003). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a

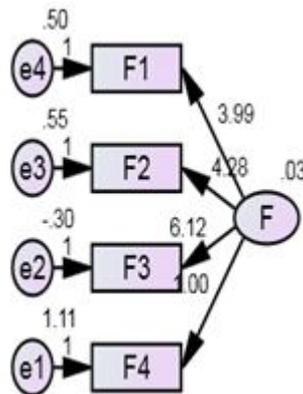
given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in ID4, Intelligence Dissemination is increased by 1.18 units. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf) ; for e.g., the result suggests that e23 is 0.56 which means 56% of the variance is unexplained by ID1 in predicting Intelligence Dissemination. The lower the variance, the better it is. The figure also shows the R<sup>2</sup> value which is 0.42 and reflects the proportion of variance in the dependent variable explained by all the predictors; the results here shows that 42% of the variances in the dependability are explained by all the observed variables. The higher the R<sup>2</sup>, the better it is. ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf)). Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Intelligence dissemination). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error23 (.56) associated with observed variable (ID1), error24 (.66) associated with observed variable (ID4), error25 (.69) associated with (ID2), and error26 (.63) associated with observed variable (ID3) represents measurement error.

**Table-4.20: Standardized Regression Weights: (Group number 1 - Default model)**

ID1	<---	ID	0.634
ID4	<---	ID	0.676
ID2	<---	ID	0.613
ID3	<---	ID	0.674

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, ID3 & ID4 have factor loadings of 0.674 and 0.676; this shows that they are best indicators of Intelligence Dissemination.

**4. Flexibility**



**Figure-4.6: Flexibility and its measured Variables**

In the above 4.6 figure, Flexibility is the latent construct having 4 measured variables. The degree to which each of these measured variables is related to latent construct is represented by the variable’s loadings or standardized estimates. Since a measured variable doesn’t explain the latent variable perfectly, an error term is added. The four unidirectional arrows leading from F to each of the four observed variables (F1, F2, F3 and F4) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

F = Flexibility

F1 = Increase the ability of producing non-standard products.

F2 = Increase the product orders with different specifications.

F3 = Ability to change machine and equipment priorities when necessary.

F4 = Increase the ability of flexible production.

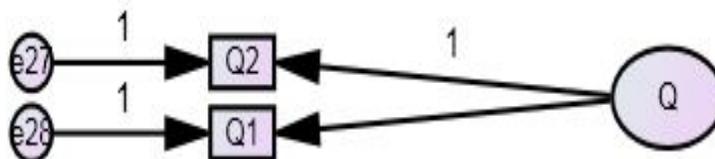
The construct “Flexibility” with overall value of 0.03 is included in the validated model of product innovation. The items including Increase the ability of producing non-standard products. (3.99), Increase the product orders with different specifications (4.28), Ability to change machine and equipment priorities when necessary (6.12), and Increase the ability of flexible production (1.00) have all been included in the validated model of product innovation as suggested in conceptual model (G. Ulusoy, G. Gunday, L. Alpkan and K. Kilic, 2008; Gurhan Gunday, Gunduz Ulusoy, Kemal Kilic, Lutfi Alpkan, 2009; Boyer, K.K., Lewis, M.W.,2002). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in F1, Flexibility is increased by 3.99 units. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf); for e.g., the result suggests that  $e_4$  is 0.50 which means 50% of the variance is unexplained by F1 in predicting Flexibility. The lower the variance, the better it is. The figure also shows the  $R^2$  value which is 0.03 and reflects the proportion of variance in the dependent variable explained by all the predictors; the results here shows that 3% of the variances in the dependability are explained by all the observed variables. The higher the  $R^2$ , the better it is. ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf)). Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Flexibility). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error4 (.5) associated with observed variable (F1), error3 (.55) associated with observed variable (F2), error2 (-.30) associated with (F3), and error1 (1.11) associated with observed variable (F4) represents measurement error.

**Table-4.21: Standardized Regression Weights: (Group number 1 - Default model)**

F3	<---	F	0.962
F2	<---	F	0.849
F1	<---	F	0.826
F4	<---	F	0.986

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, F3 & F4 have factor loadings of 0.962 and 0.986; this shows that they are best indicators of Flexibility.

## 5. Quality



**Figure-4.7: Quality and its measured variables**

In the above 4.7 figure, Quality is the latent construct having 2 measured variables. The degree to which each of these measured variables is related to latent construct is represented by the variable’s loadings or standardized estimates. Since a measured variable doesn’t explain the latent variable perfectly, an error term is added. The two unidirectional arrows leading from Q to each of the two observed variables (Q1 and Q2) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

Q = Quality

Q1 = Focuses on Increasing the product and service quality according to customer’s perception.

Q2 = Focuses on Increasing the product and service quality compared to rivals.

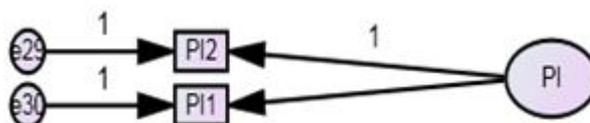
The construct “Quality” is included in the validated model of product innovation. The items including Increasing the product and service quality according to customer’s perception and Increasing the product and service quality compared to rivals have all been included in the validated model of product innovation as suggested in conceptual model (G. Ulusoy, G. Gunday, L. Alpkan and K. Kilic, 2008; Gurhan Gunday, Gunduz Ulusoy, Kemal Kilic, Lutfi Alpkan, 2009; Gunday, G., Ulusoy, G., Kilic, K., Alpkan, L., (2008). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in Q2, Overall Quality is increased. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf). The lower the variance, the better it is. Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Quality). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error27 associated with observed variable (Q2) and error28 associated with observed variable (Q1) represents measurement error.

**Table-4.22: Standardized Regression Weights: (Group number 1 - Default model)**

Q2	<---	Q	0.873
Q1	<---	Q	0.715

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, Q1 & Q2 have factor loadings of 0.715 and 0.873; this shows that they are best indicators of Quality.

**6. Linking Product-Process Innovation**



**Figure-4.8: Linking product-process innovation and its measured variables**

In the above 4.8 figure, Linking product-Process Innovation is the latent construct having 2 measured variables. The degree to which each of these measured variables is related to latent construct is represented by the variable’s loadings or standardized estimates. Since a measured variable doesn’t explain the latent variable perfectly, an error term is added. The two unidirectional arrows leading from PI to each of the two observed variables (PI1 and PI2) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest

items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

PI = Linking product-process innovation

PI1 = Determines and eliminates non value adding activities in production processes.

PI2 = Decrease manufacturing cost in components and materials of current products.

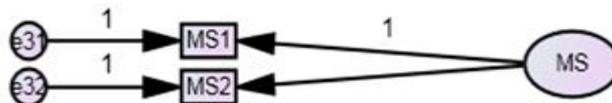
The construct “Linking product-process innovation” is included in the validated model of product innovation. The items including Determines and eliminates non value adding activities in production processes and Decrease manufacturing cost in components and materials of current products have all been included in the validated model of product innovation as suggested in conceptual model (Ettile, 1995; Fruin, 1998; Galbraith, 1982; Meeus & Edquist, 2006; Damanpour, Gopalakrishnan 1999; Pisano, 1997). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in PI2, overall Product-process Innovation is increased. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf) The lower the variance, the better it is. Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Linking product-process innovation). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error29 associated with observed variable (PI2) and error30 associated with observed variable (PI1) represents measurement error.

**Table-4.23: Standardized Regression Weights: (Group number 1 - Default model)**

PI2	<---	PI	0.663
PI1	<---	PI	0.753

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, PI1 PI2 have factor loadings of 0.753 and 0.663; this shows that they are best indicators of Linking product-process innovation.

**7. Marketing support of the Product**



**Figure-4.9: Marketing support of the product**

In the above 4.9 figure, Marketing support of the product is the latent construct having 2 measured variables. The degree to which each of these measured variables is related to latent construct is represented by the variable’s loadings or standardized estimates. Since a measured variable doesn’t explain the latent variable perfectly, an error term is added. The two unidirectional arrows leading from MS to each of the two observed variables (MS1 and MS2) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

MS = Marketing support of the product

MS1 = Renews the design of the current and/ or new products.

MS2 = Renews the distribution channels without changing the logistics processes related to the delivery of the product.

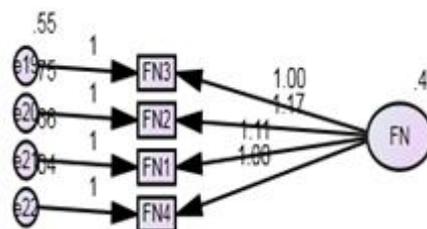
The construct “Marketing support of the product” is included in the validated model of product innovation. The items including Renews the design of the current and/ or new products and Renews the distribution channels without changing the logistics processes related to the delivery of the product have all been included in the validated model of product innovation as suggested in conceptual model (Hauser, et al., 2006; Henderson, 1994; Pelham, 1997; Wang and Wei, 2005; Lhuillery, 2014; Li, 2000; Buzzel and Gale, 1987; Venkatraman and Prescott, 1990, Wang and Wei, 2005). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in MS2, overall Marketing support of the product is increased. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf) . The lower the variance, the better it is. Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Marketing support of the product). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error31 associated with observed variable (MS1) and error32 associated with observed variable (MS2) represents measurement error.

**Table-4.24: Standardized Regression Weights: (Group number 1 - Default model)**

MS1	<---	MS	0.642
MS2	<---	MS	0.895

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, MS1 & MS2 have factor loadings of 0.642 and 0.895; this shows that they are best indicators of Marketing support of the product.

**8. Financial Performance**



**Figure-4.10: Financial performance and Its measured variables**

In the above 4.10 figure, Financial performance is the latent construct having 4 measured variables. The degree to which each of these measured variables is related to latent construct is represented by the variable’s loadings or standardized estimates. Since a measured variable doesn’t explain the latent variable perfectly, an error term is added. The four unidirectional arrows leading from FN to each of the four observed variables (FN1, FN2, FN3 and FN4) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

FN= Financial performance

FN1= Increase in the ratio of Return on sales (profit/total sales).

FN2= Increase in the ratio of Return on assets (profit/total assets).

FN3= Increase in the General profitability of the firm.

FN4= Increase in the Cash flow of the firm excluding investments.

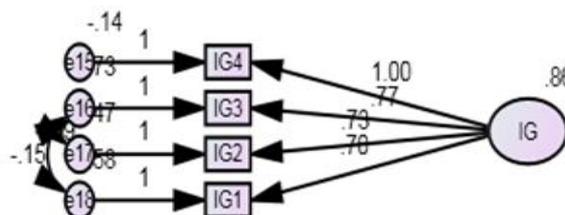
The construct “Financial performance” with overall value of 1.03 is included in the validated model of product innovation. The items including Increase in the ratio of Return on sales (profit/total sales) (.04), Increase in the ratio of Return on assets (profit/total assets) (.71), Increase in the General profitability of the firm (1.00), and Increase in the Cash flow of the firm excluding investments (.10) have all been included in the validated model of product innovation as suggested in conceptual model (Aktan & Bulut, 2008; Andriessen, 2007; Venkatraman and Ramanujam 1986; Fis & Cetindamar, 2009; Floyd & Woolridge, 1990; Gatignon & Xuereb, 1997; Gopalakrishnan, 2000; Gunday, et al., 2011; Heshmati & Loof, 2006; Lumpkin & Dess, 2001; Malerba & Marengo, 1995; Mankin, 2007). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in FN2, Financial performance is increased by 1.17 units. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf) ; for e.g., the result suggests that e19 is 0.55 which means 55% of the variance is unexplained by FN3 in predicting Financial Performance. The lower the variance, the better it is. The figure also shows the R<sup>2</sup> value which is 0.49 and reflects the proportion of variance in the dependent variable explained by all the predictors; the results here shows that 49% of the variances in the dependability are explained by all the observed variables. The higher the R<sup>2</sup>, the better it is. ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf)). Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Financial performance). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error19 (.55) associated with observed variable (FN3), error20 (.75) associated with observed variable (FN2), error21 (.66) associated with (FN1), and error22 (.64) associated with observed variable (FN4) represents measurement error.

**Table-4.25: Standardized Regression Weights: (Group number 1 - Default model)**

FN4	<---	FN	0.909
FN2	<---	FN	0.698
FN3	<---	FN	0.613
FN1	<---	FN	0.745

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, FN1 & FN4 have factor loadings of 0.745 and 0.909; this shows that they are best indicators of financial performance.

## 9. Intelligence Generation



**Figure-4.11: Intelligence Generation and its measured variables**

In the above 4.11 figure, Intelligence generation is the latent construct having 4 measured variables. The degree to which each of these measured variables is related to latent construct is represented by the variable’s loadings or standardized estimates. Since a measured variable doesn’t explain the latent variable perfectly, an error term is added. The four unidirectional arrows leading from IG to each of the four observed variables (IG1, IG2, IG3 and IG4) advised that these score values are each impacted by the corresponding basic construct. As such, these path coefficients show the degree of demanded deviation in the manifest items for every deviation in the linked hidden item (or construct). Here the connotation for the following terms is as:

IG = Intelligence generation

IG1= Process of Intelligence Generation is important to design new products and services.

IG2= Organize the process of intelligence generation and use it to design new products, services or systems.

IG3= Capability to generate intelligence and utilize it is most important source of a firm’s sustainable competitive advantage.

IG4= People with entrepreneurial pursuits tend to engage in greater level of information scanning activities

The construct “Intelligence generation” with overall value of 0.86 is included in the validated model of product innovation. The items including process of Intelligence Generation is important to design new products and services (.70), Organize the process of intelligence generation and use it to design new products, services or systems (.73), Capability to generate intelligence and utilize it is most important source of a firm’s sustainable competitive advantage (.77), and People with entrepreneurial pursuits tend to engage in greater level of information scanning activities (1.00) have all been included in the validated model of product innovation as suggested in conceptual model (Nonaka and Toyama, 2002; Wiig ,1997 ; Ramachandran and Ray, 2006). The unstandardized regression coefficients represent the demanded deviation in the dependent item connected with a unit deviation in a given estimator while controlling for the inter-related impacts of other estimator ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)); this outcome recommends that for every single unit of increase in IG3, Intelligence Generation is increased by 0.77 units. The above figure also shows the error variance which represents the amount of variance unexplained by the observed variable ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf) ; for e.g., the result suggests that e16 is 0.73 which means 73% of the variance is unexplained by IG3 in predicting Intelligence Dissemination. The lower the variance, the better it is. The figure also shows the R<sup>2</sup> value which is 0.86 and reflects the proportion of variance in the dependent variable explained by all the predictors; the results here shows that 86% of the variances in the dependability are explained by all the observed variables. The higher the R<sup>2</sup>, the better it is. ([https://stat.utexas.edu/images/SSC/Site/AMOS\\_Tutorial.pdf](https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf)). Error connected with manifest items display measurement error, which shows on their sufficiency in calculating the linked basic construct (Intelligence generation). Measurement error origins from two sources: random measurement error (in the psychological manner) and error uniqueness, a definition used to state error variance obtaining from some features that is taken to be particular (or unique) to a specific barometer item. Such error usually shows nonrandom (or systematic) measurement error. Error15 (-.14) associated with observed variable (IG4), error16 (.73) associated with observed variable (IG3), error17 (.47) associated with (IG2), and error18 (.58) associated with observed variable (IG1) represents measurement error.

