

## **Research on ICT Patterns and Integration in Small & Medium Enterprises” A Case Study of Pakistan”**

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### **Abstract**

*The main object of this paper is to examine the current situation of ICT (Information Communication Technology) and integrating factors of ICT by the Small & Medium Enterprises (SME's) existed in Sindh province of Pakistan. Moreover on the basis of cited literature, to find out the relationship of variables that enforce SME's to add ICT applications in their enterprises. Mix paradigm approach has followed and randomly data was collected from the owner/managers of SME's particularly manufacturing sector and analysis done by SPSS. The results of this paper provide a well-timed understanding of ICT integration by SMEs as well as also explained the ICT usage level inside the small and medium scale business units in the province. Finally a model has been developed on the basis of variables related to the integration of ICT. Four variables have been identified as the factors which are correlated in adoption of ICT applications, including economic perspective, competition perspective, innovational perspective and personnel perspective. Additionally, finding shows that the individual and economic factors have positive and significant impact on ICT integration by SMEs in Sindh. Usually it is important for small & medium scale firms and top level executives to add and organize ICT applications in an effective manner, get advantage of existing resources and accelerate the economic development in the region.*

**Keywords:** *SMEs, ICT integration, Sindh, Pakistan.*

### **1. Introduction**

Recently, SME's become dynamic elements for the economic engine of countries throughout the world. These small elements act as catalyst in poverty reduction, empower the gross domestic products (GDP), improve the national economical skeleton of the country, provide employment opportunities, enhance skill development, and promote business activities across the boundaries and so on. But in this digital and competitive era, all these advantages could not be obtained except the proper integration of ICT in SME's sector. Since the growing spread of (ICT) and ever falling cost of communication mediums around the world, SME's facing pressure to integrate sophisticated ICT solution inside the organizations. Moreover, in developed countries and probably Large Enterprises are already getting proper advantages of technology, where as SMEs in developing countries like Pakistan are still very far behind. Although there is slow ICT adoption has been seen in developing countries of SMEs [14], while large scale companies are well stable in the adoption of ICT related tools / applications. The main reason behind this aspect is that, the SME's have limited resources, minimum technological capabilities although the less complicated structure allows them more flexibility for changes [2]. In many different developed or developing countries the SME accelerates the average economic growth and provide drastically employment option [9]. Furthermore, it is also believed that ICT could change the way of life and also changed

many things in the business. The main purpose of this paper is to determine the factors those enforce SMEs to integrate the information & communication technologies and get its proper advantage, as they can compete in global economy, as well as can improve their trade trends, and could enhance their trade boundaries. In this way these small business elements dynamically contribute in GDP, poverty reduction and create opportunities for the local population of the region. Since last one and half decade, Pakistan is facing various serious general problems, like energy crises, unstable economical conditions, war against terrorism, political disorder, lack of proper IT skills etc. These elements badly affect to the economical condition of the country, where SMEs sector was considered as a backbone of the economics. Scholars believed that the situation of the country can be changed by promoting SMEs by the integrations of ICT.

In addition to that Global Competitiveness Index presents Pakistan at the 133rd rank amongst 148 countries [15]. It is evident that Pakistan as a developing country could also improve its economic condition by getting benefits through the promoting the activities of SMEs. Although the SMEs constitute nearly 99% of all the enterprises in Pakistan and share 40% in the annual GDP, 25% share in manufacturing exports and 78% share in individual employment of the country [18]. Pakistani SMEs are crippled by incomplete ICT integration, property rights protection and security. The macroeconomic situation and SMEs infrastructure, productivity, trade is also irritating. Moreover, the potential of ICTs is not sufficiently leveraged in Pakistan, where access to ICTs remains the privilege of a few. Although studies regarding to ICT adoption have already been conducted by several researchers, but the most of these were been focused on large scale enterprises and also done in developed countries [13]. In the light of these arguments, this studies draw an attention to analyze the existing trends of ICT in SMEs along with the identification of variables those influence on the integration of ICT in developing countries like Pakistan where such type of studies are rarely found.

## 2. Classification of SME's in Pakistan

Figure 1 represents the classification of SMEs existing in different province of Pakistan. Pakistan has been categorized in to four provinces and SMEs are probably existed in each city of each province. The maximum percentage i.e 65.26% of SMEs is available in the Punjab Province, while Sindh Province has 2<sup>nd</sup> highest percentage of SMEs i.e 17.83%, Khaiber Pukhtunkhuwah (old name of this province was NWFP North West Frontier of Pakistan) equipped 3<sup>rd</sup> place having SMEs percentage of 14.21% and the last province named Balouchistan having the SMEs about 2.10%. Figure 1 clearly explains the percentage of SMEs in each province. This data has been taken from a Regulating Authority of SMEs in Pakistan named as SMEDA.

