

## **ICT Investments and Growth of Small and Medium Firms: A Study of Food Processing Industry in India**

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### **Abstract:**

Small and medium enterprises (SMEs) cover a wide range of industries and play a major role in both developed and developing economies. They are considered as significant sources of entrepreneurship. Information and communication technology (ICT) is a general purpose technology that can help these firms in improving their operations, and thereby positively affecting their growth and competitiveness. However, there are hardly any empirical studies that have analyzed the effect of adoption of ICT on the performance of SMEs. Hence, the objective of the present study is to examine the effect of ICT investments on the sales growth of SMEs from the food processing industry in India. Secondary data is collected from the Prowess database provided by Centre for Monitoring Indian Economy (CMIE) for the period of five years from 2010 to 2014. Panel data regression technique is used for the analysis. The result shows that ICT investments in the previous year has a favorable effect on the sales growth of SMEs. Other variables like size of the firm and age of the firm are also statistically important in explaining sales growth of SMEs in the food processing industry.

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## 1. INTRODUCTION

The role of small and medium enterprises (SMEs) is important for any economy. SMEs cover a wide range of industries and play an important role in both developed and developing economies. In India, SMEs occupy a prominent position as they account for 45 percent of the industrial production, 40 percent of the total exports and have generated employment for about 60 million people (Unnikrishnan et al., 2015). In the recent past, SMEs in developing countries like India face several challenges due to opening up of the economy, lowering of international trade barriers, economic liberalization, globalization, privatization and deregulations (Kale et al., 2010). Thus, SMEs need to be more efficient and competitive in order to face domestic and global competition, economic downturns and rapidly changing customer demands. The use of information and communication technologies (ICT) enhances SMEs competitiveness and ability to survive in any economy. It also improves the firm's economic growth and productivity by encouraging innovation (Diaz-Choa et al., 2015).

ICT is often considered as a general purpose technology and its use benefits SMEs in many ways like increased knowledge and efficiency, improved performance, better customer and supplier relationship, and reduced production cost. ICT is one of the tools for a firm to create new ways of doing business with its buyers and suppliers and thereby overcome the communication barriers in the business processes (Aliu and Halili, 2013). The use of ICT in daily business process is important since it improves coordination among business partners, improves efficiency and reduces transaction costs. Generally, it is known that SMEs are flexible in nature and this makes them to easily create flexible linkages with their trading partners using ICT, which in turn leads to an improvement in the SMEs' competitiveness. The use of ICT also helps SMEs to easily identify new products, new market and new customers by providing right information at the right time (Esselaar, 2007; Akomea-Bonsu and Sampong, 2012). ICT can be used in both production and non-production business processes. The use of ICT helps SMEs to maintain the accuracy of data, to have proper control of inventory and material resources, to avoid delays in production, to improve communication and to reduce operations costs (Kale et al. 2010; Akomea-Bonsu and Sampong, 2012; Colin et al. 2015).

In the present era of globalization, SMEs are also expanding their businesses globally. Within India too, due to industrial and trade liberalization, SMEs are exposed to competitive pressures from multinational businesses. This has forced many SMEs to develop more innovative products to compete in the global market. Thus, in the present global scenario, SMEs need to be highly competitive to maintain reliable and continually improving business and manufacturing processes.

The empirical literature on firms in India has largely ignored the role of investments on ICT in fostering growth of SMEs. This study attempts to fill this gap in the existing literature. Hence, the objective of this study is to understand the role of ICT, globalization in terms of exports and other factors in determining sales growth of SMEs. To achieve this objective, food processing industry from India is chosen.

In India, about 54.6 percent of the Indian population is engaged in agriculture and other allied activities. The sector contributes nearly 17.4 percent to the country's gross value added. Many of the agricultural products require some amount of processing to increase their shelf life or to convert the raw product into an easily consumable form. Thus, food processing industry plays a significant role in supporting agriculture. Food processing sector in India is growing faster than agriculture and manufacturing sectors. The average annual growth rate of food processing sector is around 8.4 percent as compared to around 3.3 percent of agriculture and 6.6 percent of manufacturing during the last five years ending 2012-13 (MOFPI, 2015).

Food processing sector needs to be innovative to produce and serve safe, quality and attractive products to its consumers to meet their expectations. ICT in the form of email, internet, local area network, intranet, extranet, sensors and communication intelligence are crucial for food processing sector to become more efficient and sustainable in the market. The use of ICT in food processing industry improves their business speed, reduces transaction costs, builds a good relationship with partners, consumers and government, and improves overall efficiency, competitiveness, growth and productivity of the firms. The technology also helps to simplify business processes and reduce costs associated with purchase, wholesale activity and retail activity (Hill, 200; Baourakis et al. 2002 and Mavridis et al. 2008).