**Table-4.26: Standardized Regression Weights: (Group number 1 - Default model)**

IG4	<---	IG	0.992
IG3	<---	IG	0.686
IG2	<---	IG	0.771
IG1	<---	IG	0.897

The standardized regression weights show the quantity of deviation in the dependent item that is attached to a single standard deviation unit deviation in the estimator item. The standardization of the coefficients based on the standard deviations of the variables is the approach typically used to make coefficients comparable ([http://www.esapubs.org/bulletin/backissues/086-4/pdf\\_web/comm1\\_86\\_4.pdf](http://www.esapubs.org/bulletin/backissues/086-4/pdf_web/comm1_86_4.pdf)). In the table above, IG1 &

IG4 have factor loadings of 0.897 and 0.992; this shows that they are best indicators of Intelligence Generation.

**Table-4.27: Model Fit Indices of each Construct**

Constructs	MODEL FIT INDICES				
	CFI	GFI	RMSEA	P-CLOSE	CMIN/df
Dependability/ Delivery	0.998	0.997	0.033	0.517	1.536
Technology selection	0.992	0.968	0.056	0.062	4.200
Financial performance	0.998	0.989	0.038	0.851	1.966
Intelligence Generation	0.989	0.975	0.052	0.382	2.810
Flexibility	0.999	0.997	0.059	0.305	3.336
Intelligence dissemination	0.997	0.987	0.052	0.079	4.509
Quality	0.998	0.989	0.038	0.851	1.966
Linking Product-process Innovation	0.989	0.975	0.052	0.382	2.810
Marketing Support of the product	0.992	0.97	0.059	0.078	3.305

**NOTES**

1. CFI & GFI value of 0.95 and above signifies good model fit (Byrne, 2013)
2. RMSEA value less than 0.05 is considered good, P-CLOSE value greater than 0.05 is acceptable and CMIN/df value between less than 3 is considered good but sometimes less than 5 is permissible (Hu and Bentler, 1999)

The table 4.26 above shows the model fit indices of all constructs namely, Intelligence Dissemination, Intelligence Generation, Technology Selection, Quality, Flexibility, Dependability/ Delivery, Marketing support of the product and Linking product-process innovation. In case of Dependability/ Delivery, all indices values are above the cut-off level and imply a good model fit; the GFI and CFI value are above the cut-off point, RMSEA is close to cut-off point and P-CLOSE is in acceptable range. CFI & GFI are goodness of fit indices whereas RMSEA is badness of fit index, therefore, the lesser it is the better the model fit is. The CMIN/df value is also within acceptable range indicating a good model fit .

In case of Technology selection, the GFI & CFI are within the acceptable range, RMSEA is close to cut-off with PCLOSE value of 0.062 which is above the 0.05. The CMIN/df value is little more than the threshold but permissible. Thus, the model seems to be fairly a good fit model. In case of Financial performance, the CFI & GFI re above the cut-off and RMSEA is good enough to be below 0.05 indicating good model fit with a PCLOSE value fairly above the threshold. The CMIN/df is very good as it is below the cut-off point of 3. Thus, overall the model is a good fit. In case of Intelligence Generation, the CFI & GFI are above threshold, RMSEA is close to cut-off point but acceptable with PCLOSE value far above the threshold; CMIN/df value is also within acceptable range indicating a good model fit. In case of Flexibility, the CFI & GFI are within the acceptable range, RMSEA just near to cut-off with a good PCLOSE value of 0.305. Also, the CMIN/df value indicates good model fit. In case of Intelligence dissemination, the CFI & GFI are above the cut-off and RMSEA is good enough to be close to 0.05 indicating marginally good model fit with a PCLOSE value fairly above the threshold. The CMIN/df is high though within permissible limits giving marginally good model fit. In case of Quality, the CFI & GFI re above the cut-off and RMSEA is good enough to be below 0.05 indicating good model fit with a PCLOSE value fairly above the threshold. The CMIN/df is very good as it is below the cut-off point of 3. Thus, overall the model is a good fit. In case of Linking Product-process Innovation, the CFI & GFI are above threshold, RMSEA is close to cut-off point but acceptable with PCLOSE value far above the threshold; CMIN/df value is also within acceptable range indicating a good model fit. In case of Marketing Support of the product, the CFI & GFI are within the acceptable range, RMSEA just near to cut-off with a good PCLOSE value of 0.078. Also, the CMIN/df value indicates good model fit.

#### 4.10 MEASURES OF FIT

SEM researchers separates two categories of fit indices: those that show “absolute” fit, and those that show a model's “incremental” fit, or the fit of one model in comparison to another. Absolute barometers of model fit involve  $\chi^2$  and SRMR, among others. Incremental fit statistics involve CFI, among others. **Here are their terms and basic behavioural features.**

**Chi-square (CMIN/DF):-** Among the SEM fit indices, the  $\chi^2$  is the only likely statistic; all the others are detailed. That is, only for the  $\chi^2$  may we make statements regarding significance or hypothesis testing, and for the others, there lie only “rules-of-thumb” to test goodness-of-fit. The main significant of these is that the  $\chi^2$  is responsive to sample size (Gerbing & Anderson 1985). While it is significant to have a large sample to increase the accuracy of criterion assessment, it is the instance that as N moves,  $\chi^2$  moves up. A  $\chi^2$  will almost always be important (stating a poor fit) even with only moderate sample sizes. As a consequence, it has been recommended, with some similarity in the psychology study, that a theory states acceptable fit if the statistic adjusted by its degrees of freedom does not greater than 3.0 (Kline, 2004):  $\chi^2 / df \leq 3$ . Chi-square assess the null-hypothesis that blueprint of the factor loadings, factor variances and covariance, and error variances for the theory under research are accurate, the chi-square test continuously assess the degree to which this blueprint is real. Therefore, the greater the chances connected with chi-square, the nearer the fit between the hypothesized model (under H0) and the perfect fit (Bollen, 1989a). Because of the constraints linked with chi-square as fit indices, Analysts have forwarded the disadvantages by making goodness-of-fit indices that take a more efficient method to the monitoring process. One of the foremost fit statistics to address this issue was the  $\chi^2/\text{degrees of freedom}$  ratio (Wheaton, Muthen, Alwin, & Summers, 1977), which seems as CMIN/DF.

**SRMR means** for “standardized root mean square residual.” SRMR is a badness-of-fit index (greater values states bad fit), and it moves from 0.0 to 1.0. SRMR is zero when the theory estimations meet the information accurately. SRMR is improved (lowered) when the measurement model is clear (high factor loadings; Anderson & Gerbing 1984, p.171). The index is a really better barometer of whether the analysts theory grab the data, since it is comparatively less reactive to other challenges such as break-ups of distributional hypotheses. The root mean square residual (RMR) shows the mean residual value extracted from the fitting of the variance–covariance matrix for the assumed model  $\Sigma$  to the variance–covariance matrix of the sample data (S). The standardized RMR, then, shows the mean value across all standardized residuals, and moves from zero to 1.00; in a good fit model, this figure will be little (say, .05 or less).

**CFI** is the “comparative fit index” and just like the  $\chi^2$ , which relatively matches the model to data, the CFI takes the fit of one model to the data and matches it to the fit of another model to the similar data. Hence, this form of statistic grabs the comparative goodness- of- fit, or the fit of one's hypothesized model as an experimental increase above a simple model (in specific, one in which no paths are predicted). Just like the  $\chi^2$  and SRMR, the CFI is a goodness-of-fit index. It moves from 0.0 to 1.0, and higher numbers are good. Also just like the previous two indices, the CFI tries to mould for model complications or closeness. It does so by involving the degrees of freedom used in the model straight into the calculation. Similar to the  $\chi^2$ , the RMR and SRMR are worsened indices— greater values show worse fits. If the model estimated the data ideally and accurately, then the residuals should be close to zero, making the numerator of RMR definitely zero (or zero squared), and the numerator of the numerator of SRMR equally zero.

**RMSEA** is an index that seems just like the SRMR but it is calculated in another way and it behaves distinctly (Steiger, 2000). The RMSEA is the “root mean square error of approximation” (Iacobucci, 2010). MacCallum et al. (1996) have currently explained on these bench points and observed that RMSEA values moving from .08 to .10 state medium fit, and those higher than .10 state worse fit. Although Hu and Bentler (1999) have recommended a value of .06 to be barometer of good fit between the assumed model and the manifest data, they warned that, when sample size is small, the RMSEA (and TLI) tend to Over reject true population models (but see Fan et al., 1999, for matches with other indices of fit). In addition to reporting a confidence interval around the RMSEA value, AMOS tests for the parsimony of fit (PCLOSE). That is, it assess the assumption that the RMSEA is “good” in the population (particularly, that it is .05). Joreskog and Sorbom (1996a) have recommended that the p-value for this test should be .50.

**Goodness-of-Fit Index (GFI)** is a measure of the comparative volume of variance and covariance in S that is combingly elaborated. The Adjusted Goodness-of-Fit Index (AGFI) separates from the GFI only in the fact that it adopts for the number of degrees of freedom in the particular model. Although both indices move from zero to 1.00, with values close to 1.0 being indicator of good fit, Joreskog and Sorbom (1993) observed. The final index of fit in this set, the close Goodness-of-Fit Index (PGFI), was launched by James, Mulaik, and Brett (1982) to consign the challenge of closeness in SEM. As the first of a range of “close-based indices of fit” (see Williams & Holahan, 1994), the PGFI takes into picture the complication (i.e., number of predicted criteria) of the assumed model in the test of entire model fit. As such, “two meaningful inter-linked sets of information,” the goodness-of-fit of the model (as measured by the GFI) and the closeness of the model, are shown by the single index PGFI, thereby providing a more accurate assessment of the assumed model (Mulaik et al., 1989, p. 439). Generally, close-based indices have smaller values than the standard level commonly taken as “acceptable” for other normed indices of fit.

Bentler and Bonett's (1980) **Normed Fit Index (NFI)** has been the practical parameter of selection, as seen in greater portion by the present “classic” level of its own publication (see Bentler, 1992; Bentler & Bonett, 1987). Although, consigning proof that the NFI has given a biasness to under show fit in small samples, Bentler (1990) corrected the NFI to take sample size into details and introduced the Comparative Fit Index (CFI). Although a value of .90 was actually taken representative of a well-built theory (see Bentler, 1992), a corrected cutoff value closer to .95 has currently been recommended (Hu & Bentler, 1999). Lastly the **Tucker-Lewis Index (TLI; Tucker & Lewis, 1973)**, similar consistent with the other indices observed here, gives values moving from zero to 1.00, with values close to .95 (for large samples) being barometer of good fit (see Hu & Bentler, 1999).

#### **P of Close Fit (PCLOSE)**

This measure gives is one-sided test of the null hypothesis is that the RMSEA equals .05, what is stated as close-fitting model. Such a model has blueprint error, but “not very much” blueprint error (Hayduk, L., Cummings, G. G., Boadu, K., Pazderka-Robinson, H., & Boulianne, S., 2007). The other, one-sided hypothesis is that the RMSEA is higher than 0.05. So if the p is higher than .05 (i.e., not statistically significant), then it is said that the fit of the model is "parsimony." If the p is less than .05, it is said that the model's fit is bad than parsimony fitting (i.e., the RMSEA is higher than 0.05). As with any significance test, sample size is a important determinant, but so also is the model df, with lower df there is less power in this test. You can use the RMSEA confidence interval to assess any null hypothesis about the RMSEA. For example, if you want to assess the one-sided that that RMSEA is higher than 0.05 (what is tested with PClose) with .05 alpha, you would notice the 90 percent confidence interval of the RMSEA and observe whether the extracted RMSEA moves the lower bound. If it does, the theory is bad fitting than a parsimony fitting mode, one with a population value for the RMSEA of 0.05.

#### **4.11 OVERALL VALIDATED AND PROPOSED SEM MODEL**

A confirmatory factor analyses (CFA) was performed with Amos. All variables parcels loaded significantly onto their particular constructs (loadings moving from .63 to .72 on the product innovation scale and between .65 and .86 on the impact of financial performance scale). Even though the two factors are assumed as independent, they were permitted to inter-link. The regular correlation ( $r = .05$ ) between the constructs though was not important, holding the independence of the two measurements. Chi-square value for the entire model fit was important,  $\chi^2(416) = 3669.903$ ,  $p < .001$  recommending a deficiency of fit between the assumed model and the data. Although, due to the responsiveness of  $\chi^2$  in big samples, other fit indices were tested (Kline, 1998).

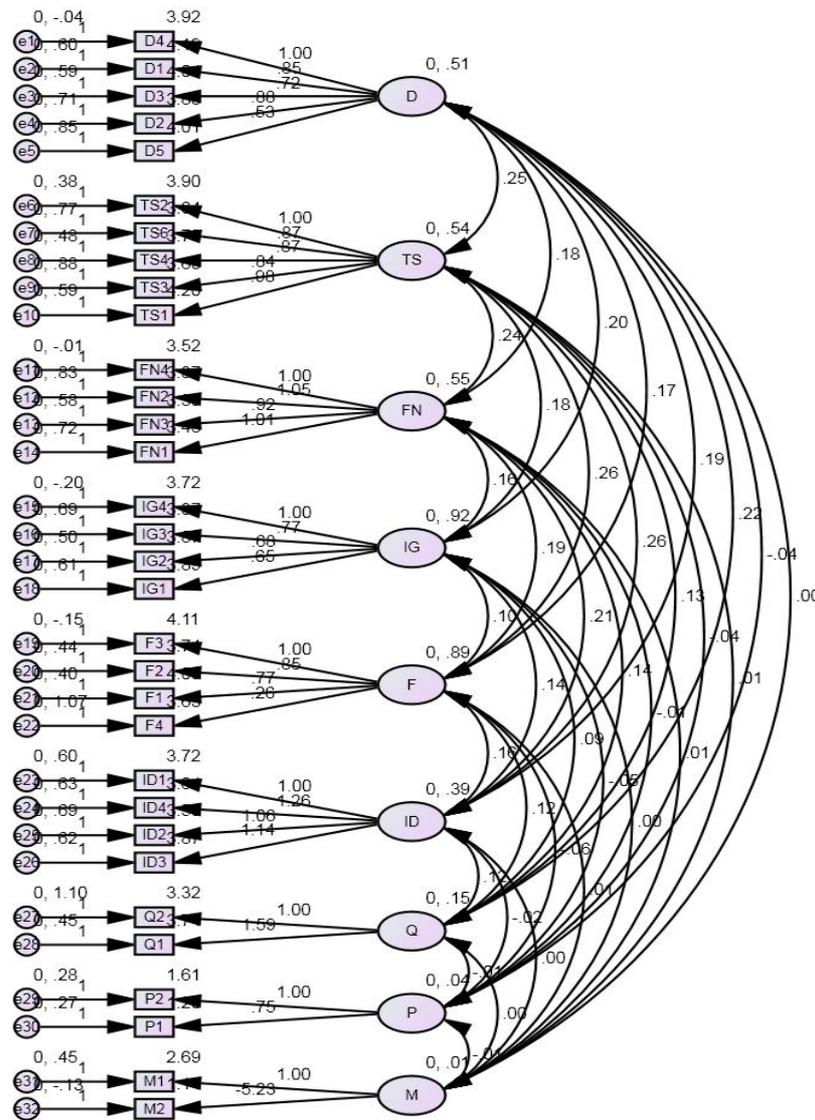


Figure-4.12: shows the First Order Confirmatory Model

#### 4.11.1 First order- SEM Model

The CFA structure in the above figure comprises nine factors— Dependability (D), Technology Selection (TS), Financial Performance (FN), Intelligence Generation (IG), Flexibility (F), Intelligence Dissemination (ID), Quality (Q), Linking Product-Process Innovation (P) and Marketing Support of the product (M). Each construct is measured by distinct manifest items, the validity of which is affected by random measurement error, as shown by the linked error term. Each of these manifest items is regressed onto its particular construct. Lastly, the nine constructs are represented to be correlated. The important criterion to be predicted in a CFA model are the regression coefficients (i.e., factor loadings), the factor and error variances, and the factor covariances. Given that the hidden and manifest items are mentioned in the model in AMOS Graphics, the program by default shows the factor and error variances. In other sense, variances linked with these mentioned items are freely shown automatically. We can found that there are 32 regression coefficients (factor loadings), 41 variances (32 error variances and 9 factor variances), and 36 factor covariances. The 1's given to one of each group of regression path criteria shows a fixed value of 1.00; as such, these criteria are not predicted. In short, then, there are 100 criteria to be predicted for the CFA model. One of the regression paths coming from each construct to a group of manifest barometers, some fixed value should be

mentioned; this fixed criterion is defined a reference item. Revising the CFA model in the above model, let's now see how many data points we have to go with (i.e., how much information do we have with respect to our data?). As observed earlier, these contains the variances and covariances of the manifest items; with p items, there are  $p(p + 1) / 2$  such constituents. Given that there are 32 manifest items, this shows that we have  $32(32 + 1) / 2 = 528$  data points. Prior to this conversation of identification, we found a total of 100 unknown criterions. Therefore, with 528 data points and 100 criterions to be predicted, we have an over identified model with 428 degrees of freedom.