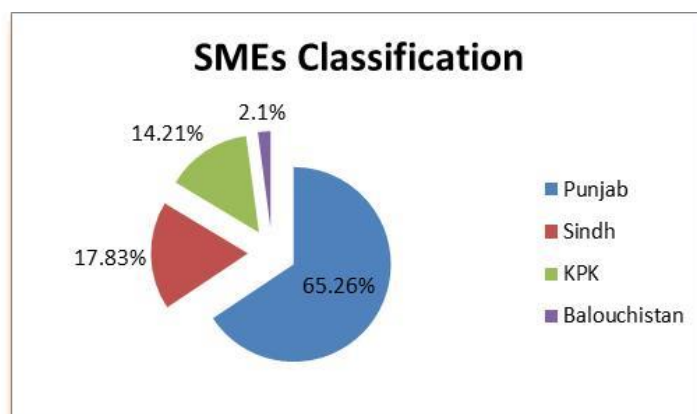


Figure 1. Taxonomy of Pakistani SME's

The controlling and facilitating authority of SMEs in Pakistan called Small and Medium Sized Development Authority of Pakistan (SMEDA) state the definition of SMEs on the following prerequisites: a micro enterprise as a business entity having 1~5 employees working in the firm including on contract staff and annual sale turnover up to 20 Million. A small scale firm is a business entity having 6~20 people and annual sale turnover up to 75 million; and a medium enterprise as a business entity having 21~50 people in the organization and annual sale turnover up to 400 millions. If more than 51 employees working in any firm or organization and turnover more than 400 million, this business entity treated as a large enterprise of the country. Table No. 1 explains the definition of SMEs as per SMEDA (2005) showing the size of enterprises in different categories.

**Table 1. SME's Definition on the basis of Work Force**

Category	No. of Workers	No. of firms in Pak	%age of SMEs	Annual turnover
Micro	1-5	28,51,061	96.37%	20 Million
Small	6-20	79291	2.68%	75 Million
Medium	21-50	26352	0.90%	400 Million
Large	51+	1617	0.05%	More than 400 Million

The above cited conditions is the reason for this study to find out about ICT practices and integrating factors of ICT in SMEs and further to examine the variables affecting SMEs in the adoption of ICT. In this regard, Sindh Province of Pakistan was chosen as a place in which this research has been conducted. Firstly, Pakistan is one of the developing countries in Asia, and within Pakistan Sindh Province is not too much developed as compared to other province like Punjab. SMEs form over 99% of all businesses in Pakistan, but the adoption of ICT by Pakistani SMEs is still lagging behind when compared to SMEs in developed countries. To improve the GCI ranking as well as Economic Skeleton of Pakistan, the significant sector i/e SME's which consists agriculture, manufacturing, production and services etc, could fill out the scarcity at some level. Hence in order to achieve the main goal of this study, two research objectives has been set: The first objective of this study is to categorize the ICT trends / practices of manufacturing sector (SMEs) of Sindh Pakistan and the second objective is to investigate the variables which enforce SMEs to adopt ICT applications for their firms.

