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Modern Office Technology and Firm Performance in Khulna District of Bangladesh

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Abstract: Modern office technology affects firm performance significantly through the channel of raw materials collection, production, and distribution to final consumers.Using data from 40 sample manufacturing firms in Khulna district, we estimate the impact of modern office technology on output level. Computer, fax, and landline phone significantly increase the output level. Hypothesis tests support the difference in average output between firms with and without this office equipment.

Keywords: Modern office technology; Firm performance; Manufacturing firm; Bangladesh

1. INTRODUCTION

In this paper, we attempt to explore the technological state of manufacturing firms in the Khulna district of Bangladesh. Specifically, we answer a) what type of modern office technology do the firms use? and, b) how modern office technology affects the output level of the manufacturing firms?

Bangladesh has huge potential in the industrial sector due to her central strategic location at the crossroads of the two large burgeoning economic hub groups, the South Asian Association for Regional Cooperation (SAARC)and the Association of Southeast Asian Nations (ASEAN).The manufacturing value-addedas a percent of GDP increased from 14 percent in 2000 to19percent in 2019 in Bangladesh (WB, 2020).The ready-made garment industry is the main driving factor behind experiencing this dynamic and strong growth in Bangladesh (Fernandes, 2008). The tiles firms in the south-west region of Bangladesh have a superior position in employment generation, capacity utilization, target fulfillment, and profit perspectives (Haider, 2011). Wooden furniture achieves the highest yearly sales growth rate at 34 percent and the mud tiles firms are in the top rank at 81 percent in capacity utilization (Haidar and Hasan, 2010). Greater scope

for raw material sourcing has a positive influence on the operating profit to sales ratio and a negative influence on the sales growth rate of the firms (Haider, 2010). But Ahmed *et al.*(2010) estimate the input-output relationship in shrimp processing firms and showed that about 80 percent of the firms in this region possess decreasing return to scale.

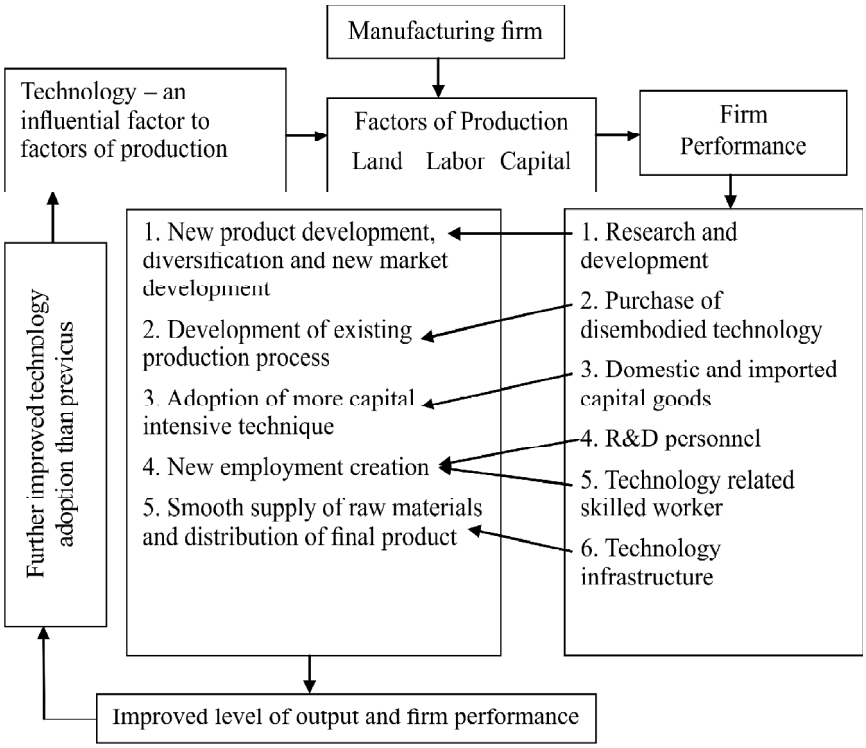
Modern office equipment covers a significant part of a firm's technology profile. Previous literature justifies the importance of office technology to drivesubstantiative growth in manufacturing firms. Flexible production process and new technology adoption can improve the indigenous human capital stock (Nelson and Phelps, 1966). Pfano and Beharry(2016) found that modern office technology, in particular, computers and telephones brings a significant difference in the work environment. Based on a survey of 67 business firms, they suggest the right use of technology gadgets improve management performance and benefit the business in South Africa. In a similar studyin Ghana, Oteng and Seidu (2016) suggest that the performance of office staff, regardless of their skill and competency, depends on the availability of office technology. (Lee *et al.* (2016) stateinvestment in information technology (IT) and its effective utilization drives firm growth in the Republic of Korea. Using the purchase data of a company from 2011-2014, the authors suggest that wireless technology is the main IT driver of their revenue growth. Rahman and Ferdaous (2019) analyze the impact of IT investment on firm performance using stock market data from 2007-2017 in Bangladesh. The authors report both positive and negative relationships between IT investment and stock market performance and suggest efficient utilization of IT assets.