## **2. LITERATURE REVIEW**

This section presents the review of literature on factors that determine sales growth of manufacturing firms.

### *Information and communication technology*

Information and communication technology (ICT) is any communication device or application such as radio, television, mobile phones, computer, network hardware, software, satellite system and also other associated services and applications such as videoconferencing and e-learning that are used to support information gathering, processing, distribution and use (Agboh, 2015). Locke (2004) examined the impact of ICT adoption in growth of SMEs in New Zealand and found that adoption and use of internet and cellular phones are positively influencing SMEs' growth. The study also suggested that SMEs needs to invest more on these technologies to get higher levels of profit. Chowdhury (2006) stated that investment in ICT can be a substitution for other forms of capital and labor and can generate large amount of returns for firms. The study found that investment in ICT helps SMEs in expanding their market share. Esselaar et al. (2007) noted that ICT is a productive input factor and its use has increased the productivity of thirteen African SMEs. More recently, in the context of Iran, Assadzadeh et al. (2015) noted that use of ICT is important for small and medium enterprises since it improves their performance. Thus, ICT is important for better performance of firms, including SMEs. Hence it is hypothesized that

H1: Investment in information and communication technology positively affects sales growth of SMEs.

### *Globalization*

Exporting is a relatively easy and fast way for SMEs to operate in global markets because it involves low levels of commitment and risk compared to foreign direct investments. Delgado et al. (2002) examined the relationship between total factor productivity and firm's export activity using panel data analysis in Spanish manufacturing firms. The study found that productivity was higher for exporting firms since internationalized firms' are more exposed to intense competition and this situation pushes firms to be more innovative and competitive through consistent development of products and services to increase their performance. Thus, exposure to global markets through exports positively influences the performance of the firms. Lu and Beamish (2006) examined the relationship between SME internationalization and performance and found a positive relationship between export activity and firm's sales growth. The study stated that a firm can sell its products either directly or through export agents to their clients in new geographic markets and this broadens firm's consumer base and results in higher sales volumes. Wagner (2007) noted that firms which are involved in international markets face intense competition which forces the firms to develop innovative products and services leading to higher productivity growth of business firms. In the present study firm's globalization is measured in terms of the firm's export intensity and it is hypothesized that

H2: Firm's export activity (as a proxy for globalization) positively influences sales growth of SMEs.

### *Size of the firm*

Size of the firm is a predictor of firm's growth (Steffens et al., 2009). Size represents several features of an organization such as slack resources, structure and flexibility in decision making process (Zhu et al., 2006). Larger firms can have larger growth since they are characterized with abundant resources to undertake the necessary investments and can sell their products to a large market. Glancey (1998) examined the determinants of growth and profitability in entrepreneurial firms and found a strong positive relationship between firm size and entrepreneurial firms' growth. The study further stated that large firms have higher rate of growth than the smaller firms because entrepreneurs in these firms are more growth oriented and have greater entrepreneurial insight and managerial ability than those in smaller firms. Bentzen (2012) also found a positive association between firm size and growth rate in Danish firms. Panda (2015) examined the growth determinants of small agro-industry firms in India and found that size of the firm significantly determined the sales revenue. The study observed that larger the size of the firm, higher the sales revenue. Hence, we hypothesize that

H3: Size of the firm positively influences sales growth of SMEs.

### *Age of the firm*

Age of the firm represents the length of time that the firm has been in the market. It also indicates the business firm's experiences in production and the vintage of the firm's capital and technology (Aw, 2002). Majumdar (1997) studied the impact of firm age and size on firm-level performance in Indian context. The study found that older firms are more productive than the newly started firms. Glancey (1998) stated that the relationship between age of the firm and growth of the firm can be expected to be positive since older firms may benefit from dynamic

economies of scale and by learning from their experiences. The older firms can also benefit from their reputation effect, which allows them to earn higher margin on sales. Rodriguez et al. (2003) noted that age is one of the important factors that conditions the firm's probability of growth and survival since it reflects the learning process undergone by the business organization. Vijayakumar (2011) examined the relationship between firm structure and performance and found a positive influence of age of the firm on the performance in terms of profitability in Indian automobile firms. The study stated that older firms enjoy superior management of the licensing process and this allows them to identify relevant customer segments and provide differentiated products that meet demands.

However, there are some studies (McPherson, 1996; Burki and Terrell, 1998; Yasuda, 2005) that have identified an inverse relationship between firm growth and age. Burki and Terrell (1998) examined the efficiency of small manufacturing firms in Gujranwala, Pakistan and found negative relationship between firm age and growth. The study suggested that firms suffer productivity losses as they become older since firms may fail to invest sufficiently in emerging technologies and this hinder the firms growth. Since, most of the studies based on Indian context find a positive relationship between age of the firm and performance, it is hypothesized that

H4: Age of the firm has a positive effect on sales growth of SMEs.