### 3. Research Design

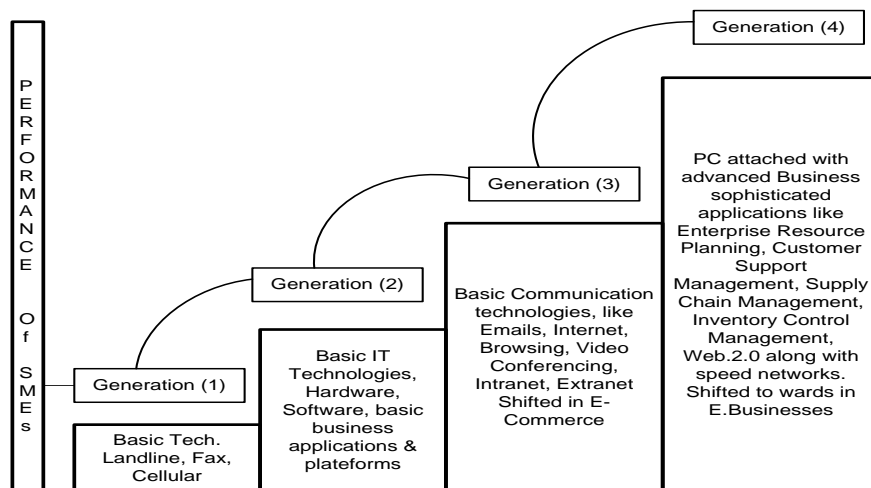
For this proposed study, mixed research paradigm has been adopted. There are two major steps of data collection have predicted, one is exploratory and other is explanatory. In exploratory step, data collected to develop a clear idea about the utilization of ICT applications, practices in the manufacturing sector's SMEs. In this phase, in-depth literature survey has conducted, that helps to develop a questionnaire as a final data collection tool, which is later-on administered to the owner / managers of SMEs in Sindh Province. In exploratory phase, queries have been posed as open ended about the utilization of ICT and reasons extracted about the adoption of ICT applications. This leads to come up with a set of 4 main variables and assist to develop a detailed questionnaire consisting on several sub factors. Finally, the variables in the survey instrument were derived from exploratory research and the relevant theoretical and empirical literature, the total respondent sample size was 146, consisting on manufacturing sector (including bangles, garments, fabric, foot wear, food processing, handi made items like shawl, carpets, sport manufacturer) inside main cities of Sindh Province. Collected data through survey method transformed into numbers which are

empirically tested to see relationship between dependent and independent variables. In these above cited sectors data collected instrument distributed. In order to analyze the collected data, regression analysis has been carried out which is more appropriate to find the causal relationship between the factors those caused pressure on SMEs to integrate ICT applications in their SME's. This analysis helps in developing a model which includes a dependent variable (Integration of ICT) and independent variables identified from literature i.e are (economical perspective, cultural perspective, personnel perspective, competition perspective and innovation perspective etc).

The selection of the research design probably depends upon the nature of study and analytic capabilities of researcher towards the how data will be used (Gray, 2004). In this study the qualitative method used to dig out entire scenario about the ICT trends, while quantitative remains more appropriate to find out empirical findings from the survey and reach the objectives of this study which is used to express the causal relationship between the factors those caused pressure to integrate ICT applications in their SME's

#### 4. ICT Trends in the SME's of Sindh

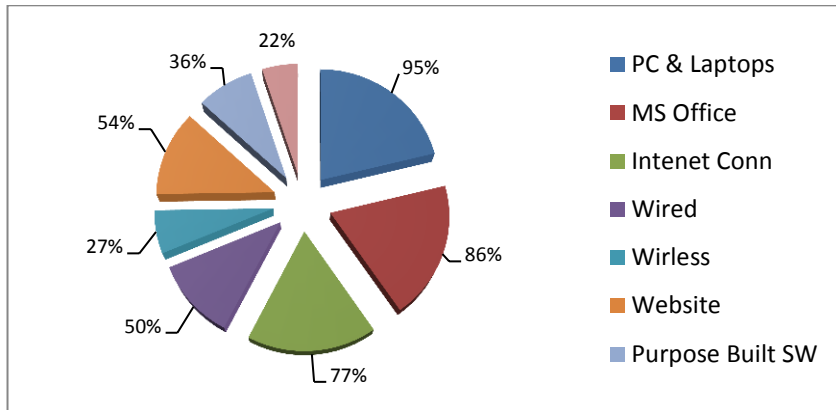
Historically, the use of ICT in small business firms range from basic technology such as radio and fixed lines to more advanced technology such as e-commerce, e-business and complex information processing systems. Fig. 2 represents ICT trends from evolutionary points in the SMEs of Pakistan, these trends have been categorized in four generations.



**Figure 2. ICT Trends in SMEs of Pakistan**

Figure 3 represents the basic description of IT & ICT infrastructure within the surveyed enterprises of Sindh. About 98% of the surveyed SME's are fully equipped with personnel computers / hand held computers and laptops. Microsoft applications like MS word, MS Excel, MS PPT etc are being used by the most of SME's to maintain their records & internal processes of the enterprises only, from the surveyed SME's 81% of enterprises used these kinds of tools. It is also noticed from collected data that 37% of SME's having their own purpose built software applications like Enterprise Resource Planning ERP, Supply Chain Management SCM, Customer Relation Management CRM, Inventory Control IC, Business to Customer B2C etc. Overall 71% of SME's having internet connections including ISDN, DSL, Dial up and ISPs, out of that 52% had wired networks including servers, routers and firewall and 18% had wireless networks. 55% of SMEs indicated about the use of their own web page for advertizing and marketing

purpose these sectors used different platforms via social webpage to promote their business and 22% SMEs mentioned about electronic commerce.



