



## REVISITING IT ADOPTION IN SUPPLY CHAIN AND ITS IMPACT ON PRODUCTS AND SERVICES DELIVERY: AN EMPIRICAL STUDY

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### ABSTRACT

*With the rapid development of technology and globalization, there has been a tremendous competition in the market dictating the over-growing fight between firms vying for market share. The production of a product and service are being revolutionized with the advent of Information technology. A lot of minor to major issues are involved in the various stages involved in the manufacture of a product (service as well) till its delivery. Previously there used to be lot of issues like delay and lags due to various internal as well as extraneous factors which sometimes created an obstacle in the execution of a particular activity within a stipulated time resulting in delay in the subsequent stages. Now IT has facilitated quick information processing and transmission across the various stages of products and services delivery thereby reducing hassles and lags. This has also resulted in the optimal allocation and utilization of resources thereby increasing efficiency and effectiveness in the manufacturing and other allied processes. Using 8'Ps of Marketing from Lovelock as a basis of our study, in this paper an effort has been made to find the real latent factors existing across the various dimensions of products and services delivery as perceived by the IT professionals in the Indian context. The obtained results exhibit conformance with the theoretical results.*

**KEYWORDS:** *Eight P's of Marketing, Information Technology, Product and Services Delivery, Factor Analysis.*

## I. INTRODUCTION

In the backdrop of globalized business models, organizations are getting entangled in ever intensifying global competition, frantically trying to protect their market share and maintain their niche market-positions. With the advent of new technologies, expansion of the business horizon and increment in the capabilities of IT enabled business management and control systems, global business players (firms) are loosening their capital flows, trying to implement the most advanced state-of-art IT technologies and protocols to increase their co-ordination prowess of their supply chain network and extend their product variety and availability at most competitive price to their customers. It is no more a myth to the business community that to reach the pinnacle, certain key tactics holds the secret to success like achieving flexibility through transparency, increasing co-ordination and sector-wide collaboration throughout the entire allied distribution network and supplier catchment, etc. Thus at this juncture it won't be out of the shell to state that the emergence of advanced IT networking techniques has revolutionized the very way firms communicate and deal with their suppliers and distributors, both upstream and downstream.

Advancements in IT techniques and its co-ordination with Global SCM practices have marked a new era of business and helped in building a global robust framework. The main view is achieving the once utopian goal of rapid information sharing, increasing network trust and commitment, reducing chain uncertainty, increasing agility in product introduction and service delivery, increasing responsiveness in sensing, perceiving and anticipating changes, increasing flexibility in dealing with rapid changes in product volume, product configuration and organizational issues and finally from a holistic perspective making the organizations more competitive and equipped with necessary resources as and when required (Sharifi & Zhang,1999).

The contribution of IT in these domains reflects its predominant impacts on the supply chain of today's firms. Established literature in this sector defines and categorizes this role of IT in SCM into three broader segments, namely the transformational role of IT, evolving role of IT and the constraining role of IT. Transformational role, it indicates the fact that IT has facilitated the easy sharing of product demand and other related informational updates through all the members involved across the supply chain network, thus shaping and modifying the way traditional supply chain members used to interact. Evolving role signifies the contribution and impact of IT supply chain has towards the gradual evolving daily aspects of the chain and there exists a host of dynamic variables which constrain the process from becoming stationary. In brief, the numerous ways in which IT can help in supply chain integration is being explored frequently are indicated. Finally the constraining role speaks about the possible disadvantages and limitations that the supply chain and its members might face due to the implementation of IT techniques. Further research focus and light can be thrown on this viewpoint through careful investigation using some established theories involving Resource Based View (RBV), complex adaptive systems (CAS), adaptive structuration theory (AST) etc. In a rather recent work concerning the theoretical perspectives of co-ordination of supply chains Holweg & Pil (2008) have stressed that supply-chain coordination relies on the availability of prompt and accurate information that is visible to all actors in the supply chain and in their study have attempted to evaluate the applicability of these three theoretical perspectives to understand the underlying synchronization

between information flow, physical flow, and the complex rationales driving the evolving framework of SCM.