2. CONCEPTUAL FRAMEWORK

Figure 1 shows how the technology profile of a firm influences the firm performance.Firms organize land, labor, and capital efficiently to operate the production process in a cost-effective way that gives increased profit levels over time (Ahmed and Haider, 2013).

Technology is another factor that makes labor and capital more efficient for production with a new process in the shortest possible time (Deraniyagala, 2001). Internal R&D, disembodied technology, imported and domestic capital goods, R&D personnel, computer, fax, phone, and energy sufficiency are some indicators of a firm's technology profile. With an enriched technology profile, firms can improve their existing production process. As a result, new products are developed through diversification that helps to increase the volume of output and ensuresgreater market share (Chuang, 2008). Modern office technologysuch as computerized machinery,

Figure 1: Technology in Firm Performance



Source: Authors' Compilation based on (Prakash and Sharma, 2011; Claudio *et al.*, 2010; Chuang, 2008; Fisher and Jefferson, 2008)

telecommunication facilities, internet access saves time and costs to access raw materials and help to distribute finished products on time. Besides, increased capital-intensive technique increases the firm's capital stock and internal R&D creates a new scope for employment generation to skilled human resources that may reduce the possibility of brain-drain. Finally, improved output, profit, and otherperformance enable firms to adopt more advanced technology further.

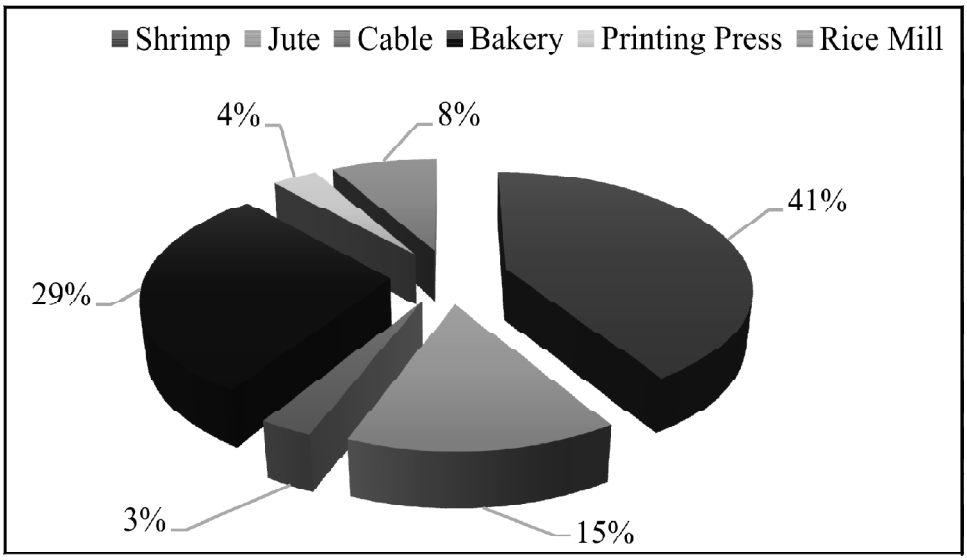
3. DATA AND METHODOLOGY

3.1. Data

To collect data, we have surveyed 40 manufacturing firms using convenience sampling in the Khulna districtof Bangladesh. We allocated these firms into two groups, large and medium, following (Ahmed and Haider, 2013). The firm size is considered based on the number of employed labor. Large firms are defined as labor > 100 and medium firms are defined as 25 <

labor ≤ 100. The distribution of sample firms based on the type of output is given in figure 2. Table 1 includes a detailed definition of variables.

