

Productivity and Performance of IT Sector in Bangladesh: Evidence from the Firm Level Data

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This paper analyses productivity and performance of the IT sector in Bangladesh based on a survey of 202 firms of various sizes. It also makes an assessment of the impact of recent global financial crisis on the sector. The negative impact of the global financial crisis appeared in the performance in 2007 but most IT firms seemed to have recovered in 2008. This indicates the inherent strength of the sector in terms of productivity and efficiency. It is observed that e-governance activities contribute to total productivity of the firms that are more than five years old. Infrastructure development, tax exemption, export promotion and training of engineers, among others, are major concerns in IT business operations, which can be tackled by appropriate policies to support further development of the sector.

I. INTRODUCTION

The Information Technology (IT) industry is one of the fast growing industries worldwide. It is widely recognised that South Asia has tremendous potential in the IT sector development because of availability of talented workforce at cheap wage rates. The IT industry can contribute to the overall economic development of these developing countries through employment generation, gaining share of service trade and increasing production efficiency of

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other sectors by the adoption of proper information technology. However, except India, the IT sector has not developed strongly in other South Asian countries. In Bangladesh, the IT sector has started growing, particularly after 2000, as a result of some favourable policies of the government. The objective of this study is to examine the productivity and performance of IT firms in Bangladesh. It will also assess the impact of the global financial crisis on the IT sector in terms of productivity and profitability, which will help understand the extent of integration of this sector with the global market.

The Sub-prime loan crisis that led to the grave recession in 2007 in the United States seemed to have affected trading partners all over the world since demand from those countries decreased. At the same time, some countries might have benefited from this crisis due to shifts in locations of productions for cost advantage. Cost reductions have been revealed to be one of the main factors to trigger offshoring activities (Dachs *et al.* 2006, Houseman 2007, Lewin and Cuoto 2007, Marugami *et al.* 2005). As for the supply side, there might be a case that international investors who rebuilt supply chains in order to hedge the risk from the global financial crisis could have brought new opportunities. Therefore, it is neither evident whether the effect of the financial crisis was negative in all sectors, nor how severe those effects were. Even within the sector, there might be a case where not all the firms are affected by the crisis in the same manner. The effects of the crisis may not be avoided but for a country, with cost advantage and abundant human resource base, like Bangladesh can minimise the crisis impact. In this study, the IT sector in Bangladesh is examined in order to measure the effect of the recent global financial crisis and identify factors that enable firms to make a good use of opportunities yielded, and to direct to policy recommendations.

For the analysis, this study uses survey data of 202 IT firms collected for the year 2008 from various locations of Dhaka. The data were collected by using a structured questionnaire. Combining with descriptive analysis, we have estimated productivity of firms and examined the determinants of productivity and how the firm productivity and profitability were influenced by the global financial crisis.

The paper is organised as follows. After the introduction, the background of the IT sector is outlaid in Section II, followed by performance assessment of IT firms in Section III. The analysis of determinants of productivity of the IT sector is provided in Section IV with some consideration about the impact of the global financial crisis. Section V discusses some relevant policy recommendations. Finally, Section VI concludes the paper.

II. BACKGROUND OF THE IT SECTOR IN BANGLADESH

Bangladesh is a country of population over 150 million with literacy rate of more than 50 per cent. In the last two decades, the country has fetched remarkable economic progress with GDP growth rate of more than 5 per cent. It is argued that there is a tremendous prospect for the country to leapfrog into industrialised economy through the development of the IT sector. Because Bangladesh has high potential to become a huge source of skilled human resources with its cultural adoption capability, English language skills, analytical capability and a large number of educated and energetic youths with bright aptitude, good quality and natural ability in software development. A recent study by Hossain *et al.* (2011) shows that the wage rate of IT professionals in Bangladesh is almost half of the Indian IT professionals. However, the IT sector has not yet been growing as much as expected. The country obtained US\$ 33 million by exporting software in 2009. Although the export earnings from the software sector increased by eight million dollars in 2009, compared to 2008, the share of software export is only 0.2 per cent of the country's total export (BASIS 2010). The IT sector mainly concentrates in Dhaka, the capital city of Bangladesh. There is only one IT cluster namely the IT incubator centre, which was established in November 2002, where around 50 IT firms are now doing business.