**Figure 3. ICT Infrastructure in surveyed SME's**

Hence in order to look on the ICT trends and integrating factors within SME's, the survey focused on those SME's which are using at least some IT or ICT based solutions, therefore this shows good ratio of ICT based tools in their enterprises. The respondents were further inquired about the access to ICT and ability to use ICT solutions, because these factors also represents ICT practices in some extent, the table 2 represents these parameters statistics.

**Table 2. Access to ICT and Ability to use ICT in surveyed SME's**

N=146					
Access to ICT			Ability to use ICT		
Level	Frequency	%age	Level	Frequency	%age
Excellent	20	13.699	Excellent	27	18.493
Very Good	46	31.507	Very Good	54	36.986
Average	67	45.890	Average	59	40.411
Poor	13	8.904	Poor	6	4.110
Not at all	0	0.000	Not at all	0	0.000
Total	146		Total	146	

The survey showed from collected data that the SME's which are exist in Urban areas of the country they are getting geographical advantage of technology; these enterprises have sufficient ICT access and skilled labor. Here the excellent ICT access and excellent ability make sense that these enterprises are using the latest and grooming ICT technologies and networks like 4G, 3G, high speed ISDN etc, whereas which are in very good level, these have faster broad band networks, DSL and sufficient qualified IT skilled labor in their companies. The maximum frequency reside on average level that present average ICT infrastructure and limited IT based Human resources are available in their firms. In these SMEs ICT operated by LAN, low broadband connection and not too much skilled IT work force. This study has been linked by Ladder model theory, according to Ladder theory, the evolution of business firms in utilizing ICT and internet for attaining their goal to business performance and profit growth by presenting the level of take-up as a ladder though which the enterprises could grow. This theory is one of the e-business diffusion levels and is favored by the UK government's Department of Trade and Industry

(DTI). Usually it starts from using the basic technologies for only communication purposes and then to adopt step by step new suitable technologies for the grooming of their performance and expansion of business. Generation one is first step of ladder adopted by SMEs and sequentially put their next step for further betterment in their internal as well as external operations. Therefore, it appears to be a deterministic view of change in implying that all small enterprises have to follow one prescribed course and if they do not complete the course of climbing to the next step of the ladder, they have somehow failed in their growth and performance endeavors. To analyze the second object of this study, SPSS has been used to find out the casual relationship between dependent and independent variables.

## 5. Influential Parameters of ICT Integration

There are many studies have already investigated about adoption of ICT by SMEs have explored, Domenico Consoli, investigated the determinant factors in his study i.e are individual, organizational, environmental, technological, economical [4]. Literature revealed the several determinant factors indifferent case studies by various authors. The following table present some investigated variables which affect in the adoption of ICT in small and medium scale enterprises.

**Table 3. Literature Insights about Influential Factors**

S#	Core factors investigated	Author	Year
1	Individual	Leidner & Kayworth	2006
		Barba Sanchez et.al	2007
		Zahra	2005
		Damaskopoulos et al	2003
2	Organizational	Morgan Et al	2006
		Fabiani et al	2005
		Fried & Lins	2005
		Hollensetein	2004
3	Environmental	Bayo Moriones & Lera Lopez	2007
		Hollensetein	2004
		Porter	2004
		Blomquist & Wilson	2007
4	Technological	Cesaroni	2011
		Consoli & Sentuti	2011
		Wen et.al	2009

Based on literature reviewe, this study proposed four major variables which are grouped into twelve sub groups: economic perspective consisting on sub factors i.e (management, taxes, government policy, interest rates and labor costs), competitioanal perspective consisting on (customers/suppliers pressure), Personnel Perspective consisting on (Manager or Owner’s experience, Interest, capability) and Innovational Perspective consisting on (organizational processes, innovative staff) , are identified as influential variables that impact on the integration of ICT within their firms..

**1. Economic Perspective:-** The economic perspective perceived those aspects which focuses about on how resources are dispersed in an organizational domain. Economic factors consist of long term strategies about the productivity and growth of business opportunities. The basic sub variables of economic perspective for this study considered as government incentives, free collateral schemes on ICT equipments, cost of labor, and size of firms. These variables caused to integrate ICT applications, therefore to maintain all these aspects SMEs adopted ICT.