These theories look at different perspectives of an organization and discuss the analyses from the specific perspectives. Firstly, the resource based view talks about the characteristics that the concerned organization should look out while procuring its resources thereby gaining core competency. So the role of IT can be linked in a framework with these theories thereby integrating and making a holistic view on the role and impact of IT on today's supply chain. A quick scan in the contemporary research works suggests that little attention has been given to study the impact of IT implementation in a firm's supply chain perspective linked with new product launch by the concerned firm and its subsequent acceptance in the market. This gives the impetus to probe deeper and study the role and impact of IT from the given perspective; simultaneously studying how IT implementation can help in successful synchronization of the supply chain network during introduction of a product and helping the same to get rapid acceptance by the customers through improvement in service delivery. It can be logically deduced that as technology adoption and implementation have considerable effect in improving supply chain efficiency and effectiveness, whether its impact in product launch, subsequent acceptance and subsequent enhancement of the service delivery to the customers is possible or not is an intriguing question.

## **II. REVIEW OF LITERATURE**

Since inception manufacturers are trying to achieve flexibility, responsiveness and agility in their distribution networks and supply chain but few have achieved because of the huge investments required in employing expensive technologies to achieve improved performance. Though few of the large firms have achieved that, but majority of the players missed out and were unable because of the obvious reasons. Thus there exists a plethora of problems in any supply chain which can be omitted with the implementation of IT. Also the supply chain has evolved from its traditional form of merely linking the suppliers and manufacturer and further downstream, with the emergence of new product segments and sector specific practices and benefits. The present day supply chain has become much more complicated and its complexity has increased due to the involvement of increased human interface and intervention than that in its preceding form and hence the cost and effectiveness in mitigating its problems have increased manifolds. Hence it becomes extremely necessary to first study the present form of supply chain and parallel to it identifying the associated challenges, besides analyzing the scope of superior IT implementation and its associated benefits and limitations. This in turn helps in co-integrating the two related yet parallel strands thereby giving birth to a more effective and efficient supply chain (Pereira, 2009). This sort of cross integration is highly essential and also beneficial as the current IT practices and adjoining strategies have given rise to certain problems which can be eliminated when the two strands of the controlling tool (IT and SCM practices) are jointly analyzed. All this calls for a newer strategy for effective alignment of IT with supply chain. However this cross linking is not easy at times, as implementation of IT has been forced by institutional isomorphism, namely coercion, mimesis, and norms. It's imperative in this regime to keep in mind that the initiatives and steps taken by a firm in adoption of IT in its supply chain have several implications for its associated supply chain members too. So in a study Lai et.al (2006) explores this and states that occasionally supply chain members are not themselves well prepared

for adopting this technology and needs to be training and educating the same for bridging the gap. In this scenario it is worth mentioning that the electronic data interchange had been around some 30 years now but it's sad that it has not reached small and medium-sized enterprises to any significant extent. Literature shows because of this, many companies may go out of operation in the supply chain. But the advent of Internet and e-business concepts has opened up new avenues for their growth (Stefansson, 2002).

It's not necessary that implementing IT will always result in positive organizational performance. It can be seen from a resource based view (RBV) that IT-enabled supply chain capabilities are very specific to the firms and inimitable (Wu et al., 2006). But these capabilities if worked upon can give the firms core competencies and thereby can earn higher value. The adoption of IT framework across the firm needs synchronized implementation of infrastructure, capital and labor at various strategic levels of the organization. So unless being initiated and driven by a lot of organizational factors, usually firms don't go for adopting IT framework. Zhang & Dhaliwal (2009) have confirmed with their study that firms can implement IT in their internal operations and processes and employ the same in communicating with their supply chain partners giving rise to significant competitive advantages for themselves but this is possible only when this urge is felt in the organization as a whole. Literary evidences clearly portray the fact that RBV have given sound platform to practitioners and managers working towards enhancing supply chain excellence with the help of IT support. Thus IT helps in sharing relevant information across the members of supply chain and also helps in updating and quickly responding to an arriving demand. Recent research findings by Yu et al. (2010) indicate that in the backdrop of IT enabled supply chain infrastructure many different types of information can be shared but the sharing of critical demand related information gives rise to maximum efficiency across the supply chain. Though only the capacity and demand related critical information are shared most often, however complete sharing of information is no doubt the best option as sharing of only capacity and inventory related information usually has detrimental effects and magnifies the bullwhip effect leading to most misunderstandings among the supply chain partners. Thus information sharing leads to positive firm performance. Byrne & Heavey (2006) studied the information sharing issue in a setting involving multiple customers, distributors and product families, with customers and distributors face differing demand patterns and found that potential total supply chain cost savings of up to 9.7% can be achieved with increased savings occurring with reduced system capacity. Their study used ERP implementation in an organization. Obviously in today's age, the introduction of ERP not cheap and firms have to make tough decisions while making heavy investments decisions in implementing ERP in their organizations and the same have considerable impact on the bottom lines as well. In another very recent paper, Su & Yang (2010) confirmed that the operational, managerial, and strategic benefits of ERP has significant impact in enhancing the supply chain competencies, but also in contrast mentions that the IT infrastructure and organizational benefits are not as significant predictors of the others. They mention further that consequently many organizations perceive ERP implementation as the first step to design an effective and efficient supply chain.