#### *Labor intensity*

Labor and their skill are important input for manufacturing firms since the efficiency of transformation of inputs to outputs is largely dependent on the skills of the labor (Coves et al. 1982). Most of the empirical studies have noted improved labor productivities, defined in terms of higher output per unit of labor, in companies that employ high skilled labor. Corvers (1996) studied the effects of human capital on both the level and growth of labor productivity in manufacturing sectors and found that both intermediate and highly-skilled labor had a positive effect on the firm's labor productivity growth. Khan and Lim (1998) stated that productivity growth could be higher in industries that make intensive use of engineers and statisticians. The study of Khan and Lim (1998) found a strong evidence on the improved productivity growth in the more skill-intensive manufacturing industries. Haskel and Hawkes (2003) also found that labor qualifications support more sophisticated production processes and this leads to firm's higher productivity. Shahidul and Anwar (2007) stated that labors skill is one of the important factor that improves manufacturing firms' performance. Fallahi et al. (2011) also stated that labor force skills play an important role in efficient utilization of physical capital and this increases performance of enterprises in terms of profitability. The study found a positive relationship between workers education and the growth of firm's labor productivity.

In a country like India, where labor is in abundance, higher labor intensities, especially of skilled ones, in a firm can result in higher labor productivity, which in turn can result in higher sales growth. Hence, it is hypothesized that

H5: Labor intensity has a positive influence on sales growth of SMEs.

### *Capital intensity*

Capital intensity represents firm's operating leverage. It is the amount of money invested in order to get a dollar worth of output. It is found that the differences in firm's performance are linked to differences in their capital intensities (Khalilzadeen-Shirazi, 1974). Capital intensity reduces a firm's risk since capital intensive firm may reduce its costs especially during economic downturns with the help of its previously invested fixed structure (Lubatkin and Chatterjee, 1994). Doms et al. (1995) examined the role of technology and capital intensity in the survival and growth of manufacturing plants and found that capital intensity is positively correlated with plants growth. This indicates that more capital intensive plants have higher growth. Bigsten and Gebreyesus (2007) stated that capital intensity captures firm's access to a wide range of resources and the study found a positive impact of capital intensity on firm's growth rate. This indicates that firms with higher capital intensive grow faster than those firms with smaller capital intensity. Hence, it is hypothesized that

H6: Capital intensity has a positive influence on sales growth of SMEs.

### **3. Data and Methodology**

In this study, the sample is taken from the food processing firms operating in India. The companies are selected based on the National Industrial Classification (NIC)-2008. The NIC is an important statistical standard in India for developing and maintaining comparable database according to economic activities. As per this NIC-2008 classification, food processing industry is categorized under Division-10, namely "Manufacturer of Food Products."

The data for the study is drawn from the Prowess database provided by the Center for Monitoring Indian Economy (CMIE). Prowess is a database of the financial performance of Indian listed and unlisted companies. The annual reports of individual companies are the main source of this database. Prowess also has a field indicating the NIC-2008 classification for the firms. Firm level data on net expenses towards software, net investment on computers and IT systems, communication equipments, software charges, IT enabled service charges, salaries and wages, exports, net fixed assets, net sales and year of incorporation are collected from Prowess database for the analysis. The details of the variables, their symbols and definitions are given in the Table 1.

The initial data extracted from the Prowess database consisted of 916 firms under the Division-10 of NIC-2008 for the years from 2010 to 2014. According to Government of India, small and medium firms are defined as the ones which have investments in plant and machinery between twenty five lakhs to ten crores rupees.<sup>3</sup> Hence, from the overall sample only those firms that had investments of rupees less than ten crores in plant and machinery were shortlisted. Of these four of the firms had plant and machinery investments even lower than twenty five lakhs, that is, they were micro firms. Further, since we required a balanced panel for analysis, all those SMEs that

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<sup>3</sup> Source: Government of India, Development Commissioner (MSME), Ministry of Micro, Small & Medium Enterprises. Definitions of micro, small, and medium enterprises. [http://www.dcmsme.gov.in/ssiindia/defination\\_msme.htm](http://www.dcmsme.gov.in/ssiindia/defination_msme.htm) (accessed 15.07.2016).

did not have sales, fixed assets and salaries and wages values for any of the years from 2010 to 2014 were dropped. After defining the variables, the outlier firms were identified through observation and they were also eliminated from the present study. The final sample used in this study is a balanced panel consisting of 85 firms (including four micro firms) for the years from 2010 to 2014. However, since the sales growth definition requires the data from previous year, in the econometric estimation models sales growth has been considered only for the four years, that is, 2011 to 2014.