Recently, in Bangladesh, large-scale automation projects have been implemented in telecom, banking, finance, pharmaceutical, and garment/textile sectors and domestic demand for software and IT Enabled Services (ITES) industries is, therefore, expected to increase rapidly. According to Bangladesh Association of Software and Information Services (BASIS), more than 500 software and ITES companies are registered in Bangladesh. These companies employ over 12,000 IT professionals. Out of 500 software and ITES companies, more than 20 per cent companies are exporting their products and services to over 30 countries. About 6 per cent companies have been established through joint-venture with overseas companies or as an offshore development centre (ODC) by 100 per cent foreign capital. Most of these companies started their operations within last five years, indicating that the Bangladesh software and ITES industries have started to be focused by overseas clients. Over twenty companies have already obtained ISO certification and a number of companies are in the process of acquiring CMMI certification and at least six companies have achieved Capability Maturity Model Integration (CMMI) Level 3.

The size of the IT market in Bangladesh, excluding telecom, is estimated to be around \$300 million (BASIS 2010). Hossain *et al.* (2011) show that the major export market is North America, followed by EU countries and East Asian

countries, especially Japan. The present government of Bangladesh is envisioned to create a “Digital Bangladesh” by 2021.¹ In this context, with government IT supportive policies, more automation projects such as e-governance projects are expected to be undertaken, which will increase the demand for IT services as well as will contribute to further development of the sector.

In pursuit of that, the Bangladesh government, in its Export Policy, has formally identified the IT sector including the software industry as one of the “thrust sectors.” In what follows, initiatives taken are exemptions of income tax, value added tax, and customs duty for the IT industry, formulation of National IT Policy, organising the IT National Taskforce (the chair is the Prime Minister), establishment of IT incubation centre, enactment of Copyright Law (Trademark Law 2009), enacting of ICT Act 2006 in the parliament, increase in IT budget allocation by the government (targeting 2 per cent of annual development plan expenditure), etc. With these supports from the government, the software industry in Bangladesh has started growing since the 2000s. Bangladesh has recently been focused by other countries as an outsourcing target. However, the absence of IT Park as well as electricity and internet problems remain as key barriers to expanding the industry at an expected level.

Historically, computer use started back in 1964 by Atomic Energy Centre and Dhaka University. The first main frame computer came to Bangladesh in 1964. The Internet came late in Bangladesh, with UUCP e-mail beginning in 1993 and IP connectivity in 1996. By July 1997, there were 5,500 IP and UUCP accounts.² In June 1996, the government decided to allow private companies to act as Internet Services Providers (ISPs) using VSATs. In June 1997, the Government of Bangladesh appointed a Committee to look into the problems and prospects of export of software from Bangladesh. The Committee submitted its report in September 1997.³ The government has taken a decision on June 1998 to withdraw all import duties and VAT from all computer hardware and software.

¹ Piazzolo (2001) provides a definition of an “digital economy” as: “an economy where both final output and intermediate input increasingly consist of information and where the modern (digital) IT increasingly provide world-wide immediate access to any information made available. These new technologies might have the potential to enable an increase in the productivity of conventional business practices, but also facilitate the establishment of new processes and products. Consequently, the evolution of the digital economy should not be considered as being restricted to the information sector, but as a far reaching process that might alter and extend the products and production processes within the whole economy” (p 30).

²http://www.c2o.org/reports/Report_PAN_Asia_Networking.pdf

³<http://www.sdnbd.org/sdi/issues/IT-computer/expartsoft-report.htm>

This has brought the prices of computers down to a level affordable by middle-income households. Mobile telephony has seen a phenomenal growth in Bangladesh, which is contributing to the growth of the IT sector positively in recent years, particularly after 2000.