With increasing complexity in supply chains, new systems are being developed which involve a large no of participants and these need to agree on processing and marketing of goods, information management, responsibility, and identification because these are vital issues relating to tracing a product. Tracing is indeed beneficial to reduce complexity, improve security, control

quality, combat fraud or manage complex chains (GSI Traceability, 2006). These are known as industrial traceability systems and in this context, XML and SOAP can be surely regarded as emerging enabling technologies but plain help from these two is not alone sufficient (Bechini et al., 2008). Though the emergence of IT has considerable impact on the supply chain as well as on the firm's performance but literature indicates absence of direct benefits of e-Business technologies on performance. Still these technologies have supported integration of suppliers and distributors ending with customer integration. Studies indicate that supplier integration positively impacts cost, quality, flexibility, and delivery performance; however there is no literary and research based empirical evidence supporting positive impact of relationship between customer integration and performance. It exhibits that close relationship exists between e-business technologies and supplier integration, leading to improved performance. Contemporary studies emphasize and show that both the customer integration and supplier integration has an integrative effect, and give rise to the notion that firms having both forms of integration, supported by e-Business technologies, can easily outperform their rival firms. However it is neither easy, nor is it spontaneous for the firms to go for implementing IT technologies and adoption of IT enabled infrastructure. In a supply chain, both the manufacturer and the supplier has to agreed upon as implementation on one side will not reap the desired profits and benefits to both ends. So it's necessary to have mutual interest. But in doing so, some coordination problems might occur which prohibit both the parties to invest in new technology that can give rise to increased efficiency and security in the supply chain. Lee et al.(2011) studied this scenario in a decentralized environment and found that the following two coordination problems might prohibit the parties from investing: (a)security concerns are not dominating the efficiency concerns in which stakeholders will be reluctant to invest and to resolve this ,tax incentives might be considered (b)in the same case stake holders will not invest at all because of the uncertainty in their partner's behavior ; imposing a penalty for a breach of security can be used to alleviate such behavior.

IT has paved the way for gaining better agile supply chain as illustrated by the works of Ngai et al. (2010). It also showed that supply chain agility is different from firm competence and both have a considerable impact on firm performance. This is possible because agility increases quickness, responsiveness and overall flexibility in the entire supply chain thereby leading to better firm performance. Though therefore it's acknowledged that IT has helped in supply chain integration and coordination through information sharing like demand, capacity, inventory and scheduling but no work has been done to measure the magnitude and effectiveness of the available information that the logistics information systems provides. To substantiate we should quote the work by Barut et al. (2002). They developed a generic measure and states that:

“.....Degree of supply chain coupling (DSCC), a 2-tuple index, and take into account both the intensity and extent to which information about demand, capacity, inventory, and scheduling is shared and used by the firm in both directions of the supply chain...”

Traditionally customers have perceived a company's product depending on the company's image and brand equity. Even today the situation has not differed. Seggie et al. (2006) studied the IT alignment in this realm and found that IT alignment and inter firm system integration have positive effects on brand equity while partner dependence throughout the chain affects the resources availability throughout the supply chain. This gives the impetus to study how firms