The model was made and revised for a good model fit. The predictions used for measuring the model fitness were Chi-square/degrees of freedom ( $\chi^2/df$ ) ratio, root mean-square error of approximation (RMSEA), Goodness of fit index (GFI), comparative fit index (CFI). The results are shown in the table 4.28 below:

**Model Fit Indices**

	<b>CFI</b>	<b>GFI</b>	<b>RMSEA</b>	<b>P-CLOSE</b>	<b>CMIN/df</b>
SEM Initial Model	0.874	.862	.043	0.634	3.278

**NOTES**

1. CFI & GFI value of 0.95 and above signifies good model fit (Byrne, 2013)
2. RMSEA value less than 0.05 is considered good, P-CLOSE value greater than 0.05 is acceptable and CMIN/df value less than 3 is considered good but sometimes less than 5 is permissible (Hu and Bentler,1999)

**4.11.2 Interpretation of Model Fit Indices**

**The RMSEA** is the root mean square error of approximation which indicates badness of fit model i.e. higher values means worse fit. If the value is less than .05 then the model has good or best fit. If it ranges between 0.8 and 0.10, then it is a mediocre fit and finally if it is more than 0.10, then it is considered as poor fit. Here, in the above model, the value of RMSEA is 0.043; this clearly shows that the model has the best fit, as it is less than 0.05.

**The P-Close** is the p of the close fit and assess for the parsimony of the fit. Additionally, reporting a confidence interval around the RMSEA value, AMOS assesses for the parsimony of fit (PCLOSE). That is, it assesses the assumption that the RMSEA is “good” in the population (specifically, that it is .05). If the p is higher than .05 (i.e., not statistically significant), then it is said that the fit of the model is "parsimony." If the p is less than .05, it is said that the model's fit is bad than parsimony fit. Here, in the above model, the value of P-Close is 0.634, which indicates that the model is acceptable as it has the close fit.

**The CFI** is the comparative fit index which shows comparative goodness of fit model i.e. fit of one model to the data and matches it to the fit of another model to the similar data. Usually, the value ranges between 0.1 and 1 in CFI. The CFI tries to mould for model complications or closeness. It does so by involving the degrees of freedom used in the model straight into the calculation. Here, in the above model, the value of CFI is 0.874; this clearly signifies that the model has good relative fit as it is close to the value of 0.95.

**Goodness-of-Fit Index (GFI)** is a measure of the comparative volume of variance and covariance in S that is combingly elaborated. The value of GFI ranges between zero and one. If it is close to 1, then it shows that the model is indicative of good fit where as if it is less than 0.5 then it is an indicative of worse fit. Here, in the above model, the value of GFI is 0.862, which indicates that the model is an indicative of good fit.

**CMIN/DF** is the Chisquare  $\chi^2$  test which is the only inferential statistic and exists “rules-of-thumb” to test goodness-of-fit. The main significant of these is that the  $\chi^2$  is responsive to sample size (Gerbing & Anderson 1985). While it is significant to have a large sample to increase the accuracy of criterion assessment, it is the instance that as N moves,  $\chi^2$  moves up. A  $\chi^2$  will almost always be important (stating a poor fit) even with only moderate sample sizes. Therefore, it s significant in case of small sample size and it is non-significant in case of large samples. The value of CMIN/DF is acceptable if it is it is less than 0.3 which indicates its significance level. Here, in this model, the value of CMIN/DF is 3.278, which indicates that sample size is adequate as the level of significance is acceptable.

**Table-4.29: shows the Summary of Overall Reliability, Validity & Model Fit**

Constructs	RELIABILITY	CONVERGENT VALIDITY	DISCRIMINANT VALIDITY	MODEL FIT INDICES				
	Cronbach Alpha	Average Variance Explained	Maximum Shared Variance	CFI	GFI	RMSEA	P-CLOSE	CMIN/df
Intelligence generation	0.811	0.497	0.31	0.989	0.975	0.052	0.382	2.81
Intelligence Dissemination	0.751	0.584	0.25	0.997	0.987	0.052	0.079	4.509
Technology Selection	0.784	0.55	0.37	0.992	0.968	0.056	0.062	4.2
Flexibility	0.811	0.577	0.38	0.999	0.997	0.059	0.305	3.336
Dependability/Delivery	0.781	0.574	0.36	0.998	0.997	0.033	0.517	1.536
Quality	0.736	0.504	0.44	0.998	0.989	0.038	0.851	1.966
Marketing support of the product	0.708	0.541	0.28	0.992	0.97	0.059	0.078	3.305
Product-Process Innovation	0.715	0.512	0.4	0.989	0.975	0.052	0.382	2.81
Financial Performance	0.819	0.595	0.43	0.998	0.989	0.038	0.851	1.966
Overall MODEL	0.893			0.874	0.862	0.073	0.851	3.278

**4.12 TESTING OF PROPOSED MODEL: STRUCTURAL EQUATION MODELING**

(SEM) was used in this research to check proposed model and assumptions and used AMOS as the analysis instrument. For criterion estimation, maximum likelihood method was accepted. Measurement model and structural model test were taken to test fitness of the model. To test straight and implied relationships among the interested variables the researchers have taken a two-step procedure using confirmatory factor analysis and structural equation modeling (Anderson & Gerbing, 1988). Amos has been taken to perform these analyses. The proposed model was initially checked for the fitness. The prediction taken for measuring the model fitness were Chi-square/degrees of freedom ( $\chi^2/df$ ) ratio, root mean-square error of approximation (RMSEA), normed fit index (NFI), comparative fit index (CFI), Tuck Willis Index (TLI).

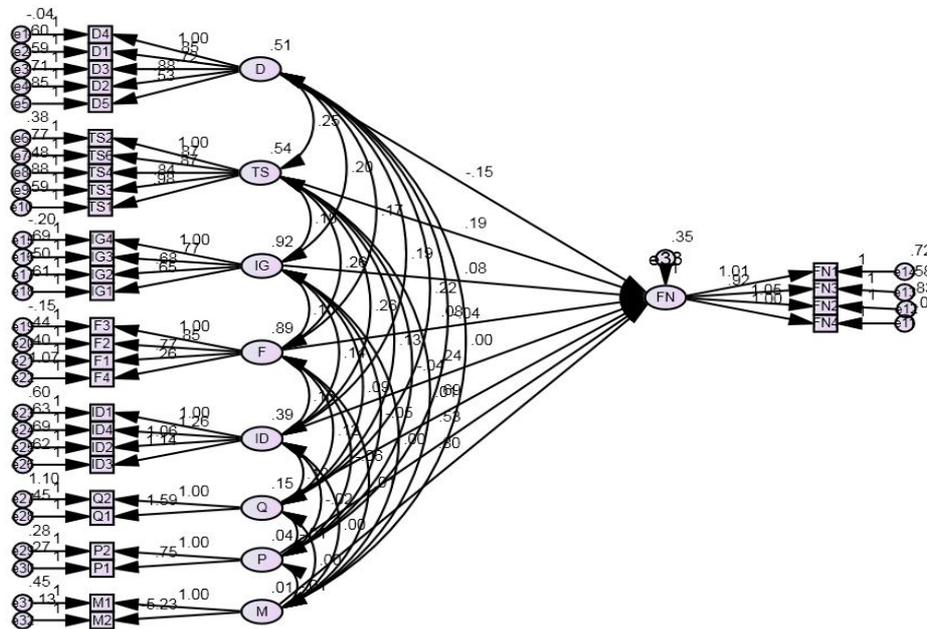


Figure-4.13: Showing the second order Confirmatory Model

#### 4.12.1 Measurement Model Validation

The measurement model was assessed using confirmatory factor analysis. Since inclusion of a large number of variables in a single measurement model using AMOS 18.0 would render the model too complex, we followed Bentler and Chou’s (1987) recommendation to analyse sub-models in place of the complete model. Two separate measurement models, consisting of related constructs, were tested. Sub-model one consisted of the following variables:

- Intelligence generation
- Intelligence dissemination
- Technology selection
- Flexibility
- Dependability/ Delivery
- Quality
- Marketing Support of the Product

Product Innovation After the factors were extracted the next step involved subjecting them to confirmatory factor analysis following the work of Anderson and Gerbing (1988) to test the validity of the measures.

##### 4.12.1.1 Sub-model

For CFA the model was divided into sub models following Bentler and Chou’s (1988) recommendation because managing too many variables in Amos 18 is cumbersome. Therefore the sub models were of the independent variables Intelligence generation Intelligence dissemination, Technology selection, Flexibility, Dependability/ Delivery, Quality, Marketing Support of the Product that impacts financial Performance.

Product Innovation was of the factors of the dependent variable financial Performance in other words financial performance of a firm is dependent on the various factors of product innovation. Standardized Root Mean Square Residual (SRMR) > .05, Root Mean Square Error of Approximation (RMSEA) =0.081, which was slightly less than the maximum limit of .08 for a good fit; Incremental Fit Index (IFI) = 0.811; Tucker-Lewis Index (TLI) = 0.804, which was near to .90 required for a good fit.

To better the model Hair et al. (2010) was followed and corrections were made based on the standardised residual covariance matrix scores, standardised regression weights (r), and squared multiple correlations (R<sup>2</sup>). The modifications were made only in keeping with the theoretical arguments.

**4.12.2 Tests of Absolute Fit for Validation Model**

The chi-square test of entire model fit is named variations in this result. Its figure is 3669.903 with 416 degrees of freedom, giving a probability value of less than .000 that a chi-square value this large or larger would be extracted by probability if the null hypothesis that the model fits the data is real.

The 416 degrees of freedom shows the level of over identification of the model. Since the probability value of the chi-square test is smaller than the .05 level used by conference, we would dismissed the null hypothesis that the model fits the data. Although, due to the responsiveness of  $\chi^2$  in large samples, other fit indices were assessed (Kline, 1998). Inspection of these indices represents acceptable model fit with TLI = .811, CFI = .842, RMSEA = .079, NFI= 0.797.

**4.12.3 Second Order- Structural Model**

Financial performance (FN) is defined as the second order factor which is elaborating all variance and covariance linked to the first order factor arrangement. It is significant to take specific note of the fact that financial performance (FN) does not have its own group of measured barometers; instead, it is related impliedly indirectly to those measuring the lower order constructs. Let’s now take a parsimony look at the criteria to be predicted for this second-order model. Initially, observe the availability of single-headed arrows coming from the second-order construct (FN) to each of the first order constructs (Dependability (D) to Marketing support of the product (M)). These regression paths shows second-order factor loadings and all are independently predicted. To revise, although, that for causes related to the model searching problem, a limitation must be put either on one of the regression paths or on the variance of an independent construct, as these criterion cannot be predicted continuously. Since the impact of FN on each of the lower order Product innovation constructs is of main interest in second-order CFA models, the deviation of the higher order factor is commonly limited to equal 1.0, therefore leaving the second-order factor loadings to be independently predicted. A second area of this second-order model, although needing elaboration, is the first vision that the first-order constructs work as both independent and dependent items. This condition, although, is not so, as items can provide as either independent or dependent items in a theory, but not as both. Because the first-order factors operation as dependent items, it shows that their variances and covariances are no longer predictable criteria in the theory; such deviation is assumed to be accounted for by the higher order factor. In comparison, it is observed that there are no longer double-headed curved arrows relating the first-order product innovation constructs, thereby showing that neither the factor covariances nor variances are to be predicted. A second-order CFA model for which the higher order level is shown by a decrease type of a arrangement model, the complete structural equation model consists of both a measurement and a structural model. Hence, the complete model consists a structure of items whereby hidden constructs are regressed on other constructs as mentioned by literature, as well as on the exact manifest measurement. In other sense, in the complete SEM model, few hidden items are linked by one-way arrows, the direction of which shows assumptions having on the cause arrangement of items in the model.

The model was made and revised for a good model fit. The prediction used for computing the model fitness were Chi-square/degrees of freedom ( $\chi^2/df$ ) ratio, root mean-square error of approximation (RMSEA), Goodness of fit index (GFI), comparative fit index (CFI). **The results are shown in the table 4.30 below:**

**Model Fit Indices**

	<b>CFI</b>	<b>GFI</b>	<b>RMSEA</b>	<b>P-CLOSE</b>	<b>CMIN/df</b>
SEM Final Model	0.842	.833	0.054	0.634	3.647

**NOTES**

1. CFI & GFI value of 0.95 and above signifies good model fit (Byrne, 2013)
2. RMSEA value less than 0.05 is considered good, P-CLOSE value greater than 0.05 is acceptable and CMIN/df value less than 3 is considered good but sometimes less than 5 is permissible (Hu and Bentler,1999)

**4.12.3.1 Interpretation of Model Fit Indices**

**The RMSEA** is the root mean square error of approximation which indicates badness of fit model i.e. higher values means worse fit. If the value is less than .05 then the model has good or best fit. If it ranges between 0.8 and 0.10, then it is a mediocre fit and finally if it is more than 0.10, then it is considered as poor fit. Here, in the above model, the value of RMSEA is 0.054; this clearly shows that the model has the best fit, as it is nearer to 0.05.

**The P-Close** is the p of the parsimony fit and assesses for the parsimony of the fit. Additionally, reporting a confidence interval around the RMSEA value, AMOS tests for the parsimony of fit (PCLOSE). That is, it tests the hypothesis that the RMSEA is “good” in the population (specifically, that it is .05). If the p is higher than .05 (i.e., not statistically significant), then it is said that the fit of the model is "parsimony." If the p is less than .05, it is said that the model’s fit is bad than parsimony fit. Here, in the above model, the value of P-Close is 0.634, which indicates that the model is acceptable as it has the close fit.

**The CFI** is the comparative fit index which shows comparative goodness of fit model i.e. fit of one model to the data and matches it to the fit of another model to the similar data. Usually, the value ranges between 0.1 and 1 in CFI. The CFI tries to mould for model complications or closeness. It does so by involving the degrees of freedom used in the model straight into the calculation. Here, in the above model, the value of CFI is 0.842; this clearly signifies that the model has good relative fit as it is close to the value of 0.95.