TABLE I
ICT DEVELOPMENT INDICATORS IN BANGLADESH, 2006-2008

	2006	2007	2008
Internet users	450,000	500,000	556,000
Internet users (per 100 people)	0.28	0.3	0.3
Secure Internet servers (per 1 million people)	0.019	0.01	0.1
Telephone mainlines (per 100 people)	0.72	0.8	0.8
Investment in telecoms with private participation (in million US\$)	1113	1348.8	896
International Internet bandwidth (bits per person)	2.2	4.1	--
International Internet bandwidth (Mbps)	348	642	--
Mobile phone operators	6	6	6
Mobile phone subscribers (in million)	22	33	44

Source: World Development Indicators, World Bank; BTRC, Dhaka.⁴

III. PERFORMANCE ASSESSMENT OF IT FIRMS SURVEYED

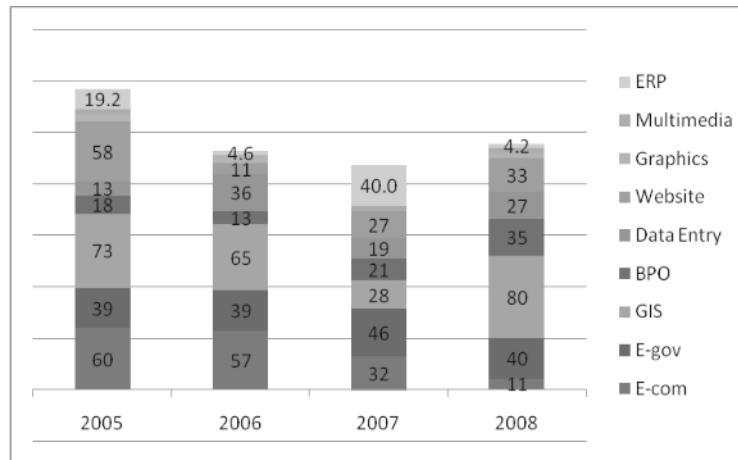
We conducted a survey of IT firms in Dhaka in October 2009 and surveyed firms are asked to provide relevant data for the year 2008. Firms were selected by using stratified random sampling method from all the key commercial areas in Dhaka, such as Motijheel, Farmgate, Dhanmondi, Mirpur, BSRS Building, Banani, Gulshan, Baridhara and Uttara. In total, 202 software firms including some ISPs (Internet Service Providers) were sampled.⁵

III.1 Sales Revenue and Profit

Based on the data of 202 surveyed firms, different indicators of performance of IT firms are examined. The IT firms in Bangladesh showed a staggered growth of sales revenue over the years, 2005-2008 (Figure 1).

⁴All the tables were produced by the authors if not specified.

⁵This survey was supported by Grant-in-Aid for Scientific Research, Japan Society for the Promotion of Science, No. 20402027 and No. 21530259.

Figure 1: Average Growth of Sales of IT Firms by Major Activities, 2005-2008 (per cent)

Global economic recession in 2007 has impacted Bangladeshi software firms to some extent. Figure 1 shows that Bangladeshi software firms have faced downturn in product sales growth for some activities during 2006 and 2007 and there is a sign of rebound in 2008. The above picture is also confirmed from respondents' opinion. Whereas about 55 per cent firms were affected by the global recession through drop in sales, about 12 per cent firms were reportedly benefited by the global recession through increase in sales.

Table II shows that gross profit of firms is reported to be around 18 per cent of the total revenue on average in 2008. As expected, profit declined slightly in 2008 for most of the firms except for the medium-sized firms.