feel that IT adoption and implementation helps them in product launch and subsequent acceptance. The RBV view of the firm states that resources are heterogeneously distributed across various firms and these differences in the resource levels over time help firms to sustain competitive advantages. The key attributes of these competitiveness generating resources are essentially along the four lines of their valuable property, rarity, imperfect imitability and substitutability (Barney, 1991). So enabling the IT framework in the supply chain practices of the firm can lead to effects that can be analyzed along the lines of traditional RBV theory. Andreu and Ciborra (1996) in their research findings also acknowledge this effort and argued that information systems can be used by organizations to transform into a new organizational structure. So RBV can be used to analyze the transformational role of IT. Firms implementing IT can realign their focus and strategies to meet the dynamic market demand and also can have flexibility throughout their organization so as to incorporate any environmental change. Holland (1995) proposed the Complex adaptive systems theory which aims in studying the dynamic responses of flexible systems. This has been use in several disciplines like biology and sociology. Because of the flexible nature of such systems, IT and supply chain (as systems) can deviate from their intended purpose and objectives. Thus CAS fails to account for the combined change in any two systems. For this adaptive structuration theory was proposed. In fact the AST theory was suggested to analyze variations in an organization which occur as a result of implementation of emerging technologies. The main concepts of AST are structuration (Giddens, 1979), and appropriation (Ollman, 1971). AST enables to understand the dynamicity in several processes and how the several dynamism may give rise to positive results when these processes are properly directed and managed. The adaptive process takes place at different velocities at different levels across different organizations. So it can be said that the firm specific factors has a huge influence in shaping this processes. But the benefits can be extended to from employee to business partners also thereby indicating the long reach of the allied consequences

There are many theories that can explain the dynamic role that IT plays at the product launch and service delivery stages. However it is extremely essential to explore the various factors that significantly help in assessing the ever changing roles of IT across the above mentioned segment and this can be done well if the said study can be done in the context of marketing mix and its elements because these only govern the product and service delivery.

### **III. OBJECTIVE**

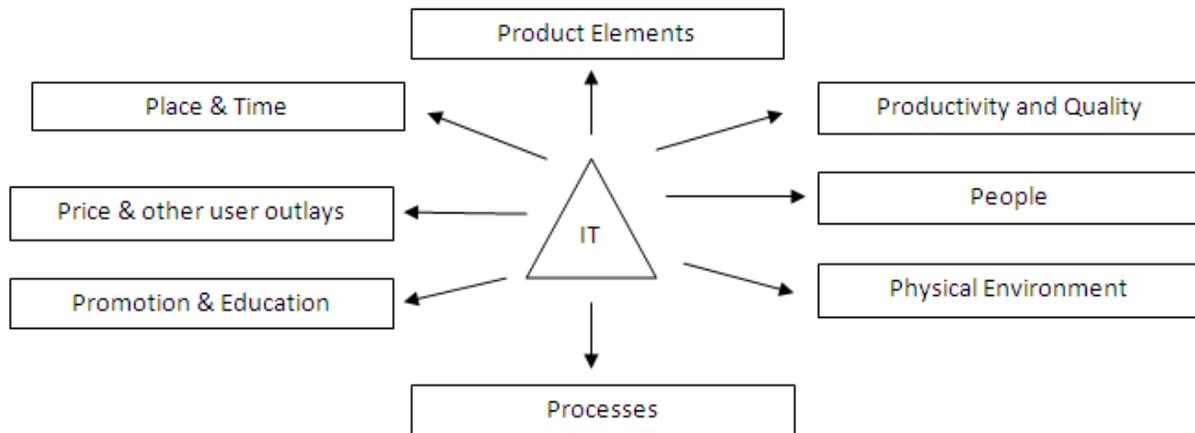
This paper makes an attempt to integrate the transformational, evolving and constraining roles of IT with three theories based on resources and firms, simultaneously analyzing how IT implementation in supply chain impacts a firm's product launch and its subsequent efficiency or effectiveness through enhanced service delivery. This study attempts to focus on a new dimension of role of IT in global SCM and associated firm phenomenon like introducing new products, related service delivery and impact on IT integrated supply chain phenomenon.

### **IV. METHODOLOGY**

Focused group discussions have been used to identify relevant items that must be included in our study trying to delineate the broader roles of IT in product promotion and service delivery. A 5 point Likert scale can be used to rate the items (1=strongly disagree to 5=strongly agree).

Thereafter exploratory factor analysis can be employed to identify the important dimensions that might come out of the collected data.

### PROPOSED MODEL



As marketing evolved in course of time, with the advent of technology there was simultaneous development in the product features and service delivery and gradually it came to notice the combo nature of product and service which means that nowadays every product has some service element attached with it and vice versa. In this backdrop it was felt therefore to analyze the various ways and devise strategies to market services. Thus the 4 Ps of marketing mix was reconceptualized to make it fit for services marketing. Another vital 4 Ps have been added to the earlier. With these the 8 Ps of services marketing stands today as:

1. Product Elements
2. Place & Time
3. Price & other user's outlays
4. Promotion & Education
5. Processes
6. Physical Environment
7. People
8. Productivity & Quality

[Source: Services Marketing (Lovelock et al., 2010)]