In this study ICT is defined as the total of net expenses towards software, net investment on computers and IT systems, communication equipment, software charges, IT enabled service charges, all in millions of Rupees. Since relatively larger firms among the SMEs may have more resources to invest on ICT, the variable has been normalized for size of the firm by considering it as a percentage investment over sales. Thus, ICTI represents the intensity of ICT investments by the firms. As mentioned earlier, in this study, extent of globalization is measured in terms of export intensity (EXPI) of the firms. Age of the firm (AGE) represents the experiences of the firm. Labor and capital are two of the important resources in any firm that directly affect the output of the firm and hence are likely to be important even for the sales growth. Size of the firm is separately considered since it can be considered as a proxy for the amounts of all types of other tangible and intangible resources available with the firm. Size of the firm is defined as logarithm of sales.

Bayo-Moriones et al. (2013) stated that ICT investments may require time to materialize since firms need time to learn, adjust or reorganize their business process due to the changes caused by ICT investments. Hence, in this study another econometric model is estimated with one year lag of ICTI, LABI and CAPI in order to explore whether there are any lag effects of these variables on firm's sales growth. In the second model, EXPI is also considered as a lagged variable to avoid simultaneity problem between EXPI and Sales Growth (SG).

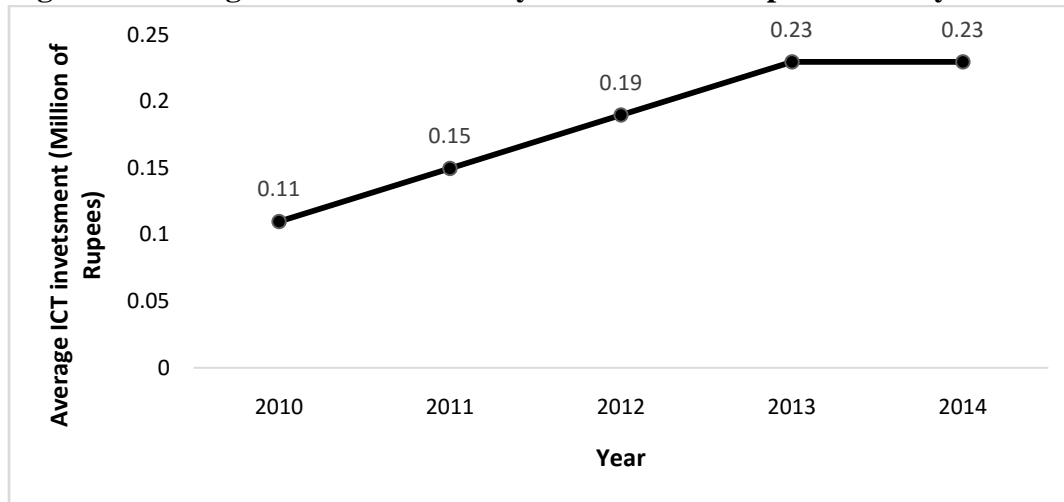
**Table 1: Variables, their symbols and definitions used in the study**

Variables	Symbols	Definitions
Sales Growth	SG	(Present year sales-Previous year sales/Previous year sales) in percentage terms
Information and communication technology	ICT	Sum of net expenses towards software, net investment on computers and IT systems, communication equipment, software charges, IT enabled service charges in millions of Rupees
Information and communication technology intensity	ICTI	Percentage of ICT as a ratio of Sales for present year
Lag of information and communication technology intensity	ICTI_1	Previous year's information and communication technology intensity
Export intensity	EXPI	Percentage of export as a ratio of sales for the

		present year
Lag of export intensity	EXPI_1	Previous year's export intensity
Age of the firm	AGE	Year of observation - Age of Incorporation
Size of the firm	SIZE	Logarithm of sales in thousands of Rupees for the present year
Labor Intensity	LABI	Percentage of salaries and wages by sales for the present year
Lag of labor intensity	LABI_1	Previous year's labor intensity
Capital Intensity	CAPI	Percentage of net fixed assets by sales for the present year
Lag of capital intensity	CAPI_1	Previous year's capital intensity

Figure 1 shows the average amount of ICT related investments undertaken by the food processing SMEs in the present study sample during 2010-2014. Here ICT investments include net investments on software, computers and information technology systems and communication equipment apart from software charges and information technology enabled services charges. Overall, the graph shows an increasing trend in average ICT investments. Thus, for the sample firms, the average ICT investments have almost doubled in five years from Rs. 0.11 millions in the year 2010 to Rs. 0.23 millions in the year 2014.