TABLE II
GROSS PROFIT AS PER CENT OF SALES REVENUE

Gross Profit as % of revenue by size (the number of employees)	Micro (<10)	Small (10-49)	Medium (50-99)	Large (>100)	All
2008	17.3	18.7	19.4	12.2	18.1
2007	28.8	20.1	17.0	26.2	21.1
2006	27.0	17.5	17.4	20.6	18.8
2005	20.6	18.1	20.8	28.3	19.7
2004	52.4	32.6	16.2	20.4	31.9

III.2 Skill Level and Labour Dynamics

In view of the theoretical and empirical evidence, skill level is positively associated with the performance of firms. As mentioned earlier, an important prerequisite for the development of IT sector is the availability of skilled workforce with cheaper wage rate. Table III shows that highly skilled or skilled workforce is necessary for all the services, but particularly for E-commerce, website/web-analytics, Enterprise Resource Planning (ERP) and graphic analysis.

TABLE III
SKILL LEVEL FOR PARTICULAR ACTIVITY

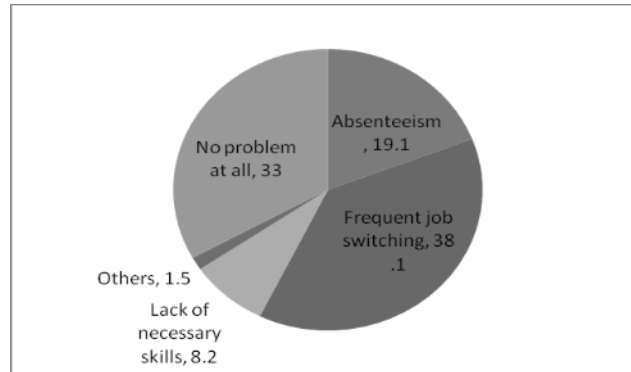
Level/Section	E-commerce	E-governance	GIS	BPO	Data Entry	Web site	Graphic	Multimedia	ERP	Call centre	Internet serv.
Highly skilled	30.2	11.9	6.9	14.9	16.8	47.5	29.2	16.3	23.3	5.9	28.7
Skilled	16.3	9.9	7.4	12.9	13.4	15.3	10.4	7.9	15.8	5.9	16.3
Semi-skilled	5	4	1.5	5	6.9	4	3.5	1.5	3.5	4.5	6.9
Unskilled	0.5		2	2.5	2	0.5	1	2	2	3.5	3

About 90 per cent of IT firms are highly satisfied with the level of skill of their employees. Skill appears to be an important factor for the industry, and thereby firms are willing to pay higher salary for high skilled employee (Table IV).

TABLE IV
WILLINGNESS TO PAY FOR BETTER SKILLED EMPLOYEE

	Satisfied	Willing to pay higher salary for skilled employee
Micro	88.2	75.8
Small	87.7	77.5
Medium	93.3	80.0
Large	85.7	85.7
All	88.5	78.2

However, frequent job switching (38 per cent), absenteeism (19 per cent) and lack of required level of skill (8 per cent) are the major problems that firms often face (Figure 2). High mobility of IT professionals is observed in the cases of those who have expertise in E-commerce, website development and ERP software. Fierce competition in these areas and relatively low wage rates are the main reasons for job switching of employees (Table V).

Figure 2: Human Capital Related Problems for the IT Industry

Firms tend to overcome these problems by increasing salary (63 per cent) or providing promotion (40 per cent). In other words, the situation indicates scarcity of appropriate human capital required for the further development of the industry.

TABLE V
LABOUR MOBILITY AND REASONS

Activities	High mobility (in 1 month)	High mobility (in 3 month)	Reasons for mobility			
			Many competitors	Job is not interesting	Low salary	Others
E-commerce	6.9	8.4	40.0	6.7	46.7	6.7
E-gov	1.5	4.5	50.0		37.5	12.5
GIS	0.5	2.5	20.0	20.0	40.0	20.0
BPO	3	5	40.0	10.0	40.0	10.0
Data Entry	3	0	20.0	20.0	50.0	10.0
Web site	11.9	11.4	30.0	15.0	45.0	10.0
Graphic	5.4	3.5	18.2	9.1	72.7	
Multimedia	3	2	40.0		60.0	
ERP	7.4	6.9	25.0	18.8	43.8	12.5
Call centre	0	0.5	100			
Interest serv.	5	10.9	26.9	15.4	50.0	7.7