This is the new Marketing mix in today's age. With the addition of the last 4 Ps there has been a growing research works to enhance the service part attached with the product part because for standardized products this is an area where an organization can focus and make some points of differences and consolidate its market position. Briefly speaking, in the last 4 Ps today's organizations are competing to make the difference because of the fact that - any service is in itself unique and its exact replication is impossible as the human touch is involved there. So by proper planning and training of employees and its service people along with the people who are involved in the execution of the service; an organization is sure to make a difference and carve out a niche for itself in today's globalized market. Thus for our analysis in assessing the role of IT in today's product promotion and service delivery, we adopt the above mentioned 8 Ps Model as a generic representation of marketing in both product, service regime as well as product-service portfolio. In this regime, IT adoption has helped these organizations in a diverse no of ways. So here in this paper we tried to see what are the holistic roles of IT that impacts each or all the levels of the evolved marketing mix model. Before going to do so, it's necessary to define the prescribed role:

### **1. PRODUCTS ELEMENTS**

There are a host of tools like AUTO CAD and a host of others which help in designing various component parts of a product say an automobile. In this way there has been a host of such tools and technologies that have helped in the design of the various parts of a core product. It's known that there is always a core product and all the activities of associated services revolve around it. So IT has transformed the long hours of manual drawing and designing work to a reduced minimum and simultaneously communicating across relevant departments as and when required during the design process. This has reduced the time taken by obstacles that blocks the designing process at any particular step because previously the designing person has to wait until he has discussed with concerned department of a probable modification in the design process so that the obstacle can be removed and he can proceed on. Thus in this way IT has transformed the way in which traditionally engineers used to design their daily assigned jobs. IT in this sector is rapidly evolving for the better.

### **2. PLACE & TIME**

This deals with the delivery of the above product elements to a customer at a place and at a suitable time. The transaction involves various location as well as timing decisions and also decisions regarding methods and channels are important. But it's the nature of service that will determine the method of delivery which may be physical and electronic or both may be employed. In such cases, it's imperative for the firm to take care and monitor the service delivery process and the behavior of the service personnel associated as it has been pointed out already that this is one of the areas where today's competing firms strives to make a difference. Mention worthy is that speed and convenience of place are the important determinants in effective service delivery. Messaging services through mobiles and emails and other relevant media have helped a long way in transforming this sector which are few of the significant contributions of IT in this arena.

### **3. PRICE & OTHER USER OUTLAYS**

In this regime companies are highly monitored for their pricing activities by the customer segment. This is because firms have to decide on pricing issues of the service thus delivered vis-a-vis the costs incurred in delivering the service as this difference will add to the company's bottom lines thereby leading to revenue generation. The strategy in this sector is highly dynamic as each and every service delivery is unique so it's every firm effort to design and provide a better service each and every time to its customers. Customers are also calculative of not only their monetary costs; but also their non-monetary expenses like time and energy spent in selecting and evaluating a service. IT in this backdrop enables the firms to easily manage their vast product portfolios and through integrated software allows the companies to rapidly make changes to prices of the product/services and analyze the probable profits and losses and accordingly decide on the strategy that should follow. Earlier these things would take days which is now a matter of minutes. IT is therefore have transformed top a greater extent and also its evolving in the sense that till it's in the search of newer and newer tools that can further enhance the current performance.

### **4. PROMOTION & EDUCATION**

It's a general fact that without proper awareness, no customer will come and buy a product. Sometimes a customer may not even know about the launch of a new product. So it's essential for firms to plan, invest and execute accordingly in order to have a proper reach among the target audience. Thus integrated communications are of outmost importance nowadays and with IT in hand, every firm are in constant effort trying to position its product or service differently but retaining some attractive unique features that will surely draw customers to it. Thus IT has helped a lot through innovative advertisements which has been possibly with the help of animation and other allied technologies. Also IT has enabled the innovative and cost effective promotion media like emails and other messaging services. This sector is constantly being upgraded as firms find newer ways of effective communications.

### **5. PROCESS**

It's important for a mundane product to have a well designed infrastructure that will stimulate the customer to choose the product and also the service personnel can faster process the bill at the cash counter. With IT the manual billing work has become history thereby facilitating easy and faster movement of the customer queue at the billing counters of big shops and retail outlets as well as malls. This would result in much lesser waiting times for customer at the counter and thereby may be a competitive dimension as nowadays time has become a key constraint in everybody's life. Thus effective p[rocesses are necessary for increasing the efficiency in service delivery.