2. **Competition Perspective:-** The competition variable refers to external pressure, scope and supplier efforts, type of industry, market and external computing support that influence ICT integration. In this paper, the small and medium scale business units around the country are being pressurized by their valued customers and suppliers. To get feedback from customer, to be in contact with consumer & supplier, organizations need to incorporate ICT based application, in this way firms can learn more, and can improve by themselves. Li, Wang, & Chu, 2010 explored in their studies that Wal-Mart has been influenced by the voice of their customers to add wireless tracking (RFID) technology. Moreover, most of MNCs are also been pushed by their customer and suppliers pressure to add convenient technology in their systems Zhang, 2010.
3. **Personnel Perspective:-** The personnel perspective is also one the main push heavily depend upon the interest and skills of top and executive level authorities of organizations. In addition to that Cloete, Courtney, and Fintz investigated in their research that personnel perspective depend upon owner or manager's awareness, interest and decision capabilities about the technology. Particularly decision making powers always remain under the umbrella of top executives of firms, therefore he / she remain involved to accept the suitable technology according to the requirement of firms [3]. In addition to that SMEs also need to be centralized, so the owner is only an option who can significantly play a role in any business decision making [11]. In this study, two personnel contexts: IT skilled owner and IT interest based manager are considered as influential variables.
4. **Innovational Perspective:-** Leung and Wei, Lin and Jeffres, examined innovativeness is important factor to launch new brand or product for firms. Marcati et al., 2008, explained in his study that innovativeness provide new ways to transform ideas in to new opportunities. New ideas transformation creates a push for organizations to add more applications. An innovative firm is an organization which is able to solve the problems by changing the structure of the company. This put implication that innovative SMEs adopt new solution which has never been tried before; hence these may be more risky. Usually small businesses are more likely have an intention to adopt an ICT based application [8].

## 5.1 Analysis & Results

The parameters which enforce the enterprises to integrate the ICT solutions in their organization are economical perspective, cultural perspective, personnel perspective, competition perspective and innovation perspective etc. All these parameters have been already asked with the help of in-depth interviews.

**Table 4. Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.657 <sup>a</sup>	.431	.415	.69988

a. Predictors: (Constant), Personnel, Economic Pers, Innovational, Competition Pers

**Table 5. ANOVA<sup>a</sup>**

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	52.420	4	13.105	26.754	.000 <sup>p</sup>
Residual	69.067	141	.490		
Total	121.486	145			

According to Qazi et al (2011), in case of large sample, the outlying residuals are not necessary to find out in the sample. When there is only one, no need to take action [1]. Here it is only one case in this study which has outstanding standard residual value, which is removed from data.

**Table 6. Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.996	.506		3.944	.000
Economic	.681	.071	.614	9.608	.000
Competition	-.383	.149	-.247	-2.574	.011
Innovational	-.156	.115	-.122	-1.358	.047
Personnel	.344	.114	.283	3.026	.003

a. Dependent Variable: Integration

Table 4, explain the model of entire summary of dependent and independent variables, the value of adjusted R<sup>2</sup> in regression model is .415, that indicates the model has 41.5% of variances on the integration of ICT by SMEs as explained by the independent variables mutually and the significance value of the regression is .00 (see in table 5) which expressed that independent factors involved in this model jointly have significant correlation with the dependent i.e Integration of ICT in SMEs. Table 6, presents that competition perspective and innovational perspective are negatively correlated however the economic perspective and personnel perspective are positively correlated to the dependent variable i.e ICT integration. The highest value of coefficients correlation beta 0.681 determines that economics perspective variable has the highest impact to the ICT integration by SMEs. Furthermore, all these factors have significant value below 0.05 that reflects that, those variables proposed as adopting parameters which enforced SMEs to adopt and integrate sophisticated application in their business processes. Therefore, it is concluded that four variables namely economic, competition, innovational and personnel perspective are perceived by the Owners of SMEs to have potential impact on the ICT integration.

Then, un-standardized coefficient equation formulated as under

$$\text{ICT integration} = 1.996 + 0.681\text{ECO} - 0.383\text{COMP} - 0.156\text{INN} + 0.344\text{PRS}$$