**Goodness-of-Fit Index (GFI)** is a measure of the comparative volume of variance and covariance in S that is combingly elaborated. The value of GFI ranges between zero and one. If it is close to 1, then it shows that the model is indicative of good fit where as if it is less than 0.5 then it is an indicative of worse fit. Here, in the above model, the value of GFI is 0.833, which indicates that the model is an indicative of good fit.

**CMIN/DF** is the Chisquare  $\chi^2$  test which is the only inferential statistic and exists “rules-of-thumb” to test goodness-of-fit. The main significant of these is that the  $\chi^2$  is responsive to sample size (Gerbing & Anderson 1985). While it is significant to have a large sample to increase the accuracy of criterion assessment, it is the instance that as N moves,  $\chi^2$  moves up. A  $\chi^2$  will almost always be important (stating a poor fit) even with only moderate sample sizes. Therefore, it s significant in case of small sample size and it is non-significant in case of large samples. The value of CMIN/DF is acceptable if it is it is less than 0.3 which indicates its significance level. Here, in this model, the value of CMIN/DF is 3.647, which indicates that sample size is adequate as the level of significance is acceptable.

**Table-4.31 showing Standardized Regression Weight Summary**

			<b>Estimate</b>	<b>S.R.</b>	<b>C.R.</b>	<b>P</b>	<b>Label</b>
Financial performance	<---	Dependability/Delivery	0.150	0.105	1.432	***	par_64
Financial performance	<---	Intelligence Generation	0.133	0.059	2.244	***	par_65
Financial performance	<---	Flexibility	0.256	0.041	6.196	***	par_66
Financial performance	<---	Technology Selection	0.087	0.068	1.293	***	par_67
Financial performance	<---	Intelligence Dissemination	0.181	0.088	2.047	***	par_68
Financial performance	<---	Quality	0.628	0.315	1.991	***	par_69
Financial performance	<---	Product-Process Innovation	0.496	0.573	0.866	***	par_70
Financial performance	<---	Marketing support of the product	0.639	0.461	1.385	***	par_71

Co variances between factors were measured and taken as input for confirmatory factor analysis. Co variances, means and standard deviations of the averaged measures are shown in Table below. All the predicted co variances were statistically significant ( $p < 0.05$ ). The path coefficients found in table of the path estimates are significant ( $p \leq 0.05$ ).

According to results, dependability, flexibility, marketing support of the product, quality, product-process innovation, technology selection, intelligence generation and intelligence dissemination has a considerable positive effect on financial performance which proves our hypothesis H9, H10, H11, H12, H13, H14 H15 and H16.

**RESULTS OF THE STRUCTURAL MODEL**

- H<sub>9</sub>** Intelligence generation is a component of product innovation that has a significant impact on financial performance. **Accepted**
- H<sub>10</sub>** Intelligence dissemination is a component of product innovation that has a significant impact on financial performance. **Accepted**
- H<sub>11</sub>** Technology selection is a component of product innovation that has a significant impact on financial performance. **Accepted**
- H<sub>12</sub>** Flexibility is a component of product innovation that has a significant impact on financial performance. **Accepted**
- H<sub>13</sub>** Dependability/ Delivery is a component of product innovation that has a significant impact on financial performance. **Accepted**
- H<sub>14</sub>** Quality is a component of product innovation that has a significant impact on financial performance. **Accepted**
- H<sub>15</sub>** Marketing Support of the Product is a component of product innovation that has a significant impact on financial performance. **Accepted**
- H<sub>16</sub>** Product- Process Innovation is a component of product innovation that has a significant impact on financial performance. **Accepted**

**CHAPTER-5**  
**SYNTHESIS OF LEARNINGS -**  
**MODEL FOR PRODUCT**  
**INNOVATION**

## 5.1 INTRODUCTION

This chapter presents synthesis of the leanings from the questionnaire based survey study and the pilot survey, based on which a product innovation model has been evolved. The model uses the determinants of product innovation for which the relevant research hypotheses are found to be true and which are also supported by the learning's from the previous studies.

## 5.2 SYNTHESIS OF RESEARCH FINDINGS

A conceptual framework was evolved for product innovation on the basis of the research evidences from the literature survey. Based on the conceptual model, the dimensions for each part of the model were identified on the basis of literature survey. The variables were enriched on the basis of the findings of the pilot study from select organizations. These variables formed the basis of the questionnaire used in the survey study administered in Automobile organizations.

### 5.2.1 Learnings from the Questionnaire Survey

Learnings, in terms of financial outcomes, from the questionnaire study are placed at Table below. The table also presents the unique issues for product innovation within organizations, evolved from the questionnaire survey study. Questionnaire study leads to conclusion that variables including Dependability/Delivery, Quality, Marketing support of the product, Intelligence generation, Intelligence Dissemination, Flexibility, Technology Selection and Product-Process Innovation are major predictors of financial outcomes. It is concluded from the survey that these above mentioned variables are the major determinants of product innovation.

**Table-5.1: showing variables emerging from the questionnaire study**

S.NO.	Variables	Questionnaire Based Survey Study (Predictors)	Unique Issues for Work environment/ organization	Remarks
1	<b>Intelligence Generation</b>	a) Process of intelligence generation	Emphasis should be given to involve external customers and partners for gathering the market information	This variable is a key driver of Financial outcome
		b) Design of new products, services or systems	Emphasis should be given to introduce new line of product or service	
		c) Capability to generate intelligence and utilize it	Emphasis should be given to collect information about external environment i.e. Customer needs and competitors actions	
		d) Capability to engage employees in innovative activities.	Emphasis should be given to involve employees in product innovation and emphasize them to	

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S.NO.	Variables	Questionnaire Based Survey Study (Predictors)	Unique Issues for Work environment/ organization	Remarks
			spend time with suppliers	
2	<b>Intelligence Dissemination</b>	a) Interaction among employees	Emphasis should be given to share the information and communication amongst the employees	This variable is a key driver of Financial outcome
		b) Availability of appropriate infrastructure and processes	Emphasis should be given to make the availability of necessary resources and systems within the organization	
		c) Familiarity with colleagues	Emphasis should be given to open the communication channels amongst the departments	
		d) Identifying and designing intelligence dissemination processes.	Emphasis should be given to design workload of employees in such a way that it leads to product innovation	
3	<b>Technology Selection</b>	a) Selection of leading strategy	Emphasis should be given to select the appropriate strategy for innovation	This variable is a key driver of Financial outcome
		b) High emphasis on R&D activities	Emphasis should be given to research activities	
		c) Selection of advanced technology in industry.	Emphasis should be given to select the modern technology suitable for innovation activities	
		d) Develops new products totally different from the current ones.	Emphasis should be given to add new line of product	
		e) Product modifications have a better market response.	Emphasis should be to alter the current products in such a manner that it leads to higher demands	
4	<b>Quality</b>	a) Increasing the product	Emphasis should be	This

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S.NO.	Variables	Questionnaire Based Survey Study (Predictors)	Unique Issues for Work environment/ organization	Remarks
		and service quality according to customer's perception.	given to increase the quality of products and services as per the demands of the customers	variable is a key driver of Financial outcome
		b) Increasing the product and service quality compared to rivals.	Emphasis should be given to make the superior and better products as compared to competitors	
5	<b>Flexibility</b>	a) Increase the ability of producing non-standardized products.	Emphasis should be given to increase the capacity of the firm to manufacture non-standardized products	This variable is a key driver of Financial outcome
		b) Increase the product orders with different specifications.	Emphasis should be given to increase the product with variations in each of them	
		c) Ability to change machine and equipment priorities.	Emphasis should be given to increase the capacity of the firm to replace machines and equipments	
		d) Increase the ability of flexible production.	Emphasis should be given to increase the capacity of the firm in flexible manufacturing	
6	<b>Marketing support of the product</b>	a) Renews the design of the current and new products	Emphasis should be given to change the design of products	This variable is a key driver of Financial outcome
		b) Renews the distribution channels without changing the logistics processes.	Emphasis should be given to change the distribution channels without altering the logistics	
7	<b>Dependability/ Delivery</b>	a) Increase the delivery speed of products	Emphasis should be given to maximise the speed of delivering the product or service	This variable is a key driver of Financial outcome
		b) Determines and eliminates non-value	Emphasis should be given to reduce the	

S.NO.	Variables	Questionnaire Based Survey Study (Predictors)	Unique Issues for Work environment/ organization	Remarks
		adding activities in delivery related processes.	waste activities in the process of delivery	
		c) Increasing the ability to meet the delivery commitments	Emphasis should be given to increase the capacity of the firm in terms of meeting deadlines for delivery orders	
		d) Decrease the make span from taking the orders to the completion of delivery	Emphasis should be given to minimise the time gap between manufacturing and final delivery	
		e) Increase the just in time delivery.	Emphasis should be given to increase the delivery of goods as and when the order is placed.	
8	<b>Product-Process Innovation</b>	a) Determines and eliminates non-value adding activities in production processes.	Emphasis should be given to remove waste activities in manufacturing process	This variable is a key driver of Financial outcome
		b) Decrease manufacturing cost in components and materials of current products.	Emphasis should be given to reduce production costs of the present line of product	
9	<b>Financial Performance</b>	a) Increase in the ratio of return on sales	Emphasis should be given to increase the return on sales	This variable is a key driver of Financial outcome
		b) Increase in the ratio of return on assets	Emphasis should be given to increase the return on assets	
		c) Increase in the general profitability of the firm	Emphasis should be given to increase the profitability of the firm	
		d) Increase in the cash flow of the firm.	Emphasis should be given to increase the cash flow of the firm	

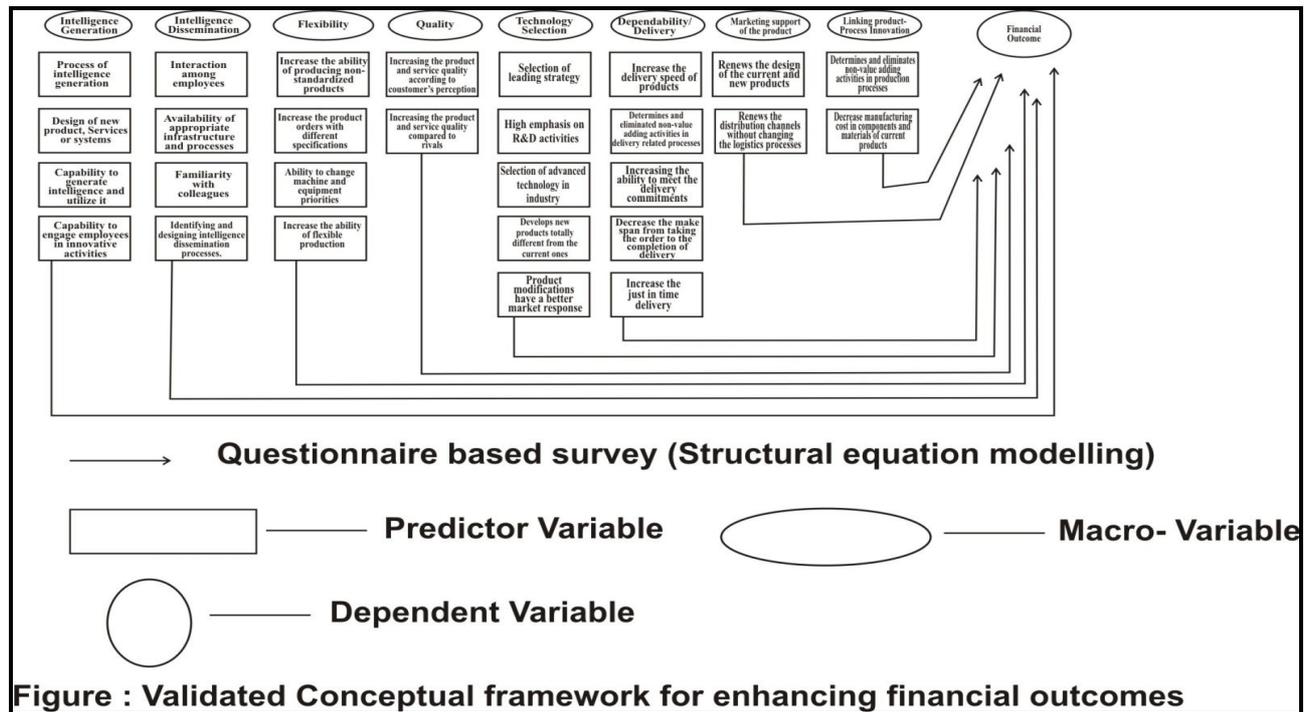
The table presents the unique issues for product innovation with in organizations, evolved from the questionnaire survey study. The analyses of variables have shown that the processes of intelligence generation, Design of new products, services or systems, capacity to generate intelligence and utilize it and capacity to engage employees in innovative activities are the four micro variables of intelligence generation,

which affects the financial performance of the business significantly. Interaction among employees, Availability of appropriate infrastructure and processes, Familiarity with colleagues and Identifying and designing intelligence dissemination processes are the four micro variables of intelligence dissemination, which affects the financial performance of the business significantly. Selection of leading strategy, high emphasis on R&D activities, selection of advanced technology in industry, develops new products totally different from the current ones and product modifications have a better market response are the five micro variables of technology selection, which affects the financial performance of the organization significantly. Increasing the product and service quality according to customer's perception and increasing the product and service quality compared to rivals are the two micro variables of quality, which affects the business financial position significantly. Increase the ability of producing non-standardized products, increase the product orders with different specifications, ability to change machine and equipment priorities and increase the ability of flexible production are the four micro variables of flexibility, which affects the financial performance of the business significantly. Renews the design of the current and new products and renews the distribution channels without changing the logistics processes are the two micro variables of marketing support of the product, which influences the ability of the firm's financial position significantly. Increase the delivery speed of products, determines and eliminates non-value adding activities in delivery related processes, increasing the ability to meet the delivery commitments, Decrease the make span from taking the orders to the completion of delivery and increase the just in time delivery are the five micro variables of dependability/ Delivery, which affects the financial performance of the firm significantly. Determines and eliminates non-value adding activities in production processes and Decrease manufacturing cost in components and materials of current products are the two micro variables of product-process innovation, which affects the business financial position significantly. Increase in the ratio of return on sales, Increase in the ratio of return on assets, Increase in the general profitability of the firm and Increase in the cash flow of the firm are the four micro variables of financial performance, which measures the financial position of the business significantly.