Table VI shows the salary structure of IT professionals for the year 2008. The table shows that family workers receive slightly higher wages than those of other staff. On average, the monthly salary of managers is about Tk. 40,000 (US\$ 575), Tk. 32,000 (US\$465) for engineers and about Tk. 10,000 (US\$150) for operators. This wage rate is cheaper compared to India (Hossain *et al.* 2011).

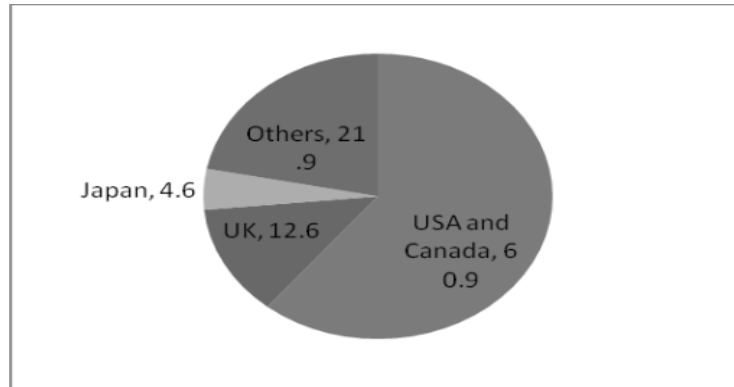
TABLE VI
WAGE STRUCTURE OF IT PROFESSIONALS, 2008

	Family worker	Permanent staff	Contractual staff
Senior/mid level manager	41,500	38,000	32,500
Engineer	56,700	32,000	32,500
Operator	7,000	10,000	8,500

III.3 Marketing and Promotion

Another important aspect of the software industry is to have better marketing strategies in place. Exploring new markets, building network and alliances with TNCs and obtaining certificates of standards and membership of IT leaders, such as Microsoft and IBM, could facilitate their entrance into the global value chain, and thus the performance of software firms. About 40 per cent firms are exporting software services. It is observed that the United States and Canada remain the major export market for Bangladeshi software firms. While the US and Canada account for 61 per cent, UK accounts for 13 per cent, Japan 5 per cent and the rest 21 per cent (Figure 3).

Figure 3: Export Market Structure of the IT Industry



As already mentioned, establishing network and alliances could be an important business strategy for better market access. Respondents suggest that one of the ways to build a network is to be a member of a software association (62 per cent). Other ways are to attend market development programme (36 per cent), to visit foreign countries as a part of delegation (25 per cent), and to achieve different quality certificates such as CMMI and ISO (14 per cent), etc. (Table VII)

TABLE VII
STRATEGY TO BUILD MARKETING NETWORK

	Percentage
Become a member of association	62.4
Attended in marketing development programme	35.6
Went abroad in a delegation on market promotion	24.8
Achieved quality certificates	14.4
Attended exhibition expo	42.6
Others	5.4

III.4 Access to Finance

During the survey, it has emerged that lack of access to finance has been an important barrier to the performance of IT firms in Bangladesh. Another barrier is related to the infrastructure, such as the lack of electricity supply (Table VIII).