Where, R<sup>2</sup> =.415

N=146

ECO= Economic Perspective

COMP= Competition Perspective

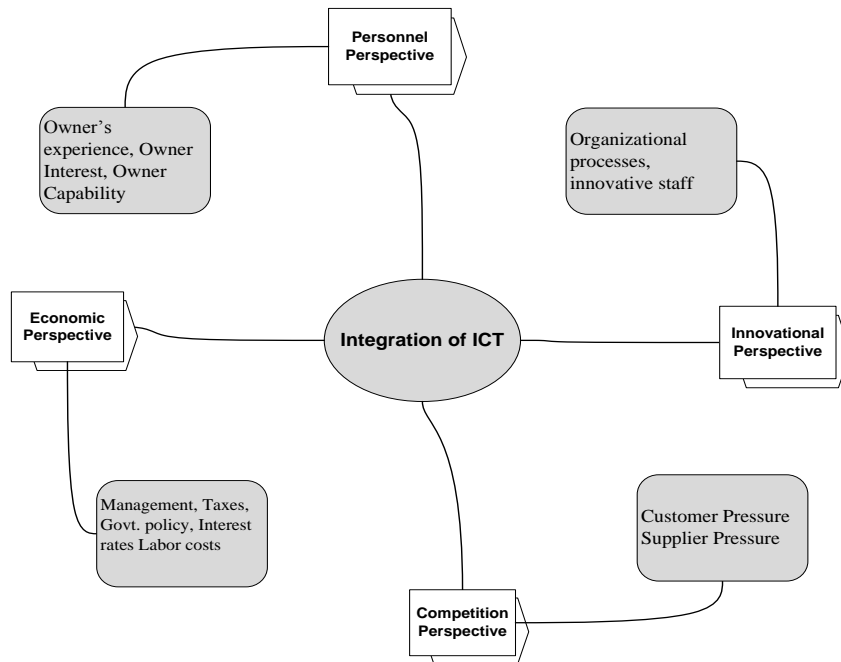
INN= Innovational Perspective

PRS= Personnel Perspective

The un-standardized coefficients has been drawn by linear equation formed above, it concludes that each independent factor has relative importance of association with the dependent one. The influence of economic perspective has high value of correlation



coefficients (beta) of 0.681. Next, it is followed by personnel perspective with beta of 0.344, innovational perspective with beta of -0.156 and lastly competition perspective with beta of -0.383. In this study, the value of coefficients of correlation indicates that the SMEs integrated ICT sophisticated applications heavily forced by economics perspective.



**Figure 4. Influential Factors of ICT integration in SME's**

## 6. Conclusion and Recommendations

Based on the analysis the small and medium enterprises of Sindh Province found not well stable in the integration of Information and communication technology. Due to the limited financial resources and human capital, huge number of owners / managers is unable to invest in ICT tools and equipment for better management of their enterprise. Moreover the enterprises which are using ICT tools and useful applications to maintain the integrity of their business are affected by several factors including economics perspective, competition perspective, innovational perspective and personnel perspective. Since it has also been observed that the SMEs which exists in urban areas of Sindh are enjoying the geographical locative advantage, those have sufficient ICT infrastructure, well IT skilled work force, implementing advanced ICT applications, and fast speed networks, therefore only the small ratio of SMEs are sound and stable in technological aspects. Whereas the SMEs in less privileged areas of country are facing number of different ICT hindrances like poor infrastructure, minimum access to the networks, old traditional store record keeping applications, therefore the rural areas enterprises are not too much technological based. Hence in order to overcome these challenges, Government of Pakistan needs to enact policies or regulations that would enhance ICT infrastructure nation-wide in order to make SME sector more active and competitive. Furthermore the Owner / Manager of SMEs also need to employ qualified IT skilled work force on pure merit basis which can help them, their enterprises be more innovative and dynamic. The result also shows that the personnel perspective, economic perspective, competition perspective and innovational perspective play a significant role in ICT integration by SMEs in Sindh. Since these factors heavily relies on Owner's experience & innovative capabilities and internal organizational process respectively. Therefore it is also very important that the top level executives and managers of organizations should be

technological familiar and IT - interested, and become source of inspiration for their firm, they need to enact ICT applications for the change of internal process of organization. Finally results shows that integration of ICT sophisticated applications in manufacturing sector enterprises is depends upon Economic, competition, innovational and Personnel perspective factors. Hence, integration of ICT in small and medium scale enterprises is essential for effective decision making, improve organizational process and increase the productivity. All these elements are very crucial to maintain the balance in the contribution of GDP and employment ratio.

**Contribution of the study:** The results of the conducted study provide a timely understanding to SME managers and top level executives for smooth implementation and integration of ICT in their enterprises and increase their personnel interest to addict the advanced technology in their system. The government officials in various ministries will find the results beneficial in making policies that will assist Pakistan to empower the small and medium business sector by creating bridge between ICT and SMEs. Moreover, the study findings are expected to open areas for further research to academicians and research institutes and overall, the community will benefit from a knowledge based society.

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