**Figure 1: Average ICT investments by the SMEs in the present study**



Source: Authors' own calculations based on data extracted from CMIE Prowess database

Table 2 presents the mean and standard deviation for the variables used in this study. The average sales growth of the SMEs is around 19 percent for the years from 2011 to 2014. The average ICTI for the period from 2010 to 2014 for the sample is only around 0.1 percent. Thus, it seems the SMEs in the food processing industry hardly invest on ICT as a percentage of their



sales. The mean value of firm's EXPI during 2010 to 2014 is around 4 percent. The average of labor intensity is around 23 percent whereas capital intensity is around 58 percent in this industry suggesting that the SMEs in this industry may be more capital intensive.

**Table 2: Descriptive Statistics**

Variables	Mean	Standard Deviation
SG	18.611	41.526
ICTI	0.109	0.318
EXPI	4.285	24.593
AGE	49.224	32.079
SIZE	11.842	1.257
LABI	22.646	21.2
CAPI	57.403	110.865

The study uses panel data technique to analyze the factors that affect sales growth of SMEs belonging to the food processing industry in India. A panel data consists of pooling of observations on cross-section units over several time periods. The use of panel data benefits in control for heterogeneity, gives more information, less variability, less collinearity among the variables and allows to study the dynamics of adjustments (Baltagi, 2005). The basic panel model is:

$$y_{it} = \alpha + x_{it} \beta + u_{it}$$

In the above model, i subscript denotes the cross-section dimension and t denotes the time-series dimensions.  $\alpha$  is a scalar,  $x_{it}$  is the  $i^{\text{th}}$  observation on K explanatory variables,  $\beta$  is  $K \times 1$  and  $u_{it}$  is error term. Hausman specification test is used to choose between fixed and random effects model. Statistical analysis has been carried out in Stata version 13 statistical package.

#### 4. Analyses, Results and Discussion

Table 3 and Table 4 present the correlation matrix between the variables used in the two econometric models. All the variables except ICTI, export intensity (EXPI) and lagged capital intensity (CAPI\_1) are correlated with the sales growth (SG). Age of the firm is negatively correlated with sales growth. It seems that sales growth is higher in younger and newly established firms as compared to the older firms.

**Table 3: Correlation Matrix**

Variables	SG	ICTI	EXPI	AGE	SIZE	LABI	CAPI
<b>SG</b>	1.0000						
<b>ICTI</b>	-0.065	1.0000					
<b>EXPI</b>	0.089	0.088*	1.0000				
<b>AGE</b>	-0.111*	-0.098*	-0.057	1.0000			
<b>SIZE</b>	0.122*	-0.325*	-0.135*	-0.131*	1.0000		
<b>LABI</b>	-0.133*	0.123*	0.194*	0.434*	-0.526*	1.0000	
<b>CAPI</b>	-0.107*	0.250*	0.071	0.097*	-0.380*	0.294*	1.0000

\* represents statistical significance at 10% level.

**Table 4: Correlation Matrix with Lagged Variables.**

Variables	SG	ICTI_1	EXPI_1	AGE	SIZE	LAB_1	CAPI_1
<b>SG</b>	1.0000						
<b>ICTI_1</b>	0.191*	1.0000					
<b>EXPI_1</b>	0.272*	0.096*	1.0000				
<b>AGE</b>	-0.111*	-0.098*	-0.059	1.0000			
<b>SIZE</b>	0.122*	-0.270*	-0.100*	-0.131*	1.0000		
<b>LABI_1</b>	0.239*	0.117*	0.222*	0.418*	-0.471*	1.0000	
<b>CAPI_1</b>	0.085	0.272*	0.077	0.087	-0.372*	0.298*	1.0000

\* represents statistical significance at 10% level.

When considered as one year lag, ICTI investment, export intensity and labor intensity are positively correlated with firm's sales growth (Table 4). The correlation coefficient between labor intensity (LABI) and other variables like AGE and SIZE is relatively high at around an absolute value of 0.5 (Table 3). However, one year lag of labor intensity (LABI\_1) has relatively lower absolute values of the correlation coefficients with AGE and SIZE (Table 4).

The results of panel data regressions are presented in Table 5. In both the econometric models, fixed effects got selected based on Hausman specification test at 1% significance level. It can be seen from the econometric results that information and communication technology intensity (ICTI) is not statistically significant in Model-1. This indicates that investments on ICT in the present year may not affect sales growth of SMEs. As mentioned earlier, investments in ICT may need time before it generates benefits to the business firm. Hence, lag of ICTI is included in Model-2 to understand the impact of previous year's ICT investments on firm's sales growth. The results of Model-2 confirm that previous year's ICTI is indeed statistically significant with positive sign in explaining the firms' sales growth. In other words, this implies that firm's previous year investment in ICT increases the SMEs sales growth in the present year. This is in line with the findings of Bayo-Moriones et al. (2013), where they suggested presence of lagged effects of ICT investments on firm performance. In the present study, Shah Foods Limited is one of the ICT intensive firms with high sales growth. The company was incorporated in the year 1982 and is a manufacturer of biscuits in India. It has been a contract manufacturer for various large companies like Lipton and Britannia Industries Limited. Shah Foods Limited has computerized auto flour handling batching and conveying system apart from auto dough feeding that meet the international standards.