Figure 2: Sample Firms by Product Type



Source: Authors' Estimation

Table 1: Variables

Variable	*Type*	*Description*
Output	Continuous	BDT(Year 2013)
Labor	Count	Number (Year 2013)
Capital	Continuous	BDT(Year 2013)
Firm age	Continuous	Year
Firm size	Binary	Large=1; Medium=0
Expenditure on domestic capital goods	Binary	Yes=1; No=0 (Year 2011, 2012)
Expenditure on imported capital goods	Binary	Yes=1; No=0 (Year 2011, 2012)
Computer	Binary	Yes=1; No=0 (Year 2013)
Fax	Binary	Yes=1; No=0 (Year 2013)
Quality certification	Binary	Yes=1; No=0 (Year 2013)
Vintage of capital stock	Count	Number (Year 2013)
Domestic medium machinery	Count	Number (Year 2013)
Domestic small machinery	Count	Number (Year 2013)
Imported small machinery	Count	Number (Year 2013)
Landline phone	Count	Number (Year 2013)

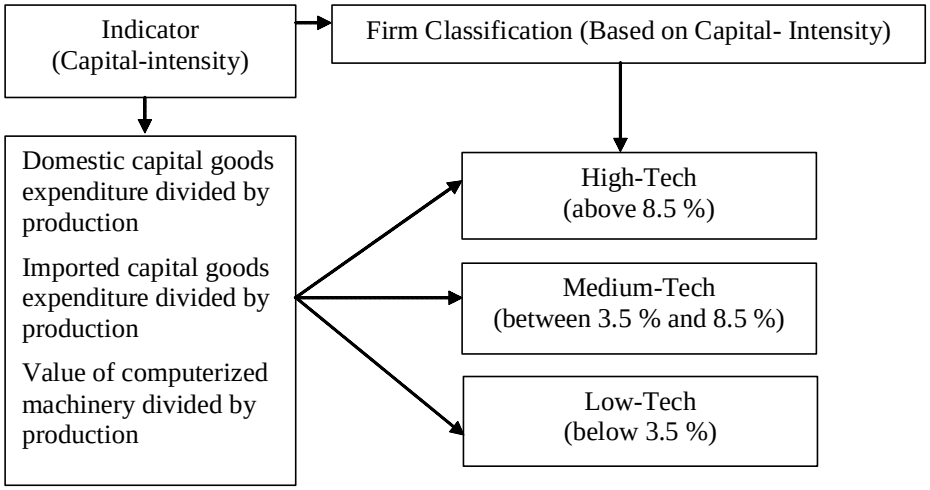
Source: Authors' compilation

Note: BDT is the abbreviation for the currency of Bangladesh, Bangladesh Taka.

3.2. Firm Classification Based on Technology

Following technology indicators of firm classification of the Organization for Economic Co-operation and Development (OECD), the authors use the capital-intensity indicator instead of the R&D indicator because sample firms are not engaged in any type of R&D activities.

Figure 3: Firm Classification Based on Technology



Source: Authors' compilation based on (Almus and Nerlinger, 1999) and (Gehrke and Grupp, 1994).

In this study, the capital-intensity indicator includes three main elements i.e. Domestic capital goods expenditure divided by production, imported capital goods expenditure divided by production and value of computerized machinery divided by production (Figure 3). Firms are categorized as low-tech, medium-tech, and high-tech by using a capital intensity rating of above 8.5 percent, between 3.5 percent and 8.5 percent, and below 3.5 percent respectively (Almus and Nerlinger, 1999) and (Gehrke and Grupp, 1994).

3.3. Estimation of Cobb-Douglas Production Function

In this study, the production function is formed including three explanatory variables i.e. labor (L), capital (K), and modern office technology (T) in light of the main Cobb-Douglas production function given by Charles Cobb and Paul Douglas in 1928.

$$Q_n = AK_n^{\alpha} L_n^{\beta} T_n^{\gamma} \varepsilon \quad (1)$$

Now *ln* is added on both sides of the equation (1) to convert this non-linear production function into a linear one. Thus, the new form of the equation is:

$$\ln Q_n = A + \alpha \ln K_n + \beta \ln L_n + \gamma \ln T_n + \varepsilon \quad (2)$$

Here, Q is the monetary value of total output produced by the firm in the year 2013, K represents the monetary value of all fixed assets i.e. machinery, buildings, equipment in the year 2013, L is the total number of labor in the year 2013, T expresses the modern office technology i.e.computer, fax, landline phone in the year 2013, A is the efficiency parameter and ε denotes an error term. Firm-specificattributes such as firm age, firm size, quality certification, vintage of capital stock, capital expenditure from previous years,and stock of machineryare included as controls.

4. RESULTS

In this section, we classify firms into three technological groups i.e. high-tech firm, medium-tech firm, and low-tech firm based on the capital intensity indicator which is constructed following the OECD technology indicator.We estimate the effect of modern office technology on output level by estimating equation (2) with the ordinary least square.