### **5.3 PROPOSED CONCEPTUAL FRAMEWORK OF PRODUCT INNOVATION FOR FINANCIAL OUTCOMES**

Based on the findings of the questionnaire survey, the validated conceptual framework is drawn. The framework shows the validated links between the research variables as proven by structural equation modelling analysis. The validated model or framework is fairly detailed and can be treated as recommended model. As per the objective of the research the major outcome variable is financial performance which is measured by increase in the ratio of return on sales, Increase in the ratio of return on assets, increase in the general profitability of the firm and increase in the cash flow of the firm. The aim was to identify the variables influencing the financial outcomes in order to create the stimulating environment for product innovation. The validate model portrays the influence relationships among the micro variables. The model has addressed the key elements of the research hypothesis. Intelligence generation, Intelligence Dissemination, Technology selection, quality, marketing support of the product, flexibility, Dependability/ Delivery, and Product-Process innovation have emerged as the key drivers or enablers of financial outcomes. The above findings indicate that various financial outcomes are not stand-alone practices. In fact, determinants of product innovation achieve higher level of outcomes when a set of practices complement each other in developing the products, services, markets and processes. The synthesis of the product innovation model as given in table 5.2, explains the impact of these variables on financial outcomes in terms of driving influence, by the relationship and description of the relationship. The variables have been discussed according to the importance, which has emerged from Structural equation modelling which includes confirmatory factor analysis and path analysis. The similar order has also been followed in the figure 5.1. Figure 5.1: Shows the validated conceptual framework for enhancing financial outcomes:-

Financial Performance Evaluation of Product Innovation



**Table- 5.2: Synthesis of Influencing Relationships for Product Innovation Outcomes**

Relationship No.	Influencing Practice	Practice Area being Influenced by the relationship	Influence Relationship Description
1	Intelligence Generation	Information gathering pertinent to financial outcomes	Customer and market information helps to lead to better financial outcomes
2	Intelligence Dissemination	Interdepartmental meetings and sharing of information	Availability of pertinent data/information leads to financial outcomes
3	Quality	Increasing the product and service quality according to customer's perception and compared to rivals	Superior quality leads to better financial outcomes
4	Flexibility	Increase the product orders with different specifications	Ability for flexible production leads to better financial outcomes
5	Dependability/ Delivery	Increase the delivery speed of products and ability to meet the delivery commitments	Increasing the just-in-time delivery leads to better financial outcomes
6	Marketing support of the product	Renews the design of the current and new products	Changing product style leads to better financial outcomes
7	Technology Selection	Selection of leading strategy and advanced technology in industry	Modern and Latest technology leads to better financial outcomes
8	Linking product-process innovation	Determines and eliminates non-value adding activities in production processes and Decrease manufacturing cost	Complementing the processes of production with the end product leads to better financial outcomes
9	Financial performance	Increase in the general profitability of the firm	Higher earnings leads to better financial outcomes

## **5.4 THE DETAILED INTERPRETATION OF THESE VARIABLES IS EXPLAINED AS FOLLOWS**

### **5.4.1 Intelligence generation**

The study findings shows that Intelligence generation has inertial propensity in advancement. Insight generation has been conceptualized as a mental procedure, in which an assortment of restrictions are made through dynamic correspondences among persons, firms and the encompassing (Nonaka and Toyama, 2002). Wiig (1997) characterized knowledge generation as understanding, centering and overseeing sorted out, unambiguous and purposeful insight structure, restoration and utilization. The utilization of knowledge generation to build execution point of interest has additionally been underscored. The expression "scholarly capital" incorporates a wide range of firm knowledge that can be changed into pay, in addition to ability and methods, copyrights and elite rights, and additionally the ability and practice of specialists and dealings with demographic and foremen. The supply based perspective of the association has prompted an expanding enthusiasm for the thought that knowledge is a key asset that organizations should proactively oversee on the off chance that they are to manage upper hand over the long term. Hypothesis of knowledge producing organizations accommodates associations to suggest that insight generation is basic for item development (Nonaka and Takeuchi, 1995). Further, he likewise tended to the subject of how organizations arrange the procedure of knowledge generation and spread and utilization it to outline new items, administrations or frameworks (Barringer and Bluedorn, 1999; Covin, 1991). Additionally, business firms have a tendency to join in more elevated amount of information examining conduct (Nonaka and Toyama, 2002; Ramachandran and Ray, 2006). Similar to all the above studies that Intelligence generation is a vital factor influencing the product innovation in automobile Industry.

Through the step-wise Structural equation modelling analysis, it emerged that Intelligence Generation is acting as a driver of Innovativeness. It is evident from the framework that Intelligence Generation has higher order of impact on the Innovativeness in terms of Good Communication and Periodical Review. Thus, it can be concluded that Intelligence Generation can be utilized as a major determinant to improve the financial outcomes in terms of Innovativeness, which has been practically experienced in questionnaire survey in four major organizations from automobile industries.

### **5.4.2 Intelligence Dissemination**

The study findings shows that the thoughts of understanding dispersal have in like manner been underscored for advancement results. Fitting base and methods are the instruments for improving information spread (Ruggles, 1996) (i.e., picking, demonstrating and persuading social event to disperse understanding) and firms events (i.e., flexible get-togethers to improve dispersal knowledge). It has been found that singular's joint efforts realize more huge trust, self-introduction, and obligation between them (Frances and Sandberg, 2000), which added to the regular conviction of social occasion people's dealings and backings joint conviction. Care with one another develops a protected space empowering the time of alternative points of view provoking more reasonable decision making strategies (Nonaka and Takeuchi, 1995; Sheshadri et al., 2003). The harmonious and the synchronized execution of diverse headway outlines can't avoid being an enormous determinant for the associations' assertion (Damanpour, Gopalakrishnan 1999). Affiliations need to present novel tasteful items in a dynamic circumstance and their capacity to rise to complete the process of collecting entirety quickly is basic for accomplishment (Pisano 1997). As the life cycle of the thing declines, it just so happens to be more discriminating to spread gathering restrain quickly to convey arrangements whole and addition advancement stores. For gathering firms, thing improvement structure and especially its associated systems are fundamental. Due to concentrated reasons there is a changed relationship between mechanical stock and the methodology used to convey items. The heads who tends to headway system has taken into record the relationship amidst thing and technique. Alterations in the thing arrangement have critical effects for the affiliations era approach and for mechanical and progressive techniques (Kim et al. 1992). In our study also it was found that Intelligence dissemination is a vital factor influencing the product innovation.

Intelligence Dissemination directly affects the financial outcomes. Intelligence Dissemination has emerged as a major predictor of Innovativeness. Periodical reports Circulation influences Innovativeness directly. These links were observed in macro analysis (step-wise structural equation modelling analysis) of questionnaire survey. Thus, it can be concluded that Intelligence Dissemination can be utilized as a major

determinant of product innovation to improve the financial outcomes.

#### **5.4.3 Technology Selection**

The study findings shows that Technology choice is an essential element affecting the item development as indicated by our study. Similarly Technology administration incorporates innovation assets administration, association administration and quality administration, while innovation system decides assets arranging, association structure, quality administration mode, so innovation administration ability will be influenced by innovation procedure choice. In addition, innovation system determination decides the accentuation of innovation administration. Case in point, if an organization chooses autonomous R & D procedure or a main method, the key of innovation administration is innovation gauging, R & D faculty administration, and R & D hazard administration. In the event that an organization chooses impersonation system or a taking after procedure, innovation administration will give careful consideration to innovation obtaining, particularly the expense, rate and the level of innovation securing. In addition, technology selection is a core technology management process. In our study also it was found that technology selection is a vital factor influencing the product innovation.

Technology selection directly affects the financial outcomes. Technology selection has emerged as a major predictor of Innovativeness . Selection of leading strategy influences Innovativeness directly. These links were observed in macro analysis (step-wise structural equation modelling analysis) of questionnaire survey. Thus, it can be concluded that technology selection can be utilized as a major determinant of product innovation to improve the financial outcomes.

#### **5.4.4 Quality**

The study findings shows that creative way outs showing the route of the manufacturing method with novel enhanced benefits, for example, manufacturing superiority, worth, pace and economical- can enhance the opportunity of the product advanced parts, constituents, mechanical blueprint, comfort designs etc. to fulfill the demands and wants of the clients superior than earlier. Oke's research on British firms (2007) showed that making explicit application procedures was required to start marginal goods or services creativities, signifying that enhancement of the processes is a leading strength for the benefit of the final result (good and/or service) modernizations. In our study also it was found that quality is a vital factor influencing the product innovation.

Quality directly affects the financial outcomes. Quality has emerged as a major predictor of Innovativeness. Increasing the product and service quality according to customer's perception and increasing the product and service quality compared to rivals influences Innovativeness directly. These links were observed in macro analysis (step-wise structural equation modelling analysis) of questionnaire survey. Thus, it can be concluded that quality can be utilized as a major determinant of product innovation to improve the financial outcomes.

#### **5.4.5 Flexibility**

The study findings shows that Big business creators who does research in this handle specify that operations arrangements and operations primary concern among the principle striking topic of operations administration, since this point are amongst the imperative components of money related execution and of arranged procedures of a firm (Sum et al., 2004; Boyer and Lewis, 2002; Malhotra et al., 1994; Hayes et al., 1988). Here we actualize as operations needs adaptability, quality, expense, and conveyance, which have turn out to be comprehensively utilized as announcement of the forceful size of creation (Voss, 1995). Associations focus to support from supplementary temperate advantage and to accomplish enhanced organization execution through the utilization of operations techniques, which must be in suitable plan with the attributes of the forceful setting the association is in. Various creators have examined the relationship between generation procedures and money related execution (Corbett and Campbell-Hunt, 2002). In light of an exploratory exploration, Noble (1997) clarified that generation techniques of blue-chip firms are like misfortune making firms. To remark on, their outcomes demonstrated that enhanced execution associations are more inclined to concentrate on possibilities parallel and are more likely to have characterized business techniques. McAdam and Keogh (2004) analyzed the association between association result and its

mindfulness with development. They built up that associations slants to advancements are essential in the way of making the relationship between game changer and development. Flexibility is a vital factor influencing the product innovation.

Flexibility directly affects the financial outcomes. Flexibility has emerged as a major predictor of Innovativeness. Increase the ability of producing non-standardized products, increase the product demand with distinct blueprints, capability alter appliances and material preferences and increase the ability of flexible production influences Innovativeness directly. These links were observed in macro analysis (step-wise structural equation modelling analysis) of questionnaire survey. Thus, it can be concluded that Flexibility can be utilized as a major determinant of product innovation to improve the financial outcomes.

#### **5.4.6 Dependability/ Delivery**

The study corroborates with the findings from the study given by Operation priorities components are adapted mainly from Boyer and Lewis (2002), Alpkan et al. (2003), and Kathuria (2000). Aspects of manufacturing or process performances i.e. pace, superiority, adaptability and lower cost, vision to be inter-linked to the financial achievement in procedures and product modernization according to the current study (e.g. Quadros et al., 2001). For instance, according to Koufteros and Marcoulides (2006) continuous effort and quality results in novelty leads to knowledge internally and motivates the speed and quality procedures. Therefore, technical innovation can simply be included and any plan or eminence shortages have been improved quicker than the rivals. In addition, López-Mielgo et al. (2009) told that a specifically innovation within the process puts a positive effect on the TQM of the firm. Other than quality and speed of the process, performance of the firm is based upon other aspects i.e. efficiency in costs and flexibility (Alpkan, et al., 2007). Accomplishment in the revitalization hard work particularly in organizational system, production process, and new-fangled products can give widely to the spreading of information and efficiency of harmonization inside the firm, which are essential for flexibility and effective costs (Koufteros and Marcoulides, 2006). In this concern, Liu et al. (2009) reported in an experimental research the constructive link between flexibility and success of the novel products. As for the reduction in costs and its effectiveness, Peters (2008) reports that all the innovations with in the process does not results in savings of the costs but some helped the organizations to sell products at prices lower than competitors. Gonzalez-Benito (2005) mentioned that the capability of the manufacturing function that becomes the source of ready for action strategy for the organization. Manufacturing performance is the combination of firms' achievement in enhancing speed, quality, flexibility, and cost efficiency in the day-to-day workings results in the improvement of market place status and financial outcomes. The previous experimental research reported that inspiration for using operations objectives as increase in the flexibility, improvement in quality of products for the contentment of the clients, speed of the process and cost efficiency helps in the improving the organizations performance as a whole (e.g. Alpkan et al., 2002; Alpkan et al., 2003). Dependability/ Delivery is a vital factor influencing the product innovation

Dependability/ Delivery directly affect the financial outcomes. Dependability/ Delivery have emerged as a major predictor of Innovativeness. Increase the delivery speed of products, determines and eliminates non-value adding activities in delivery related processes, increasing the ability to meet the delivery commitments, Decrease the make span from taking the orders to the completion of delivery and increase the just in time delivery influences Innovativeness directly. These links were observed in macro analysis (step-wise structural equation modelling analysis) of questionnaire survey. Thus, it can be concluded that Dependability/ Delivery can be utilized as a major determinant of product innovation to improve the financial outcomes.

#### **5.4.7 Marketing Support of the Product**

The study findings shows that Marketing Support of the Product is a fundamental component affecting the item development. Well-thoroughly considered out exploration is a basic apparatus that outfits advertisers with the insight they have to make upper hand. The trap – for advertisers and others included in contriving new and distinctive approaches to achieve clients – is to comprehend that examination is the springboard for imaginative considering, not the last referee of strategic and key bearing. What's more, progressively, the savviest advertisers are looking past customary exploration staples of center gatherings and overviews at new

and diverse examination strategies and ways to deal with extend their comprehension of clients in today's data rich environment. Those hot on the trail of the super-wired Gen Y market, for instance, are beginning to take advantage of new innovation to investigations 'purchaser produced media' like websites, talk bunches and other electronic discussions. This empowers them to keep the beat of the online buzz around new items, brands and commercial battles, in a manner that is quicker, less expensive and less one-sided than conventional exploration division. Marketing support of the product is a vital factor influencing the product innovation

Marketing support of the product directly affect the financial outcomes. Marketing support of the product have emerged as a major predictor of Innovativeness. Renews the design of the current and new products and renews the distribution channels without changing the logistics processes influences Innovativeness directly. These links were observed in macro analysis (step-wise structural equation modelling analysis) of questionnaire survey. Thus, it can be concluded that Marketing support of the product can be utilized as a major determinant of product innovation to improve the financial outcomes.

#### **5.4.8 Linking product-process innovation**

The study also revealed that Product- Process Innovation is a vital factor influencing the product innovation, they were like the explores by Marcus (1988), Olson and Schwab (2000), Knott (2001) and Baer and Frese (2003) construct just with respect to process advancements while inquires about of Atuahene-Gima (1996), Subramanian and Nilakanta (1996), Han et al., (1998) and Li and Atuahene-Gima (2001) construct just in light of item developments.

Various of these studies hold to a degree a good relationship between execution of the association and development however in the meantime there are couple of looks into that builds up the unfavorable or no association by any stretch of the imagination (Subramanian and Nilakanta, 1996). As Miller (2001) guaranteed generally associations search for development in innovation to advantage ferocious procedure in their particular commercial center. Along these lines, backing of showcasing and hierarchical advancement is must for this diligent work to succeed. When all is said in done, studies disregard the promoting and hierarchical advancements which are consistently essential to the extension and effective working of the association (e.g. Damanpour and Evan, 1984, Damanpour 1991). Relatively little examines on the capability of advancement bolster promoting and hierarchical developments. They report that more associations with development techniques concentrate on the styles of administration (Baldwin and Johnson, 1996) and achieve long haul development alongside the unrivaled results (Hult and Ketchen, 2001; Guan and Ma, 2003). Wolff and Pett (2004) and Walker (2004) completed relative study for looking at the effect of item and procedure advancement on the execution of the association. They reported that particular improvement in the item are positively connected with the developments of the association. Gopalakrishnan (2000) augmented the examination subject while focussing that the rate and extent is just as essential qualities of advancement, two of them have good impact on the execution of the association. Keeping up great correspondence with outer constituents, particularly clients, encourages the stream of data and different assets that are vital for new business creation (Lumpkin and Dess, 1996; von Hippel, 1978; Zahra, 1991). Christensen (1997) and Utterback (1994) indicated the peril of permitting client to direct development. Given a closer consideration into the deficiency of insight procedure and their reasons, it is liable to analyze whether adjustments in the game plan, the information and message skill or the HRM of the firm are obliged to focus them.