Export intensity as proxy for firm's global orientation is statistically significant in both Model-1 and Model-2. This indicates that higher export intensities tend to increase the sales growth of SMEs. The firms that cater to the needs of global market generally face more competition and this makes firms to be more innovative in terms of developing new products and services, which in turn improves firms' performance and growth. Further, through exporting, firms are able find new customers in the global market and this expands firms' consumer base and increases firms' sales volume. The results of Model-2 indicate that firm's previous year export also has a positive and statistically significant coefficient. Thus, on the whole, one can state that globalization of the

firms represented in terms of export intensity seems to be an important factor that positively affects sales growth in this industry. In the present study, Maagrita Exports Limited is one of export intensive firms. Maagrita supplies fruits and vegetables in fresh as well as dehydrated forms. It uses imported automated machines for washing, grading and packing its products. The company exports to West Asia, Colombo, Malaysia, Jakarta and Hong Kong via air and sea.

Age of the firm is statistically significant with negative sign in both Model-1 and Model-2. Thus, it seems that the relatively younger firms in the food processing SMEs are having better sales growth. The findings of this study are in line with those of Farinas and Moreno (2000), Correa et al. (2003) and Geroski and Guglar (2004). Tunip Agro Limited is one of the young firms in this study sample. Tunip is a manufacturer of fruit juices which started in 2004 with one flavor. Later, the company has seen exponential growth and today it offers 16 flavors across India, Nepal and Sri Lanka.

**Table 5: Determinants of Firms Sales Growth**

Variables	Coefficient Values	
	Model-1	Model-2
ICTI	-13.292 (-1.02)	-
ICTI_1	-	14.244 <sup>b</sup> (2.46)
EXPI	0.467 <sup>a</sup> (2.65)	-
EXPI_1	-	0.268 <sup>b</sup> (2.50)
AGE	-9.742 <sup>a</sup> (-4.96)	-10.339 <sup>a</sup> (-7.19)
SIZE	76.821 <sup>a</sup> (8.30)	87.609 <sup>a</sup> (14.69)
LABI	-0.606 <sup>b</sup> (-1.65)	-
LABI_1	-	1.538 <sup>a</sup> (7.30)
CAPI	0.053 (-0.71)	-
CAPI_1	-	0.099 <sup>a</sup> (2.75)
Constant	395.254 <sup>a</sup> (-3.68)	-553.802 <sup>a</sup> (-7.37)
F Statistics	23.46	66.63
Number of observations	340	340

a, b indicate statistical significance at 1% and 5% respectively.

Size of the firm is another important factor that is found to be statistically significant with positive sign in explaining SMEs sales growth in this study. This indicates that even in the sub-sample of small of medium firms, the growth in sales is higher for the firms which are relatively larger in size compared to the smaller ones. It is well know that larger firms have enough resources and capacity to manage the risks involved in many business processes and this helps larger firms to take better strategic decisions and in-house R&D activities. This in turn leads to the higher sales growth for relatively large sized SMEs. This is similar to the findings reported by Glancey (1998), Bentzen (2012) and Panda (2015), who have also found size of the firm to be an important determinant of performance of firms.

In the case of labor intensity, the coefficient is statistically insignificant in Model-1. It seems that firm's current year investments on labor skill are not important for SMEs to improve their sales growth. However, the results of Model-2 show a positive and significant influence of lagged

labor intensity (LABI\_1) on sales growth of SMEs. This indicates that previous year's investments on employees play an important role in improving SMEs sales growth. Thus, in the SMEs of food processing industry, experienced and skilled employees can contribute towards a firm's sales growth.

Again, coefficient of capital intensity (CAPI) is found to be statistically insignificant in explaining sales growth of SMEs (Model-1). Again, it seems that the current year's investments on capital may not show immediate favorable effects on the firm's sales growth. However, the coefficient on the lag of capital investment (CAPI\_1) in Model-2 has a positive and statistically significant influence on sales growth. This suggests that firm's capital investments may also have lagged effect on the sales growth of SMEs. In other words, even the investments on capital requires time to contribute its benefits to the enterprises.

## **5. Conclusion**

The study tried to understand the role of investment in information and communication technologies, globalization in terms of export intensity and other factors in determining sales growth for the small and medium firms in the food processing industry in India. The sample for the study consisted of 85 small and medium food processing firms from Prowess database for the period from 2010 to 2014. Panel data econometric models were used to analyze the data.