### **6. PHYSICAL ENVIRONMENT**

Appearance of an outlet ,or shop, the ambience there along with the landscaping, interior furnishing, equipment staff members' uniforms, printed materials and other similar things can attract a customer and retain them in the shop for a longer time. So service firms are counting heavily on the maintenance and arrangement of the physical things as the same can have

profound impact on customer's perceptions about the firm's service quality. IT provides ample opportunities for experimentation through simulations on packages regarding the design of services cape.

## **7. PEOPLE:**

It has always been considered as an important dimension as people are the prospects that a firm can convert into its customers. For this direct interaction has always proved to be effective as well as successful above anything else given the availability of resources as and when needed. It has constrained in this sector by enabling people to communicate sitting at one place with its customers, handling their complaints and also informing them about new launches and trials. This has the constraining effect in the sense that it's easy to influence a customer to buy a product face to face which is not possible in internet selling process.

## **8. PRODUCTIVITY & QUALITY**

With the help of IT, new tools and technologies have arrived thereby making it possible to produce bulk quantities of goods at a time simultaneously maintain quality by following zero defects. But it's necessary to see for a firm that these two are the primary targets which must be fulfilled .Unless this is fulfilled, it will be difficult for the firm to sustain its position in the market.

Thus IT has influenced almost each and every regime of the marketing mix model in one or the other way. So in this paper through a series of focused group discussions a final list of items have been prepared the following items were generated that are to be transformed into a questionnaire for survey.

## **V. THE SURVEY INSTRUMENT**

For the aforesaid study, the survey questionnaire was prepared based on a series of focus group discussions with participating members from various domains of the IT industry so that the sole objective of having a good representative sample for our study can be achieved because here the main motive is to discuss the diverse roles of IT across various areas of product and service delivery. Hence it can be said that the aforesaid list of generated items are expected to elicit the required information when transformed into a questionnaire. The questionnaire was not structured into several sections but rather the items were mixed in order to make an unbiased survey in the sense that the respondents should not understand the latent variables underlying the study. Thus the list of items used in the questionnaire for survey and are given here are the list of final items generated after necessary modification and refinement after several focus group discussions.

## **VI. SAMPLING AND DATA COLLECTION**

The data were collected using both face to face interview technique and through self administered online questionnaire from Indian nationals having spread across three cities viz. Orissa, Kolkata & Hyderabad and comprising mostly young professionals. The rationale behind the obvious sample selection rests on the fact that since the aforesaid study is concerned about

the dynamic roles and influence of IT; so it's generally assumed that the younger proportion of the professionals will have better relevant expertise, ideas suiting the purpose of the concerned study. The selected sample aptly fulfilled these criteria due to the fact majority were from the young population and thereby having the zeal for sharing their ideas, providing creative suggestions which were needed in creating and refining the final list of items for survey. Out of a total 482 questionnaires used in the study (combining questionnaires used face to face interview as well as online mode), 322 responses were obtained among which only 264 were usable responses; thereby resulting in a response rate of 54.77 %. The questionnaire contained an initial explanation of the purpose of the study. The final questionnaire consisted of a total 24 questions for final survey. The respondents were requested to indicate their choice to a given question on a 5 point Likert scale (1=strongly agree to 5=strongly disagree). The detailed sample characteristics are as Table 1:

**TABLE 1: DEMOGRAPHIC PROFILE OF RESPONDENTS**

Location:	Marital status:
Orissa: 19.29%	Unmarried: 53.68%
Hyderabad: 49.41%	Married: 26.23%
Kolkata: 31.30%	Engaged: 20.09 %
Gender:	Age:
Male: 57.56 %	21-25 years: 35.64%
Female: 42.44%	26-30 years: 47.68%
Annual Household Income:	31-35 years: 14.06%
1lakh and 3lakh: 16.32%	36-40 years: 2.62%
3 lakh and 6 lakh: 26.34%	
6 lakh and 9 lakh : 38.16%	
9 lakh and above: 19.18%	
Education:	
Graduate: 46.16%	
Postgraduate: 42.68%	
Doctorate: 11.16%	

## VII. FACTOR ANALYSIS RESULTS

### Exploratory Factor Analysis

After rotation has been performed in the varimax orthogonal mode, there were 8 significant factors which can be seen as under. The list of items pertaining to each factors have been given under a separate table due to space considerations. Table 1 shows the items with their respective mean, variances and loadings while Table 2 demonstrates the factors with their respective items.