4.1. Classification of Firms Based on Technology

Table 2 shows most of the firms belong to the low-tech category. Among all firms, 72.5 percent are low-tech firms, 17.5 percent are medium-tech firms and only 10 percent are high-tech firms. It is also the mirror image of the high labor-intensive nature of sample firms.

Table 2: Distribution of Firms Based on Technology

Capital-intensity	*Level of Technology*	*Number of firms*	*Percentage*
Below 3.5%	Low-tech	29	72.5
3.5% - 8.5%	Medium-tech	7	17.5
above 8.5 %	High-tech	4	10
Total		40	100

Source: Authors' Estimation

4.2. Estimation of Cobb-Douglas Production Function

Table 3 depicts the results of the estimated Cobb-Douglas production function. In column (1), the coefficient of capital is 1.00 which implies holding labor constant, a 1 percent increase in the capital input leads to a 1 percent increase in output which is statistically significant at 1 percent level.

Column (2) includes firm specific-attributes such as firm size and firm age as controls. This specification lowers the coefficient of capital to 0.78 but the level of significance remains the same. This result persists when we replace firm age with firm age square in column (3).

In column (4), we add modern office technology, computer, fax, and landline phone along with labor and capital to estimate equation (2). The coefficient of capital drops by more than half compared to those in column (1) to (3). Both computers and landline phones are significant at 1 percent level but fax is not significant. A firm with a computer has on average 1.41 percent higher output than that of a firm without a computer. An additional land phone increases output on average by 0.07 percent. Computer applications for managing business and communication using landline phone justify these results since computers and phones do not contribute to the production process directly. On the other hand, small local machinery has a significant negative impact on output. Medium local machinery, imported machinery, vintage of capital stock, quality certificate, and expense on capital goods in previous years do not affect the firm's output significantly.

Table A3: Production Function Estimation

	(1)	*(2)*	*(3)*	*(4)*
Labor	-0.05	-0.01	-0.01	-0.03
	[0.04]	[0.04]	[0.04]	[0.03]
Capital	1.00***	0.78***	0.78***	0.30***
	[0.09]	[0.11]	[0.11]	[0.10]
Firm size		1.15***	1.15***	0.31
		[0.39]	[0.39]	[0.28]
Firm age		-0.34	—	—
		[0.22]		
Firm age square			-0.34	-0.24
			[0.22]	[0.15]
Computer	-	-	-	1.41***
				[0.35]
Fax	-	-	-	0.69
				[0.46]
Landline phone	-	-	-	0.07***
				[0.03]
Local machineries (small)				-0.22***
				[0.08]
Local machineries (medium)				0.17
				[0.22]
Imported machineries (small)				-0.02
				[0.02]

contd. table A3

	(1)	(2)	(3)	(4)
Capital expense 2012 (indigenous)				0.10
				[0.20]
Capital expense 2011 (indigenous)				-0.31
				[0.24]
Capital expense 2012 (imported)				0.36
				[0.22]
Capital expense 2011 (imported)				0.08
				[0.25]
Vintage of capital stock				-0.14
				[0.18]
Quality certificate				-0.09
				[0.43]
Observation	40	40	40	40

Source: Authors' Estimation

Note: Dependent variable is the monetary value of output of manufacturing firms in the year 2013. Vintage of capital stock is the stock of machinery aged less than 5 years. All models report robust standard errors in brackets following the Breusch-Pagan test of heteroskedasticity. *p<0.10, **p<0.05, ***p<0.001

4.3. Robustness

We employ a t-test to check the robustness of the findings from the estimated production function. Table 4shows that the output of a manufacturing firm with a computer is onaverage approximately 6 million BDT per year whereas the output of manufacturing firms without computer is onaverage approximately 3 million BDT per year. So, the output difference between firms with and without computer is more than 3 million BDT per year and the said difference is statistically significant at 1 percent level.

Table 4: Output Status of Firms with and without Computer

Variable	*Unit of Measurement*	*With Computer*	*Without Computer*	*Difference*	*Standard Error*	*t-Value*
Output	BDT / Year	6.36	2.78	3.58	0.49	-7.35***

Source: Authors' Estimation, 2014

Note: *p<0.10, **p<0.05, ***p<0.001

Table 5depicts that, firms with a single landline phone produce output on an average equivalent to 4.41 million BDT per year while firms with more than one land phone produce output on an average equivalent to 5.86 million BDT per year. So, the output difference between these two groups is on an average 1.45 million BDT per year and the said difference is statistically significant at 1 percent level.