The results of the study found that lagged information and communication technology investment, lagged labor intensity and lagged capital intensity positively influence present year's sales growth of small and medium food processing firms. Thus, the present study finds evidence that investments on ICT indeed bring in efficiencies that improve sales growth of SMEs. However, the benefits of ICT investments may take some time to be realized, perhaps after other supporting infrastructure investments are undertaken by the firms and proper training is given to their employees.

The study also found that export intensity plays an important role in improving the sales growth of food processing SMEs. Firms that are operating in a global market are the ones that are having better sales growth compared to the ones that are more domestic market oriented. In the domestic market, these SMEs may not be able to directly compete against the food processing giants like Ruchi Soya Industries Limited and Britannia Industries Limited who can easily capture domestic market shares using pricing and other tactics.

Interestingly, even within the SMEs, relatively larger and younger firms are the ones that have higher sales growth. The policy makers can encourage information technology industry players and other financial institutions to come up with schemes that encourage the young SMEs of the food processing industry invest on ICT and further improve their operations in domestic and overseas markets.

## **References**

Agboh, K.D. (2015). "Drivers and Challenges of ICT adoption by SMEs in Accra Metropolis, Ghana." *Journal of Technology Research*, 6, 1-16.

- Akomea-Bonsu, C. and Sampong, F. (2012). "The impact of Information and Communication Technologies (ICT) on Small and Medium Scale Enterprises (SMEs) in the Kumasi, Metropolis, Ghana, West Africa." *European journal of Business and Management*, 4(20), 152-158.
- Aliu, A. and Halili, A. (2013). "The impact of Information and Communication Technologies as a tool to facilitate growth in the manufacturing sector in Republic of Kosovo." *Procedia Technology*, 8, 465-470.
- Assadzadeh, A., Khani, H. and Gassemi, A. (2015). "Studying the Effects of Information and Communication Technology on the Performance of Small and Medium Sized Enterprises in Iran." 9<sup>th</sup> International Conference on e-Commerce with focus on e-Business.
- Aw, B. Y. (2002). "Productivity dynamics of small and medium enterprises in Taiwan." *Small Business Economics*, 18, 69-84.
- Baltagi, B. H. (2005). *Econometric Analysis of Panel Data*, John Wiley & Sons, England.
- Baourakis, G., Kourgiantakis, M. and Migdalas, A. (2002). "The impact of e-commerce on agro-food marketing: The case of agricultural cooperations, firms and consumers in Crete." *British Food Journal*, 104(8), 580-590.
- Bayo-Moriones, A., Billon, M. and Lera-Lopez, F. (2013). "Perceived performance effects of ICT in manufacturing SMEs." *Industrial Management and Data Systems*, 113(1), 117-135.
- Bentzen, J., Madsen, E. S. and Smith, V. (2012). "Do firms' growth rates depend on firm size?" *Small Business Economics*, 39, 937-947.
- Bigsten, A. and Gebreeyesus, M. (2007). "The small, the young, and the productive: determinants of manufacturing firm growth in Ethiopia." *Economic Development and Cultural Change*, 55(4), 813-840.
- Burki, A. A. and Terrell, D. (1998). "Measuring Production Efficiency of Small Firms in Pakistan." *World Development*, 26(1), 155-169.
- Caves, D.W., Christensen, L.R. and Erwin, D.W. (1982). "The economic theory of index numbers and the measurement of input, output, and productivity". *Econometrica*, 50(6), 1393-414.
- Chowdhury, S.K. (2006). "Investment in ICT-Capital and Economic Performance of Small and Medium Scale Enterprises in East Africa." *Journal of International Development*, 18, 533-552.
- Colin, M., Galindo, R. and Hernandez, O. (2015). "Information and Communication Technology as a Key Strategy for Efficient Supply Chain Management in Manufacturing SMEs." *Procedia Computer Science*, 55, 833-842.
- Corvers, F. (1996). "The impact of human capital on labour productivity in manufacturing sectors of the European Union." *Applied Economics*, 29, 975-987.
- Delgado, A.M., Farinas, C.J. and Ruano, S. (2002). "Firm productivity and export markets: a non-parametric approach." *Journal of International Economics*, 57(2), 397-422.