Firms act on the premise of their market insight including their knowledge of clients and contenders. The ideas of knowledge scattering have likewise been underscored for advancement results. Proper foundation and procedures are the instruments for enhancing insight scattering (Ruggles, 1996) (i.e., picking, showing and motivating gathering to disseminate knowledge) and firms occasions (i.e., versatile gatherings to enhance dispersal knowledge). It has been found that individual's connections bring about more noteworthy trust, self-divulgence, and responsibility between them (Frances and Sandberg, 2000), which added to the common assurance of gathering individuals' dealings and helps joint conviction. Mindfulness with each other cultivates a protected situation encouraging the era of option perspectives prompting more powerful choice making procedures (Nonaka and Takeuchi, 1995; Sheshadri et al., 2003). Insight era and

Intelligence spread is segment of item advancement that has a noteworthy effect on budgetary execution.

Product-process innovation directly affects the financial outcomes. Product-process innovation has emerged as a major predictor of Innovativeness. Determination and elimination of non-value adding activities in production processes and Decrease manufacturing cost in components and materials of current products influences Innovativeness directly. These links were observed in macro analysis (step-wise structural equation modelling analysis) of questionnaire survey. Thus, it can be concluded that Product-process innovation can be utilized as a major determinant of product innovation to improve the financial outcomes.

#### **5.4.9 Financial Performance**

The emphasis is always on the financial results because ultimately everything is boiled in to financial terms and it is accepted from long time. Additionally, investor's, major shareholders and other stakeholders such as creditors, debtors etc. are keen to know the financial condition of the organization (Fis & Cetindamar, 2009) (Floyd & Woolridge, 1990). The facts which are of financial nature such as share prices, net revenue generated, net profits, return on equity etc. are the most primary and acceptable information to know the actual condition of the firm (Gatignon & Xuereb, 1997) (Gopalakrishnan, 2000) (Gunday, et al., 2011). On the other side, knowledge about finance must be provided to regulatory and legal houses to calculate the taxes to be paid. The disclosure of financial information is made to the general public or to the regulatory houses based on many factors such as type of ownership i.e. private or public, size of the firm i.e. big or small, whether it is listed on the stock exchange or not listed (Heshmati & Loof, 2006) (Lumpkin & Dess, 2001) (Malerba & Marengo, 1995) (Mankin, 2007).

Corporate performance means the capacity of the firm to produce new earning sources or profits from the day-to-day working operations of the organization over a period (Fullerton & Wempe, 2009) (Gan & Saleh, 2008) (Zahra, et al., 1999). The financial performance actions can be separated into two main forms: (1) conventional actions based on bookkeeping/financial information (i.e. the consequence of measures on one year's earnings, ROI, ROE, etc.) which shows the past results of the organization; (Bartoloni & Baussola, 2009) and (2) current actions derived from share market prices (i.e. Stern Stewart & Co.'s Economic Value Added [EVA] and Market Value Added [MVA] approaches) which are based on stock valuation doctrine (Kaplan and Norton 1992, 1993,1996, 2000 and Broadbent and Cullen 2005) (Zaltman, et al., 1973). Financial performance is a dependent variable which is affected by the determinants of product innovation.

Financial performance has emerged as a major dependent variable of Innovativeness. Increase in the ratio of return on sales, Increase in the ratio of return on assets, Increase in the general profitability of the firm and Increase in the cash flow of the firm are the measurable statements to know the financial impact of product innovation. These links were observed in macro analysis (step-wise structural equation modelling analysis) of questionnaire survey.

#### **5.5 Concluding Remarks**

The learning's from various studies namely pilot study, questionnaire based survey study and case studies have been synthesized in this chapter. On the basis of the integrated learning, a product innovation model has been presented. This model has been based on the conceptual framework evolved from the research evidences from the published literature and validated by the findings of the questionnaire based survey study obtained through statistical analysis. The product innovation model has further been verified and refined on the basis of the learning's from the case studies.

Based on the practice macro-factors, influence diagrams have been presented which bring out the dependencies and complementary nature of various practices. It is found that product innovation practices are strongly influenced by its determinants. Organization level micro-practices have been presented and their influence on financial Outcomes has been brought out.

Unique issues for product innovation practice in work environment, evolved from the survey analysis have also been presented. These have been evolved on the basis of the case studies of organizations, relevant for other organizations with respect to product innovation, implemented in dynamic business environment.

These specific issues related to product innovation and help the organization for entrepreneurial revitalization (Nwokah, N., Ugoji, E. & Ofoegbu, J., 2009; Peters, B., 2008). These specific issues also help us to address the issue of organization's lack of vitality which is one of the key aspects of the organization's sustainability. Thus, the variables and their inter-relationships (findings of the study) help to revitalize the ongoing process of entrepreneurship within the organization in terms of ongoing processes, which have been highlighted in this study.

The study leads to the conclusion that the organizations intending to practice of product innovation needs to focus on Intelligence Dissemination, Intelligence Generation, Technology Selection, Quality, Flexibility, Dependability/ Delivery, Marketing support of the product and Linking product-process innovation (in the order of importance).

# **CHAPTER-6**

## **SUMMARY, CONCLUSIONS AND IMPLICATIONS**

## **6.1 INTRODUCTION**

The synthesis of the learning issues is discussed in this chapter in the context of dynamic business environment. The results and findings of the research study are summarized and some suggestions are made for organizations, particularly for managers who want to practice product innovation within the organizations. The support for the results/findings of the study from recent published literature is also presented. Further, significant research contributions, implications for researchers and practitioners, limitations of the study, and the possible directions for the future work are outlined.

## **6.2 SUMMARY OF MAJOR FINDINGS**

The findings of different components of the research, i.e. questionnaire survey and case study analysis are synthesized according to the research objectives. The main research objective was to identify the determinants of product innovation for financial outcomes. Accordingly, a summary of the findings are presented here, reflecting upon the achievement of the research objectives. The study brings out that the framework for product innovation should be evolved keeping in view the project goals and the contextual factors namely product innovation factors. Based on the research findings, important areas have been identified which are discussed in the following sections.

### **6.2.1 Product Innovation in Automobile Sector**

The study aimed at exploring the impact of product innovation on financial performance in Automobile Sector. Some of the significant findings of this part of the research are as follows:

- The Automobile organizations have significant difference in terms of Technology selection and Quality (through survey analysis). This is also supported by the nature of industries. The Automobile organizations leave less room for flexibility and Dependability/ Delivery, since it has mostly interrelated processes and it is difficult to isolate the contribution made by an individual.
- There is almost negligible difference in terms of Intelligence Generation and Intelligence Dissemination for Automobile Industry. This is because the process of intelligence generation and dissemination, and management support is not affected by the nature of industries. It is primarily dependent on the management policy and philosophy of the organization.

In view of the above research findings, it can be safely concluded that the research objective related to the Automobile organizations has been adequately addressed in the research.

### **6.2.2 Relationships of Key Variables**

The relationships of key research variables have been established by both the questionnaire survey and the case studies and the research findings on this front are summarized as follows:

- The case studies reveal that the product innovation plays an important role for stimulating entrepreneurial behavior within the organization.
- The case studies also show that the organization structure affects the implementation of product innovation practices. The hierarchical organization structure does not help to promote product innovation. The organization structure which provides scope for flexibility to the employees is important for successful implementation of product innovation practice.
- The case studies also show that appropriate selection of technology help to manage the risk associated with the entrepreneurial efforts.
- The case studies reveal that having appropriate performance evaluation systems i.e. financial outcomes help to stimulate product innovation behavior among the employees.
- The relationships of key research variables are, by and large, consistent in terms of regression analysis of macro and micro variables in questionnaire survey as well as case studies except in case of technology

selection, and quality. The major predictor in case of macro analysis of questionnaire included Intelligence Dissemination, and Intelligence Generation. Similar findings have been reported by various researchers including Zahra (1991) and Hornsby et al. (2002). In micro analysis, it was found that variables namely, Intelligence Generation, Flexibility, Dependability/ Delivery and Intelligence Dissemination emerged as enablers of product innovation Outcome from the case studies. These results are in accordance with the findings of Nonaka and Takeuchi (1995), and Zahra et al. (1999) who identified effective communication and use of rewards being critical for product innovation process.

- The regression analysis indicates that Intelligence Dissemination and Intelligence Generation are two major predictors of Innovativeness. Intelligence Generation and Intelligence Dissemination are critical for Innovativeness. This has been corroborated by other researchers (Kanter, 1983; Pinchot, 1985). These authors emphasized on open communication for fostering information sharing and empowerment has been proffered as a critical element for innovation.
- Structural equation modelling analysis has allowed a more rigorous examination of the interrelationships between the direct measures of the financial Outcomes and the hypothesized constructs of product innovation. Structural equation modelling has further identified the simultaneous impact of product innovation including Intelligence Dissemination, Intelligence Generation, Technology Selection, Quality, Flexibility, Dependability/ Delivery, Marketing support of the product and Linking product-process innovation (in the order of importance).

### **6.3 VALIDATED CONCEPTUAL FRAMEWORK**

The validated relationships at macro level helped in the development of the validated conceptual framework as envisaged in the objective of the research. The objective has been probed in depth at the micro level as well and a validated framework exhibiting relationships among micro variables has also been developed, which can safely be treated as the validated model brought out by this research. The key findings related to validated conceptual framework are as follows:

- The validated conceptual framework generated by questionnaire survey has been corroborated by the case studies to a great extent. The variations in questionnaire survey are corroborated by micro level analysis of questionnaire survey.
- Although the Intelligence Dissemination, Intelligence Generation, Technology Selection, Quality, Flexibility, Dependability/ Delivery, Marketing support of the product and Linking product-process innovation (in the order of importance) are the major drivers ( findings from case studies and survey analysis).
- Although Intelligence Generation doesn't affect New Business Creation directly, but it has indirect relation with the product innovation Outcomes.
- Based on our study, the findings suggest that wherever modernization is under the action, it usually terminates with getting superior results. However, lack of time period may lead people to put extra efforts and get extra outputs and even able to generate more innovation, really affects them, in common, to act more innovative. Our research recommends that factors of product innovation impacts creativity in different forms based on whether the ecological system permits people to determine on their tasks, brings a feel of essential necessity about the work in hand. Our research states that thee extra knowledge and affability they get; the more probable they were able to act creatively. Researchers have strong belief that creativeness comes from the making of big number of co-workers in the mental process, followed by the choice of mergers that may be specifically alluring and helpful. The innovative act leads to product innovation activities that affect the financial achievements in a positive way. Our study also recommends that low time pressure does not automatically boosts innovative thinking- but that it can do so when persons are motivated to gain, to play with concepts, and make something really novel. For many firms, the excellent solution to improve product creativity is to coherent targets at all phases of the firms that are realistic and anxiously decided, escaping the efficient partially affects the companies decision-making.

The above research findings, reflecting the achievement of research objectives to a great extent, led to the

generation of some important recommendations, which have been partly tested in case studies.

#### **6.4 IMPLICATIONS OF RESEARCH**

This research has several important implications. From an academic point of view, the recent study gives a significant experimental route towards knowing the factors of product innovation. As earlier observed, the research in this field has been principally regulative in which most scientists have made major plans which need experimental exam, or are dependent on finite analyses of case study.

This study presents an experimental analysis that focuses the important product innovation leaders that are probably to affect financial results. This determination apparently separates this study from earlier research that focus with more concluded appraisals of firms' acceptance to start product innovation tasks with passion.

The results can be used to steer further research in product innovation. The validated model includes Intelligence Dissemination, Intelligence Generation, Technology Selection, Quality, Flexibility, Dependability/ Delivery, Marketing support of the product and Linking product-process innovation. As compared to results published by Gunday et. al (2011) and Hornsby (2002), the findings of this study emphasize on the importance of intelligence generation and dissemination as important predictors of corporate entrepreneurship which has not been included in earlier studies. Thus, the major writings in this area can therefore be used to guide further research into product innovation by focusing on the role of these factors uncovered in this study. These findings contribute to the theory of intelligence generation proposed by Nonaka and Toyama (2002). Further research may be taken up to explore the relationship of this variable and the financial outcomes of product innovation.

This study adds to the existing literature by identifying the role of intelligence generation and dissemination and highlights the importance of future research with it. It is the perceptual aspect that may become most important for future research. The future research may include these factors to understand the influence of these two variables namely, intelligence generation and dissemination with financial outcomes.

The results also indicate that before implementing any kind of change management initiatives including entrepreneurial change, the organizations are likely to analyze the determinants of product innovation for stimulating such behavior. Further research efforts should aim at developing on this theory to measure the individual elements of Intelligence Dissemination, Intelligence Generation, Technology Selection, Quality, Flexibility, Dependability/ Delivery, Marketing support of the product and Linking product-process innovation and its relationship with financial outcomes. Such a tool can be of prime importance to the organizations which can help the organizations to identify the elements to create appropriate environment for encouraging product innovation activities (Jawaroski and Kohli, 1993).

The case study results reveal that the structure, and systems play an important role in implementing product innovation practice. Future researchers may focus on identifying the different types of structure which help to implement various practices of product innovation. Also the researchers may study the various systems which stimulate product innovation behavior within the organization. The future researchers may also study the impact of structure and systems on financial outcomes of product innovation.

##### **6.4.1 Implications for Practitioners**

The tool refined in this research also has realistic conclusions for executives. For instance, the instrument can be used as an appraisal instrument for assessing firms' practice needs in venture capital and creativity. This kind of tool may further help the organizations to understand if they have the necessary internal environment to initiate product innovation. The results can help the organizations to identify the gaps. This tool can therefore be used as a diagnostic tool for product innovation. Lot of firms have started such plans in current period to search fields that need focus to motivate business related activities (Hornsby, 2002; Kuratko and Montagno, 1989). The outcomes of one experimental test shows that a coaching plan is developed to improve product innovation significantly impact thoughts of the surroundings by executives (Kuratko et al., 1990). Thus, the tool used in this research can be used as an investigative tool for identifying whether the organization has the necessary environment for initiating product innovation activities and the training needs

to motivate the employees for product innovation. This research has also the practical implications in terms of managing change within the organization. The tool can be used to identify the preparedness of the organizations to adopt entrepreneurial change. The present study also contributes towards the theory of entrepreneurial revitalization of the organization to gain competitive advantage (Volberda, 1998).

The research findings related to organizational structure would help the managers to design proper structure for implementing product innovation. The various processes and systems which help to implementing product innovation would guide the managers to design the right kind of systems which promote product innovation.

## **6.5 MAJOR RECOMMENDATIONS**

Findings of the questionnaire survey as well as case studies have been reflected upon and some major recommendations have been generated in order to help the organizations understand the internal environmental factors necessary for stimulating financial Outcomes. The recommendations have emanated out of various components of research and are tagged with specific macro/micro variables and relevant research component.

- Designing right kind of organizational structure and processes and systems to implement product innovation.
- Introduction of an effective Intelligence Dissemination process is recommended in order to implement product innovation within organizations (Intelligence Dissemination – product innovation Outcomes).
- Intelligence Generation should also be encouraged within the organization to know the needs of the users. More emphasis on inter-departmental collaboration and cross functional teams should be there. The effort should be directed towards harnessing the collaborative expertise of the employees within the organization.
- Quality of the product should be superior to enable the optimum utilization of resources. This should be supported by management to make it more effective. Nevertheless, there should also be proper monitoring systems to control the resources allocated towards various product innovation activities. The employees could be made accountable towards their activities.
- It is recommended that the organization should have speedy delivery system since it has emerged as a major driver, which acts as a pivot variable to influence the financial outcomes. These important inter relationships show that to have better financial outcomes, management should support these activities by providing organizational flexibility which can further stimulate risk-taking.
- To implement product innovation, the management should have strong marketing support for good ideas, which will motivate them.
- Flexibility in production plans and organizational boundaries has emerged as major enablers. Thus, to have proper implementation of product innovation, the organizations should have proper technology selection and linking product-process innovation in place.