**TABLE 1: ITEMS SHOWING MEAN, VARIANCES AND LOADINGS**

Items	Mean	Variance	Loadings
IT offers innovative packages facilitating faster design.	3.25	1.027	0.768
Software packages enable the flexible design that can be edited easily at any stage.	3.82	1.004	0.689
Software packages are user friendly.	3.59	1.264	0.725
IT has facilitated the information processing from the seller to the buyer.	4.05	1.319	0.693
Short message services are widely used for informing customers regarding new products.	3.64	1.077	0.714
Advertising through mobiles is not a good practice and has adverse effects.	2.87	1.254	0.724
Today's software packages facilitate quick price estimations.	2.41	1.268	0.628
Technology has helped a lot in saving time and reducing paper usage.	3.62	1.061	0.635
Modern tools helps in adjusting price levels as per market needs.	3.5	1.087	0.746
With the advent of IT, reaching the customer has become easier.	3.14	1.126	0.641
Emails impart new product information within a few seconds	3.19	1.346	0.697
Integrated marketing communications has got a new dimension with IT.	4.11	1.088	0.612
Technology has helped in optimal process design.	2.69	0.698	0.634
IT has helped in getting rough estimates of important parameter	2.91	0.912	0.688

in shop floor design through simulation.			
Modeling and simulation has made impossible estimations possible.	2.79	0.758	0.783
Through animation and 3D modeling, it has become easy to see the attractiveness of several shop floor designs.	3.34	1.134	0.762
Technology has helped in the efficient management of the assortments.	3.28	0.968	0.631
With IT, monitoring has become easier in the shops and big retail outlets.	3.14	1.125	0.674
IT has reduced the scope of face to face marketing	3.37	1.114	0.696
IT has increased the possibility of reaching the potential customer, even located at remote areas.	3.08	0.879	0.758
IT has proved a boon for CRM.	3.79	1.314	0.711
Mass productivity has been possible because of Modern tools and technologies	3.58	1.054	0.708
The concept of Zero defect has become a reality because of IT.	3.95	0.867	0.624
Modern tools has enabled in reduced servicing times than previously.	3.68	1.241	0.768

**TABLE 2: FACTORS WITH RESPECTIVE ITEMS**

<b>Factors</b>	<b>Items</b>
Product Design Reliability=0.79	IT offers innovative packages facilitating faster design.  Software packages enable the flexible design that can be edited easily at any stage.  Software packages are user friendly.
Quick Delivery Reliability=0.68	IT has facilitated the information processing from the seller to the buyer.  Short message services are widely used for informing customers regarding new products.  Advertising through mobiles is not a good practice and has adverse effects.
Flexible Pricing Reliability=0.74 3	Today's software packages facilitate quick price estimations.  Technology has helped a lot in saving time and reducing paper usage.  Modern tools helps in adjusting price levels as per market needs.
Promotion Reliability=0.67 1	With the advent of IT, reaching the customer has become easier.  Emails impart new product information within a few seconds  Integrated marketing communications has got a new dimension with IT.
Process Reliability=0.78 4	Technology has helped in optimal process design.  IT has helped in getting rough estimates of important parameter in shop floor design through simulation.  Modeling and simulation has made impossible estimations possible.
Facility Management Reliability=0.72 6	Through animation and 3D modeling, it has become easy to see the attractiveness of several shop floor designs.  Technology has helped in the efficient management of the assortments.  With IT, monitoring has become easier in the shops and big retail outlets.

Customer Management	IT has reduced the scope of face to face marketing
Reliability=0.759	IT has increased the possibility of reaching the potential customer, even located at remote areas.  IT has proved a boon for CRM.
Productivity	Mass productivity has been possible because of Modern tools and technologies
Reliability=0.643	The concept of Zero defect has become a reality because of IT.  Modern tools has enabled in reduced servicing times than previously.

## EXPLANATION OF THE OBTAINED FACTORS

### PRODUCT DESIGN

This factor accounts for explaining 10.23% of the variance with a Cronbach alpha reliability of 0.79. The product design finds right resemblance with our hypothesized factor “Product elements” as basically it talks all about the faster, flexible interaction between software packages and their immense help in the better design of the various product elements.

### QUICK DELIVERY

This factor accounted for explaining 9.56% of the variance with a Cronbach alpha reliability of 0.68. Faster information processing and communication with the customers are no. the benchmarks for gaining and maintaining a good position in the perceptual map of the customers. The items here are refereeing to these dimensions and hence the label given to this factor. This indirectly points to the factor “Place & Time” of the hypothesized model as faster and rapid information processing is associated with providing customer the right information about product or service delivery.