- Diaz-Chao, A., Sainz-Gonzalez, J. and Torrent-Sellens, J. (2015). "ICT, innovation, firm productivity: New evidence from small local firms." *Journal of Business Research*, 68, 1439-1444.
- Doms, M., Dunne, T, and Roberts, M.J. (1995). "The role of technology use in the survival and growth of manufacturing plants." *International Journal of Industrial Organization*, 13, 523-542.
- Esselaar, S., Stork, C., Ndiwalana, A. and Deen-Swarray, M. (2007). "ICT Usage and Its Impact on Profitability of SMEs in 13 African Countries." *Information Technologies and International Development*, 4(1), 87-100.
- Fallahi, F., Sojoodi, S. and Aslaninia, N.M. (2011). "Determinants of labor productivity in Iran's manufacturing firms: With emphasis on labor education and training." *International Conference on Applied Economics-ICOAE*, 169-177.
- Fariñas, J. and Moreno, L. (2000). "Firms' Growth, Size and Age: A Nonparametric Approach. *Review of Industrial Organization*." 17, 249–265.
- Farinas, J. C. and Moreno, L. (2000). "Firms' Growth, Size and Age: A Nonparametric Approach." *Review of Industrial Organization*, 17(3), 249-265.
- Geroski, P. A. and Gugler, K. (2004). "Corporate growth convergence in Europe." *Oxford Economic Papers* 56, 597-620.
- Glancey, K. (1998). Determinants of growth and profitability in small entrepreneurial firms." *International Journal of Entrepreneurial Behavior and Research*, 4(1), 18-27.
- Haskel, J. and Hawkes, D. (2003). "How much of the productivity spread is explained by skills?"
- Hill, C.A. (2000). "Information technology and supply chain management: A study of the food industry." *Hospital Material Management Quarterly*, 22(1), 53-8.
- Implications for growth – and profit-oriented strategies". *Entrepreneurship: Theory and Practice*, 33 (1), 125-148.
- Kahn, J.A. and Lim, J. (1998). "Skilled labor-augmenting technical progress in U.S. manufacturing." *The Quarterly Journal of Economics*, 113(4), 1281-1308.
- Kale, P.T., Banwait, S.S. and Laroiya, S.C. (2010) "Performance evaluation of ERP implementation in Indian SMEs." *Journal of Manufacturing Technology Management*, 21(6), 758-780.
- Khalilzaden-Shirazi, J. (1974). "Market Structure and Price-Cost Margins in United Kingdom Manufacturing Industries". *Review of Economics and Statistics*, 56(1), 67-76.
- Locke, S. (2004). "ICT Adoption and SME Growth in New Zealand". *Journal of American Academy of Business*, Cambridge 4 (1/2), 93-102.
- Lu, W.J. and Beamish, W.P. (2006). "SME internationalization and performance: growth vs profitability." *Journal of International Entrepreneurship*, 4(1), 27-48.

- Lubatkin, M. and Chatterjee, S. (1994). "Extending Modern Portfolio Theory into the Domain of Corporate Diversification: Does It Apply?" *The Academy of Management Journal*, 37 (1), 109-136.
- Majumdar, S. K. (1997). "The Impact of Size and Age on Firm-Level Performance: Some Evidence from India." *Review of Industrial Organization*, 12, 231-241.
- Mavridis, S., Kotzaivazoglou, I., Xinidou, T. and Triantafyllidou, C. (2008). "Information and communication technologies applications in Greek food and beverages companies." *International Conference on Applied Economics, ICOAE 2008*, 623-627.
- McPherson, M. A. (1996). "Growth of micro and small enterprises in Southern Africa." *Journal of Development Economics*, 48, 253-277.
- MOFPI. (2015). "Annual Report." <http://mofpi.nic.in/>, (June, 3. 2015).
- Panda, D. (2015). Growth determinants in small firms: drawing evidence from the Indian agro-industry." *International Journal of Commerce and Management*, 25(1), 52-66.
- Rodriguez, A. C., Molina, M. A., Perez, A. L. G. and Hernandez, U. M. (2003). "Size, Age and Activity Sector on the Growth of the Small and Medium Firm Size." *Small Business Economics*, 21, 289-307.
- Shahidul, M.I. and Anwar, H. (2007). "Matrix of skill-automation –product cost: few case studies on manufacturing enterprises in Bangladesh". *Journal of Arthanity*, 12 (1), 150-8.
- Steffens, P., Davidsson, P. and Fitzsimmons, J. (2009). "Performance configuration over time: UK evidence using matched establishment/workforce survey data". CeRIBA discussion paper, London.
- Unnikrishnan, S., Iqbal, R., Singh, A. and Nimkar, I. M. (2015). "Safety Management Practices in Small and Medium Enterprises in India." *Safety and Health at Work*, 6, 46-55.
- Vijayakumar, A. (2011). "An Empirical Study of Firm Structure and Profitability Relationship: The Case of Indian Automobile Firms." *International Journal of Research in Commerce, IT and management*, 1(2), 100-109.
- Wagner, J. (2007). "Exports and productivity: a survey of the evidence from firm level data." *The World Economy*, 30(1), 60-80.
- Yasuda, T. (2005). "Firm Growth, Size, Age and Behavior in Japanese Manufacturing." *Small Business Economics*, 24, 1-15.
- Zhu, K, Dong, S., Xu, S. X. and Kraemer, K. L. (2006). "Innovation diffusion in global contexts: determinants of post-adoption digital transformation of European companies." *European journal of Information System*, 15, 601-616.