It is recommended that the organization should have proper organization structure and systems to facilitate the intelligence dissemination, which has emerged as major driver of product innovation.

- Due to its greater degree of technical, product, and market uncertainties, new business creation needs, higher degree of cross functional coordination and a greater sense of urgency. The business unit organization structure is more costly due to duplication of resources, but better suited to new business creation than either the functional or the matrix organization. Due to its dedicated cross-functional resources and clear accountability for results provide the required level of coordination, focus, and speed. In spite of this, its higher cost might not be suited for mature businesses. It generally pays to separate the start-up and growth businesses from mature businesses.
- In other instances, where self-sufficient business unit is not recommended includes situations where recent organizational change has happened. This is because frequent reorganizations hamper new business creation. Such type of self sufficient business unit is also not beneficial if some sharing of functional resources is required.

- Although structural solutions are readily implemented, but it is best not to engage in a search for ‘ideal’ organization for new business creation. In spite of availability of choices, the best results may be achieved by focusing on neglected task of developing the competencies of the people and capability to work within and across boundaries through proper education, training, coaching, and mentoring.
- The organization will do better if it focuses on creating conditions that encourage competent and committed people to volunteer to lead new business initiatives. These volunteers should be allowed to recruit other believers who have the necessary skills, and the team must have sufficient autonomy and resources to proceed.
- The two basic approaches through which people can be motivated to undertake new business creation includes motivation by increasing the individual’s perception of rewards from new business creation, relative to its perceived risks. One of the methodologies is to offer financial incentives commensurate with the higher personal risk. But with a caution that this should be perceived as fair for its success. But studies suggest that use of incentives may lead to resentment among other members of the organization.
- The other approach which works best in such situations include offering plenty of recognition and career advancement as reward, and reduce the perception of personal risk considerable. This can be achieved by creating a mistake tolerant management culture. The perception of risk may be reduced through becoming ‘bodyguards’ of the intrapreneurs by lending them personal support to the people involved.
- The organization must provide sufficient resources and autonomy to decide which risks to take and how quickly to move within decided parameters.

## **6.6 SIGNIFICANT RESEARCH CONTRIBUTIONS**

The study provided some new evidence on the relationship between product innovation and its determinants. The analysis indicated that intelligence dissemination (ID), intelligence Generation (IG), Dependability (D) and Flexibility (F) were some of the most important drivers of product innovation. The predictors of innovations include intelligence dissemination, intelligence generation and dependability. This shows that for innovations to succeed, it is important to have proper processes for intelligence generation and dissemination. The study suggests that innovations require work discretion to succeed. However, the study suggests that it is more important for product innovation to be supported by management for the venture to succeed. This further validates the necessity of having proper processes for dissemination of information at all levels, emphasizes on having proper management support and work discretion for successful new venture creation. The findings have contributed towards the existing theory of product innovation by extending the previous research (Adams, W. & Jeanrenaud, S., 2008; Alpkhan, L. et al., 2010; Battisti, G. & Stoneman, P., 2010). The positive nature of the relationship points out the fact that the employees should be given the autonomy in terms of abilities and selection of venture ideas for encouraging product innovation. Also, it is important to have management support in terms of financial support for product innovation activities.

The hugely aggressive and changing surrounding present in many businesses pressurizing many firms’ to accept an entrepreneurial action, which is searching rival’s benefit through creativity on a continuous basis. The recent discussion is more on ‘how’ of venture capital and the current research recommend some of the argumentative steps to follow. This needs the senior executive group to make an organization structure that determines the consideration of particular persons working on creativity as a significant and known actions and facilitates and empower team and companies actions towards entrepreneurial results. The group will also use exact procedures to have information seen in the creativity procedure and move in a sense that facilitates assimilation of information. Regulatory aspects of entrepreneurship are important for surviving of aggressive firms’.

The significant research contributions with respect to financial outcomes are discussed as follows:

- In order to investigate the internal organizational factors that encourage product innovation, an empirical analysis has been conducted.
- The learnings from the questionnaire survey study and the case studies have been synthesized where a number of important findings have been reported, which provide a guiding framework for implementation

of product innovation approach.

- A 'Product Innovation Model' has been evolved, which may be used as guiding framework by the firms and managers intending to use the product innovation approach.
- Inter relationships have been identified and complementary nature of certain firm level macro strategies has been established. This would guide the managers in evolving and properly implementing the product innovation strategies at firm level.
- This research corroborates to the study by registering the presence of an basic set of firms' determinants that should be seen in enhancing firms' actions within an firm. The five factors recognized by Hornsby et al. (2000) through CEAI (CE Assessment Instrument) were management support, work discretion/autonomy, rewards/reinforcement, time availability, and organizational flexible boundary which represent a parsimonious description of the internal organizational factors that influence entrepreneurial activity within established companies. These five factors accounted for 46 per cent variance in the corporate entrepreneurial activities (Hornsby et al., 2002). The inclusion of two factors, i.e. risk-taking propensity and intelligence generation and dissemination explained the variance of 76 per cent (Bhardwaj et al., 2006).
- The current research provides an important empirical step towards understanding the internal factors that stimulate product innovation. As previously noted, the literature in this area has been primarily normative. This study presents an empirical analysis that emphasizes the key internal factors that impact financial outcomes. This focus clearly distinguishes this research from previous studies that tend to be concerned with more generalized assessments of organizations' readiness to initiate product innovation efforts.
- This highlights the importance of future research with the current measurement instrument. It is the intuitive element that may become very significant for further study. The tools made in this research also has realistic conclusion for executives. For instance, the altered measurement scale can be used as a judgment tool for appraising companies coaching needs in entrepreneurship and creativity. Many firms have started such plans in current years to search fields that require consideration to motivate entrepreneurial and risky tasks (Kuratko and Montagno, 1989; McWilliams, 1993). The outcomes of one experimental test states that a coaching plan is developed to improve innovation significantly impacts thought of the surroundings by executives (Kuratko et al., 1990). Thus, the tools used in this research can be used as an examination instrument for searching whether the firm has the required surrounding for starting product innovation tasks and the coaching requirement to boosts the executives for product innovation.

## **6.7 LIMITATIONS OF THE STUDY**

**The limitations of the study are given as follows:**

- Strict random sampling has not been used for the questionnaire study. Further, purposive sampling has been used for the pilot study and case studies.
- Questionnaire design and data collection is based on the assumption that various product innovation strategies can be formulated and implemented in stand-alone manner. However, the research findings have brought out that various product innovation strategies are complementary and presence of critical organizational drivers are important for financial Outcomes. The results also establish the inter relationship.
- More number of case studies in automobile industry can be undertaken to understand the impact of product innovation in wider aspects. The variables such as technology selection and quality can be studied in details in future research. Moreover, the role of intelligence Dissemination and Intelligence generation can be explored further.
- As most of the organizations were not willing to disclose the actual quantified data relating to the specific product innovation activities in terms of total number of products/services/markets identified, the product innovation Outcomes has been measured in qualitative terms through financial Outcomes in

comparison with likely Outcomes of product innovation approach where these internal variables are not available.

- The external environmental factors such as technological dynamism and market potential have not been included in the empirical study.
- Corporate level strategies can be taken up for further research, which has not been included in this model.
- The current study limits its evaluation of product innovation on Intelligence generation Intelligence dissemination Technology selection Flexibility Dependability/ Delivery Quality Marketing Support of the Product and Product- Process Innovation
- The current study is constrained in terms of the financial performance evaluation on Intelligence generation Intelligence dissemination Technology selection Flexibility Dependability/ Delivery Quality Marketing Support of the Product and Product- Process Innovation.
- There are many inquiries that needs more depth study: the research just found the role of technology selection and capabilities such as intelligence generation, dissemination, flexibility, quality and marketing support and production process in innovation success, the determinants being on the origins of innovation in ways of internal determinants. Other determinants, for instance, external determinants ( chain competence, social network) also play a significant role in firms' creativity process, although, these determinants were not involved in our concept. Apart from this, we did not acknowledge about the surrounding determinants such as related to market, related to industry or ecological factors. There is proof that market place technology changes can reduce the affect of technology action and capabilities as well as impact a firms' capabilities growth. By taking these outside and mediating factors, we can make a wider concept, which would permit more awareness into the system that leads creativity success and enhance firms' achievements.
- The study only confined to automobile sector and selected few companies dealing in passenger cars and precisely NCR. So results may vary if these constraints are not considered.

#### **6.8 STUDY IS RELEVANT TO WHOM**

**The study is relevant in the following ways:**

- Business organizations that intend to implement or adopt product innovation approach. The 'product innovation Model', which has been evolved in this research, can serve as guiding framework for implementing the product innovation. The inter relationships explained through interpretive matrix can be useful in understanding the impact on financial outcomes. It may also be useful in understanding the various processes for implementing product innovation within the organization.
- Researchers and academicians pursuing product innovation research. The results can be used to steer further research into product innovation activities.

#### **6.9 SUGGESTIONS FOR FURTHER WORK**

**The suggestions for future work are given below:**

- An empirical study may be carried out taking into account the inter-strategy influence relationships and requirements of inter-strategy support, as brought out in this study.
- Study on product innovation approach may be carried in select organizations that may be willing to share actual quantified data in terms of financial outcomes.
- Further study can be taken up by testing exact bonuses and benefits, plenty of time period given to executives to practice creative concepts and the extent of firms' backing, scientists will be able to more certainly know the amount of determinants that affect executive's efforts for product innovation activities.
- Further study works into firms' entrepreneurial surroundings requires providing extra focus to the eight internal determinants not explored earlier, especially, the role of intelligence dissemination and intelligence generation in stimulating financial outcomes.

- Future research can also incorporate external environment as a major variable to understand its impact on product innovation activities within the organizations.
- Moreover, the corporate level strategies including the vision for product innovation and leadership can also be an important contribution towards product innovation research.

The fields for more study are stated subsequently approx to the factors and results side, correspondingly, of the concept. Additional study is required to clear the relations between the existence of major aspects or features in an firms' situation and parties (such as middle-level executives) plans to practice innovation. Significant additions in these fields have come from the study of Ginsberg and Hay (1994), Hornsby et al. (2002), Hornsby and Kuratko (2003), Quinn (1985), and others, yet important study inquiries left. Additionally, these results are just example of the form of consequences that results from entrepreneurial actions. A small and moderate percentage of firms' can exactly suit to display vast entrepreneurial actions within the positions of their employees (Morris and Kuratko, 2002). While previous studies on particular aspects of the theoretical concept has stated few important linkages (i.e. organizational ancestors and self-reported results, Hornsby and Kuratko, 2003), more study should be taken to further outline the tasks of all manager levels in the product innovation activities.

While this research recommends the presence of group of determinants required for novel starting of a business, more study stating the linkages to such extent as the number of concepts generated in an firm; time period needed for concepts; and employee interest to move beyond firms' borders. Moreover, while this research has started an significant inspection, description and distillation of these determinants, it is required to additionally back the linkages between the amounts of individual novel business actions. For instance, scientists may relate this situation's three faces to financial measurements of firm achievements. While firms' start novel business starting efforts for many logics, finally, top executives demands efforts for novel business concepts to enhance the firms' financial health. Subsequently, further scientists could learn the links between new business creation phases and financial achievement measurements. At last, more studies into whether or not such elements as industry form and civilization play a significant role in the companies' entrepreneurial rulers is required. In short, this research provides experimental proof regarding the presence of internal leaders who are expected to improve new business creation within automotive business. The research outcomes and expected situation offer a base for making a trustworthy and exact amount of the company's internal leaders for new business creation for automotive business.

#### **6.10 CONCLUDING REMARKS**

The major aim of this research was to investigate the important internal organizational determinants that prompt product innovation and made a instrument that measures these determinants. To achieve this objective, the research collected data from 423 managers in 4 organizations. Outcomes from the investigation can therefore assist to define internal organizational determinants phase of impacts and finalize the base for better environment to enhance entrepreneurial activities. The role of organizational factors for stimulating product innovation has been discussed. After identifying different organizational factors from literature, a discussion has been followed by an empirical study conducted to identify the impact of product innovation on financial performance. The outcomes of the research and their affects for further study and executives action have been stated in detail.

This study has established that in the context of the fast changing needs of the customers, the adoption of product innovation is very important. The presence of internal organizational drivers/factors is critical for financial outcomes. A product innovation model has been evolved, which may be used by organizations to assess the presence of necessary and critical internal factors for stimulating product innovation activities within the organization. This framework can further be enriched by subsequent studies. There are several factors reinforcing relationships once they have been established. In this study financial performance has been related to the components of product innovation and it has been found the product innovation has a positive impact on the financial performance. So the automobile sector cannot neglect the product innovation as it is very essential for the overall success of the organization. All the business earnestly work for improvement of the financial performance so, product innovation is one of the key element to improve the financial performance.

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# **APPENDIX-I**

**PART-I: DETERMINANTS OF PRODUCT INNOVATION**

Please indicate your responses to subsequent questions by putting a cross mark (X) on the desired number as mentioned in the boxes, where

**1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree.**

S. no.	DETERMINANTS OF PRODUCT INNOVATION	1	2	3	4	5
<b>A</b>	<b>Intelligence generation</b>					
1	In our organization, the process of Intelligence Generation is important to design new products and services.					
2	In our organization, it is critical for the companies to organize the process of intelligence generation and use it to design new products, services or systems.					
3	In our organization, the capability to generate intelligence and utilize it is most important source of a firm's sustainable competitive advantage.					
4	In our organization, the people with entrepreneurial pursuits tend to engage in greater level of information scanning activities.					
<b>B</b>	<b>Intelligence dissemination</b>					
1	In our organization, Interaction among employees is critical success factor for product innovation.					
2	In our organization, the availability of appropriate infrastructure and processes are critical for improving intelligence dissemination within the organization.					
3	In our organization, familiarity with colleagues facilitates the generation of ideas, is critical to product Innovation.					
4	In our organization, Identifying and designing Intelligence Dissemination processes are important for product innovation.					
<b>C</b>	<b>Technology selection</b>					
1	The organization selects the leading strategy in our industry.					
2	The organization place high emphasis on R&D activities.					
3	The organization selects the most advanced technology in our industry.					
4	The organization develops new products with technical specifications and functionalities totally differing from the current ones.					
5	In our organization, the product modifications have a better market response.					
6	In our organization, the technologies adapted are more advanced.					
<b>D</b>	<b>Flexibility</b>					
1	The organization always tries to Increase the ability of producing non-standard products.					
2	The organization always tries to increase the product orders with different specifications.					
3	The organization possesses the ability to change machine and equipment priorities when necessary.					
4	The organization always tries to Increase the ability of flexible production.					
<b>E</b>	<b>Dependability/ Delivery</b>					
1	The organization always looks to Increase the delivery speed of products.					
2	The organization determines and eliminates non-value adding activities in delivery related processes.					
3	The organization highly focuses on increasing the ability to meet the delivery commitments.					
4	The organization always look to Decrease the make span from taking the orders to the completion of delivery.					
5	The organization always look to Increase the just in time delivery.					