### FLEXIBLE PRICING

This factor explained 8.79 % of the variance explained with a Cronbach alpha reliability of 0.743. This is indirectly related to the factor “Price and other user outlays” in the hypothesized model as the items constituting the factor (as obtained from the study) are all making price estimations easier, faster and implementing quickly.

**PROMOTION**

This factor accounted for 8.85% of the variance explained with a Cronbach alpha reliability of 0.671. This factor is directly related to the factor in our hypothesized model because the items on an aggregate level constituting the factor (as found from the survey) are all pointing towards the advertising and integrated marketing communications of any firm thereby helping in the efficient and effective promotion of their products and services.

**PROCESS**

This factor accounted for 7.76% of the variance explained with a Cronbach alpha reliability of 0.784. The factor has right similarity with a factor in our hypothesized model explaining the dynamic role of IT that had really made the designing of process faster easier and cheaper. Modelling and simulation has been helping a lot in the aforesaid process.

**FACILITY MANAGEMENT**

This factor accounted for 6.72% of the variance explained with a Cronbach alpha reliability of 0.726. It indicates a direct relation with the factor "Physical Environment" in our hypothesized model as both are talking in terms of efficient and effective facility and store design and managing them. IT has helped a great extent in doing so as evident from this latent factor that emerged from the survey.

**CUSTOMER MANAGEMENT**

This factor accounted for 7.71 % of the variance explained with a Cronbach alpha reliability of 0.759. This has close resemblance to the factor "People" in our proposed model because both talks about the way IT has helped the firms in today's market in contacting their clients and customers even at the remote locations. Finally IT has led to the birth to the emerging discipline of Customer Relationship Management (CRM).

**PRODUCTIVITY**

This factor accounted for explaining 7.37% of the variance with a Cronbach alpha reliability of 0.643. This has proved one factor in our proposed model as both are highlighting to the emerging concepts like mass customization and zero defect in the production and delivery of products and service. So quality can be maintained at the same time while responding to the customer's request for altering a certain feature of a product or service delivery.

**VIII. CONCLUSION**

The survey followed by exploratory data analysis gave rise to a set of latent dimensions which have either close or direct resemblance to the factors or dimensions where IT have considerably revolutionized the way things are done. This conformance of the latent dimensions with the proposed factor model indicates the un-denying role and importance of IT that it has harnessed in the above paradigms. So the above study has proved the massive importance of IT in various stages of product and service delivery. Future research will contribute further in the above arena

in investigating the roles and contribution of Information Technology in each of the above dimensions with much greater detail emphasis on existing and recent tools that are influencing the various functions and mode of activities in each of the dimensions.

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## **APPENDIX-A**

### **QUESTIONNAIRE GENERATED FOR SURVEY**

Please indicate your preference over the continuum from 1 indicating strongly disagree to 5 denoting strongly agree to the below mentioned items:

1. Mass productivity has been possible because of Modern tools and technologies
2. IT offers innovative packages facilitating faster design.
3. Software packages enable the flexible design that can be edited easily at any stage.

4. With IT, monitoring has become easier in the shops and big retail outlets
5. Short message services are widely used for informing customers regarding new products.
6. Advertising through mobiles is not a good practice and has adverse effects.
7. IT has reduced the scope of face to face marketing
8. Emails impart new product information within a few seconds
9. Today's software packages facilitate quick price estimations.
10. Technology has helped a lot in saving time and reducing paper usage.
11. With the advent of IT, reaching the customer has become easier.
12. IT has facilitated the information processing from the seller to the buyer
13. Integrated marketing communications has got a new dimension with IT.
14. Modern tools helps in adjusting price levels as per market needs.
15. IT has helped in getting rough estimates of important parameter in shop floor design through simulation.
16. Modeling and simulation has made impossible estimations possible.
17. Modern tools has enabled in reduced servicing times than previously.
18. Through animation and 3D modeling, it has become easy to see the attractiveness of several shop floor designs with a help of a click.
19. Technology has helped in the efficient management of the assortments.
20. Technology has helped in optimal process design.
21. . Software packages are user friendly.
22. IT has increased the possibility of reaching the potential customer, even located at remote areas.
23. IT has proved a boon for CRM.
24. The concept of Zero defect has become a reality because of IT.