Table 5: Output Status of Firms with Single and Multiple Land Phones

Variable	*Unit of Measurement*	*With Multiple Land Phones*	*With Single Land Phone*	*Difference*	*Standard Error*	*t-Value*
Output	BDT / Year	5.86	4.41	1.45	0.70	-2.08**

Source: Authors' Estimation, 2014
Note: *p<0.10, **p<0.05, ***p<0.001

We also run the mean difference test of output level between large and medium firms. Table 6depicts that, the output of large firms is on an average 3.09 million BDT higher per year than that of medium firms and it is statistically significant at 1 percent level.

Table 6: Output Status in Large and Medium Firms

Variable	*Unit of Measurement*	*Large Firms*	*Medium Firms*	*Difference*	*Standard Error*	*t-Value*
Output	BDT / Year	7.00	3.92	3.09	0.43	-7.26***

Source: Authors' Estimation, 2014
Note: *p<0.10, **p<0.05, ***p<0.001

5. CONCLUSION

Modern office technology expedites business performance saving time and effort in the workplace. In this paper, we investigate how modern office equipment influencesa firm's output level. Results suggest that computers and landline phones significantly increase output in manufacturing firms. Results from this study support but do not confirm the earlier findings on modern office equipment and firm performance since the definition of firm performance varies across studies. In light of our findings, we recommend firms procure more modern office technology following the present trend.

References

Ahmed, M.S., Ahmed, M.D. and Moni, N.N. (2010). "Allocative Efficiency for the Sustainable Production Process of the Seafood Industry in Bangladesh", *New Zealand Journal of Applied Business Research,* 8(1), p. 27.

Ahmed, S.M. and Haider, M.Z. (2013). "Efficient Utilization of Resources in Manufacturing Firms", *Asian Journal of Empirical Research,* 3(7), pp. 821-835.

Almus, M. and Nerlinger, E.A. (1999). "Growth of New Technology-based Firms: Which Factors Matter?", *Small Business Economics,* 13(2), pp. 141-154.

Fernandes, A.M. (2008). "Firm Productivity in Bangladesh Manufacturing Industries", *World Development,* 36(10), pp. 1725-1744.

Gehrke, B. and H. Grupp, (1994). "Innovationspotential und Hochtechnologie, Technologische Position Deutschlands im internationalen Wettbewerb", Schriftenreihe des Fraunhofer-Instituts fuer Systemtechnik und Innovationsforschung (ISI), Hannover.

Haidar, M. and Hasan, K.M. (2010). "Investment Climate in South-west region of Bangladesh: A study of Manufacturing Sector", Working Paper, 4, Investment Climate Series, Economic Research Group, Dhaka.

Haider, M.Z. (2010). "Raw Material Sourcing and Firm Performance: Evidence from Manufacturing Firms in South-west Bangladesh", The Bangladesh Development Studies, 33(4), pp. 51-61.

Haider, M.Z. (2011). "Product-wise Performance of the Manufacturing Firms Located in the South-west Region of Bangladesh", *International Review of Business Research Papers,* 7(2), pp. 56-68.

Lee, H., Choy, H., Lee, J., Min, J. and Lee, H. (2016). "Impact of IT Investment on Firm Performance Based on Technology IT Architecture", Procedia Computer Science. 91, pp. 652-661.

Nelson, R.R. and Phelps, E.S. (1966). "Investment in Humans, Technological Diffusion, and Economic Growth", *The American Economic Review,* 56(1/2), pp. 69-75.

Oteng, A. P. and Seidu, A. P. (2016)."The Impact of Modern Office Technology on the Secretary's Performance inSome Selected Business Organizations in the Takoradi Metropolis", *Adrri Journal of Arts And Social Sciences.* 13, 12(2), pp.1-9.

Pfano, M. and Beharry, A. (2016)."The effect of modern office technology on management performance: Durban Westville", *Problems and Perspectives in Management,* 14(2-2), pp. 376-384. doi:10.21511/ppm.14(2- 2).2016.13

Ranman, M. M. and Ferdaous, J. (2019). "The Impact of IT Investment on Firm Performance in Bangladesh", *Journal of Business Management*, 19(1), pp. 31-46.

WB (2020). Manufacturing, Value Added (% of GDP) [online], Available at: *https://data.worldbank.org/indicator/NV.IND.MANF.ZS?locations=BD&most_recent_year_desc=true* (Accessed on 28September 2020).