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<b>F</b>	<b>Quality</b>					
<b>1</b>	The organization highly focuses on Increasing the product and service quality according to customer's perception.					
<b>2</b>	The organization highly focuses on Increasing the product and service quality compared to rivals.					
<b>3</b>	The organization offer high quality products to decrease the customer complaints.					
<b>G</b>	<b>Marketing Support of the Product</b>					
<b>1</b>	The organization renews the design of the current and/ or new products					
<b>2</b>	The organization renews the distribution channels without changing the logistics processes related to the delivery of the product.					
<b>3</b>	The organization renews the product promotion techniques employed for the promotion of the current and/ or new products.					
<b>4</b>	The organization renews the product pricing techniques employed for the pricing of the current and/ or new products.					
<b>5</b>	The organization develops newness for current products leading to improved ease of use for customers and to improved customer satisfaction.					
<b>H</b>	<b>Product- Process Innovation</b>					
<b>1</b>	The organization determines and eliminates non value adding activities in production processes.					
<b>2</b>	The organization decrease manufacturing cost in components and materials of current products					
<b>3</b>	The organization increase manufacturing quality in components and materials of current products.					
<b>4</b>	The organization develops new products with components and materials totally differing from the current ones.					

**PART-II: PERCEPTIONS ON PRODUCTION INNOVATION AND FINANCIAL PERFORMANCE**

Please indicate your responses to subsequent questions by putting a cross mark (X) on the desired number as mentioned in the boxes, where

**1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree.**

**Does the product innovation impact the following financials of your company?**

<b>FINANCIAL FACTORS</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
There is an increase in the ratio of Return on sales (profit/total sales).					
There is an increase in the ratio of Return on assets (profit/total assets).					
There is an increase in the General profitability of the firm.					
There is an increase in the Cash flow of the firm excluding investments.					

# **APPENDIX-II**

**PART-I: DETERMINANTS OF PRODUCT INNOVATION**

Please indicate your responses to subsequent questions by putting a cross mark (X) on the desired number as mentioned in the boxes, where

**1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree.**

S. no.	DETERMINANTS OF PRODUCT INNOVATION	1	2	3	4	5
<b>A</b>	<b>Intelligence generation</b>					
1	In our organization, the process of Intelligence Generation is important to design new products and services.					
2	In our organization, it is critical for the companies to organize the process of intelligence generation and use it to design new products, services or systems.					
3	In our organization, the capability to generate intelligence and utilize it is most important source of a firm's sustainable competitive advantage.					
4	In our organization, the people with entrepreneurial pursuits tend to engage in greater level of information scanning activities.					
<b>B</b>	<b>Intelligence dissemination</b>					
1	In our organization, Interaction among employees is critical success factor for product innovation.					
2	In our organization, the availability of appropriate infrastructure and processes are critical for improving intelligence dissemination within the organization.					
3	In our organization, familiarity with colleagues facilitates the generation of ideas, is critical to product Innovation.					
4	In our organization, Identifying and designing Intelligence Dissemination processes are important for product innovation.					
<b>C</b>	<b>Technology selection</b>					
1	The organization selects the leading strategy in our industry.					
2	The organization place high emphasis on R&D activities.					
3	The organization selects the most advanced technology in our industry.					
4	The organization develops new products with technical specifications and functionalities totally differing from the current ones.					
5	In our organization, the product modifications have a better market response.					
<b>D</b>	<b>Flexibility</b>					
1	The organization always tries to Increase the ability of producing non-standard products.					
2	The organization always tries to increase the product orders with different specifications.					
3	The organization possesses the ability to change machine and equipment priorities when necessary.					
4	The organization always tries to Increase the ability of flexible production.					
<b>E</b>	<b>Dependability/ Delivery</b>					
1	The organization always looks to Increase the delivery speed of products.					
2	The organization determines and eliminates non-value adding activities in delivery related processes.					
3	The organization highly focuses on increasing the ability to meet the delivery commitments.					
4	The organization always look to Decrease the make span from taking the					

*Financial Performance Evaluation of Product Innovation*

	orders to the completion of delivery.					
5	The organization always look to Increase the just in time delivery.					
<b>F</b>	<b>Quality</b>					
1	The organization highly focuses on Increasing the product and service quality according to customer's perception.					
2	The organization highly focuses on Increasing the product and service quality compared to rivals.					
<b>G</b>	<b>Marketing Support of the Product</b>					
1	The organization renews the design of the current and/ or new products					
2	The organization renews the distribution channels without changing the logistics processes related to the delivery of the product.					
<b>H</b>	<b>Product- Process Innovation</b>					
1	The organization determines and eliminates non value adding activities in production processes.					
2	The organization decrease manufacturing cost in components and materials of current products					

**PART-II: PERCEPTIONS ON PRODUCTION INNOVATION AND FINANCIAL PERFORMANCE**

Please indicate your responses to subsequent questions by putting a cross mark (X) on the desired number as mentioned in the boxes, where

**1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree.**

**Does the product innovation impact the following financials of your company?**

<b>FINANCIAL FACTORS</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
There is an increase in the ratio of Return on sales (profit/total sales).					
There is an increase in the ratio of Return on assets (profit/total assets).					
There is an increase in the General profitability of the firm.					
There is an increase in the Cash flow of the firm excluding investments.					

# **APPENDIX-III**

**FIRST ORDER SEM- CONFIRMATORY FACTOR ANALYSIS**  
**Maximum Likelihood Estimates**

**Table-1: Regression Weights: (Group number 1 - Default model)**

			Estimate	S.E.	C.R.	P	Label
D4	<---	D	1.000				
D1	<---	D	.722	.054	13.391	***	par_1
D3	<---	D	.610	.050	12.101	***	par_2
D2	<---	D	.733	.059	12.376	***	par_3
D5	<---	D	.695	.081	8.536	***	par_4
TS2	<---	TS	1.000				
TS6	<---	TS	.863	.075	11.575	***	par_5
TS4	<---	TS	.855	.067	12.778	***	par_6
TS3	<---	TS	1.021	.092	11.098	***	par_7
TS1	<---	TS	.951	.073	13.062	***	par_8
IG4	<---	IG	1.000				
IG3	<---	IG	.932	.052	17.999	***	par_9
IG2	<---	IG	.878	.039	22.364	***	par_10
IG1	<---	IG	.841	.044	19.160	***	par_11
F3	<---	F	1.000				
F2	<---	F	1.070	.043	25.016	***	par_12
F1	<---	F	.972	.041	23.928	***	par_13
F4	<---	F	1.137	.109	10.391	***	par_14
ID1	<---	ID	1.000				
ID4	<---	ID	1.203	.116	10.411	***	par_15
ID2	<---	ID	1.044	.106	9.805	***	par_16
ID3	<---	ID	1.166	.111	10.543	***	par_17
Q2	<---	Q	1.000				
Q1	<---	Q	2.381	.524	4.549	***	par_18
PI2	<---	PI	1.000				
PI1	<---	PI	.588	.212	2.769	.006	par_19
MS1	<---	MS	1.000				
MS2	<---	MS	-10.047	28.204	-.356	.722	par_20

**MODEL FIT SUMMARY**

**CMIN**

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	96	1016.086	310	.000	3.278
Saturated model	406	.000	0		
Independence model	28	5969.037	378	.000	15.791

**RMR, GFI**

Model	RMR	GFI	AGFI	PGFI
Default model	.064	.862	.820	.658
Saturated model	.000	1.000		
Independence model	.240	.347	.299	.323

**Baseline Comparisons**

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.830	.792	.875	.846	.874
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

**Parsimony-Adjusted Measures**

Model	PRATIO	PNFI	PCFI
Default model	.820	.681	.717
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

**NCP**

Model	NCP	LO 90	HI 90
Default model	706.086	613.314	806.451
Saturated model	.000	.000	.000
Independence model	5591.037	5344.153	5844.340

**FMIN**

Model	FMIN	F0	LO 90	HI 90
Default model	2.408	1.673	1.453	1.911
Saturated model	.000	.000	.000	.000
Independence model	14.145	13.249	12.664	13.849

**RMSEA**

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.043	.068	.079	.634
Independence model	.187	.183	.191	.539

**AIC**

Model	AIC	BCC	BIC	CAIC
Default model	1208.086	1222.254	1596.634	1692.634
Saturated model	812.000	871.919	2455.233	2861.233
Independence model	6025.037	6029.169	6138.364	6166.364

**ECVI**

Model	ECVI	LO 90	HI 90	MECVI
Default model	2.863	2.643	3.101	2.896
Saturated model	1.924	1.924	1.924	2.066
Independence model	14.277	13.692	14.878	14.287

**HOELTER**

Model	HOELTER .05	HOELTER .01
Default model	147	155
Independence model	30	32

**SECOND ORDER STRUCTURAL EQUATION MODELLING  
Maximum Likelihood Estimates**

**Table-2: Regression Weights: (Group number 1 - Default model)**

			<b>Estimate</b>	<b>S.E.</b>	<b>C.R.</b>	<b>P</b>	<b>Label</b>
FN	<---	D	-.150	.105	-1.432	.152	par_64
FN	<---	IG	.133	.059	2.244	.025	par_65
FN	<---	F	.256	.041	6.196	***	par_66
FN	<---	TS	.087	.068	1.293	.196	par_67
FN	<---	ID	.181	.088	2.047	.041	par_68
FN	<---	Q	.628	.315	1.991	.046	par_69
FN	<---	PI	.496	.573	.866	.387	par_70
FN	<---	MS	.639	.461	1.385	.166	par_71
D4	<---	D	1.000				
D1	<---	D	.731	.054	13.492	***	par_1
D3	<---	D	.618	.051	12.187	***	par_2
D2	<---	D	.743	.060	12.476	***	par_3
D5	<---	D	.695	.082	8.527	***	par_4
TS2	<---	TS	1.000				
TS6	<---	TS	.967	.081	11.945	***	par_5
TS4	<---	TS	.858	.068	12.679	***	par_6
TS3	<---	TS	.994	.089	11.163	***	par_7
TS1	<---	TS	1.061	.079	13.465	***	par_8
FN4	<---	FN	1.000				
FN2	<---	FN	.901	.068	13.171	***	par_9
FN3	<---	FN	.789	.058	13.525	***	par_10
FN1	<---	FN	1.059	.065	16.239	***	par_11
IG4	<---	IG	1.000				
IG3	<---	IG	.934	.052	17.999	***	par_12
IG2	<---	IG	.879	.039	22.395	***	par_13
IG1	<---	IG	.843	.044	19.196	***	par_14
F3	<---	F	1.000				
F2	<---	F	1.065	.042	25.587	***	par_15
F1	<---	F	.962	.040	24.099	***	par_16
F4	<---	F	1.292	.111	11.602	***	par_17
ID1	<---	ID	1.000				
ID4	<---	ID	1.242	.116	10.687	***	par_18
ID2	<---	ID	1.032	.105	9.787	***	par_19
ID3	<---	ID	1.135	.109	10.445	***	par_20
Q2	<---	Q	1.000				
Q1	<---	Q	1.772	.298	5.947	***	par_21
PI2	<---	PI	1.000				
PI1	<---	PI	.641	.213	3.004	.003	par_22
MS1	<---	MS	1.000				
MS2	<---	MS	-8.973	21.499	-.417	.676	par_23

**MODEL FIT SUMMARY**

**CMIN**

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	114	1510.062	414	.000	3.647
Saturated model	528	.000	0		
Independence model	32	7443.454	496	.000	15.007

**RMR, GFI**

Model	RMR	GFI	AGFI	PGFI
Default model	.066	.833	.787	.653
Saturated model	.000	1.000		
Independence model	.240	.320	.276	.301

**Baseline Comparisons**

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.797	.757	.844	.811	.842
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

**Parsimony-Adjusted Measures**

Model	PRATIO	PNFI	PCFI
Default model	.835	.665	.703
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

**NCP**

Model	NCP	LO 90	HI 90
Default model	1096.062	981.051	1218.627
Saturated model	.000	.000	.000
Independence model	6947.454	6671.624	7229.709

**FMIN**

Model	FMIN	F0	LO 90	HI 90
Default model	3.578	2.597	2.325	2.888
Saturated model	.000	.000	.000	.000
Independence model	17.639	16.463	15.810	17.132

**RMSEA**

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.054	.075	.084	.634
Independence model	.182	.179	.186	.539

**AIC**

Model	AIC	BCC	BIC	CAIC
Default model	1738.062	1757.403	2423.462	2313.462
Saturated model	1056.000	1145.584	3193.013	3721.013
Independence model	7507.454	7512.883	7636.970	7668.970

**ECVI**

<b>Model</b>	<b>ECVI</b>	<b>LO 90</b>	<b>HI 90</b>	<b>MECVI</b>
Default model	4.119	3.846	4.409	4.164
Saturated model	2.502	2.502	2.502	2.715
Independence model	17.790	17.137	18.459	17.803

**HOELTER**

<b>Model</b>	<b>HOELTER .05</b>	<b>HOELTER .01</b>
Default model	130	136
Independence model	32	33

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## **NOMENCLATURE**

### **ACRONYMS USED**

- IG** : Intelligence Generation
- IG1** : The process of intelligence generation Design new products and services
- IG2** : It is critical for the companies to organize the process of intelligence generation and use it to design new products, services or systems
- IG3** : The capability to generate intelligence and utilize it is most important source of a firm’s sustainable competitive advantage.
- IG4** : The people with entrepreneurial pursuits tend to engage in greater level of information scanning activities.
- ID** : Intelligence Dissemination
- ID1** : Interaction among employees is critical success factor for product innovation.
- ID2** : The availability of appropriate infrastructure and processes are critical for improving intelligence dissemination within the organization.
- ID3** : Familiarity with colleagues facilitates the generation of ideas, is critical to product Innovation.
- ID4** : Identifying and designing Intelligence Dissemination processes are important for product innovation.
- TS** : Technology Selection
- TS1** : The organization selects the leading strategy in our industry.

- TS2** : The organization place high emphasis on R&D activities.
- TS3** : The organization selects the most advanced technology in our industry.
- TS4** : The organization develops new products with technical specifications and functionalities totally differing from the current ones.
- TS5** : The product modifications have a better market response.
- F** : Flexibility
- F1** : The organization always tries to Increase the ability of producing non-standard products.
- F2** : The organization always tries to increase the product orders with different specifications.
- F3** : The organization possesses the ability to change machine and equipment priorities when necessary.
- F4** : The organization always tries to Increase the ability of flexible production.
- D** : Dependability/ Delivery
- D1** : The organization always looks to Increase the delivery speed of products.
- D2** : The organization determines and eliminates non-value adding activities in delivery related processes.
- D3** : The organization highly focuses on increasing the ability to meet the delivery commitments.
- D4** : The organization always look to Decrease the make span from taking the orders to the completion of delivery.
- D5** : The organization always look to Increase the just in time delivery.
- Q** : Quality
- Q1** : The organization highly focuses on Increasing the product and service quality according to customer's perception.
- Q2** : The organization highly focuses on Increasing the product and service quality compared to rivals.
- MS** : Marketing Support of the Product
- MS1** : The organization renews the design of the current and/ or new products
- MS2** : The organization renews the distribution channels without changing the logistics processes related to the delivery of the product.
- PI** : Product- Process Innovation
- PI1** : The organization determines and eliminates non value adding activities in production processes.
- PI2** : The organization decrease manufacturing cost in components and materials of current products