TABLE VIII
IMPEDIMENTS TO DEVELOPMENT OF THE IT
INDUSTRY IN BANGLADESH

	1 st Obstacles	2 nd Obstacles	3 rd Obstacles	4 th Obstacles
Access to finance (availability & cost)	23.8	7.7	8.1	5.7
Access to land	4.5	6.7	3.2	4.6
Business licensing & permits	5.4	5.7	1.6	2.9
Corruption	9.9	10.8	7.0	6.9
Crime, theft & disorder	3.0	4.1	3.8	4.0
Customs & trade regulations	5.4	7.7	2.7	2.9
Electricity	26.7	20.6	14.5	8.6
Inadequate skilled labour	5.9	8.2	12.9	4.6
Labour regulations	2.0	1.5	3.2	1.1
Political stability	3.5	11.3	10.8	9.7
Tax administration	2.0	4.1	4.3	4.6
Tax rate	2.5		3.8	5.1
Transportation		1.0	10.8	10.3
Access to market	3.5	7.2	6.5	14.3
Access to technology	1.0	1.0	2.7	11.4
Copy right	1.0		2.7	2.9

It is observed that very few IT firms have access to formal financial institutions including the Equity Entrepreneurship Fund (EEF), a venture capital fund provided by the Bangladesh Bank (Central bank). Most of the IT firms

claimed that high interest rates and tangible collateral assets are the most important obstacles for their access to finance since interest rates are higher, particularly for micro firms. Average interest rate ranges between 14 and 21 per cent (Table IX).

TABLE IX
AVERAGE INTEREST RATES FOR BORROWING FUND FROM
FINANCIAL INSTITUTIONS

Firm size	Short-term	Mid-term	Long-term
Micro	25.0	30.0	16.0
Small	18.6	18.0	14.0
Medium	15.1	19.0	13.8
Large	0	14.5	17.0
All	17.4	21.0	14.2

Table X shows that in most cases, software firms use land or building and other personal assets of owner as collateral for loans since most of the firms do not have tangible assets.

TABLE X
TYPES OF COLLATERAL NEEDED

Collateral type	Short-term loan	Mid-term loan	Long-term loan
No	42.9		25.0
Land/building	14.3	60.0	30.0
Machinery & equipment including movables	14.3	20.0	20.0
Accounts receivables and inventories		20.0	5.0
Personal assets of owner	14.3		5.0
Others	14.3		15.0

IV. RECENT PERFORMANCE AND DETERMINANTS OF PRODUCTIVITY

IV.1 Impact of the Global Financial Crisis

As discussed in the previous section, in Bangladesh, the development of the IT sector has been supported by the Bangladesh government during the period starting from 2002. Recent sectoral progress shows that the efforts seem to be coming into effect. Although the domestic environment is becoming favourable with the increase in demand for the IT services, the external one was not

favourable in the face of global crisis. At the advent of the global financial crisis in 2007, India, a leader in this sector, was affected severely by the decrease in revenue and performance (NASSCOM 2008). Among the IT firms, especially SMEs were severely affected (Hossain *et al.* 2011). In the case of Bangladesh, the crisis might have affected those firms dealing with the US and European market mostly because the demand from those countries dropped. We have observed that some call centres from the US were relocated to Bangladesh due to the increase in the cost of operations in India. If the increase in new demand of the multinational firms surpasses the decrease in existing export demand, there might be a chance that this crisis might have worked positively for the IT sector in Bangladesh. In this section, we, therefore, analyse the recent trend of performance of the IT sector in Bangladesh based on several performance indicators of IT firms. In addition, the determinants of those performance indicators are investigated.

It is observed that the age of owners is mostly concentrated in the 40s and somewhat in the early 50s. This could be resulted from the reallocation of business between sectors due to the support of the government in terms of tax incentives, the positive prospect of the market, increasing number of graduates from polytechnic institutes and engineering departments. Some of the owners even said that the impression of handling business in the IT sector is better than other sectors since the IT sector has the image of modern industry and advanced technology. The fact that there are quite a few owners in the 50s may also imply that there might be some cases from early retirement of their former jobs in the public or private sectors. These owners are young in this sector although they are not new in doing business as shown in the distribution of age of owners. The average experience of the owners in doing business is 16.59 years, whereas the age of companies in the IT sector is mostly less than 8 years with peaks in 3, 5, 7, and 8 years (Figures 4 and 5).

Figure 4: Age Distribution of Owners

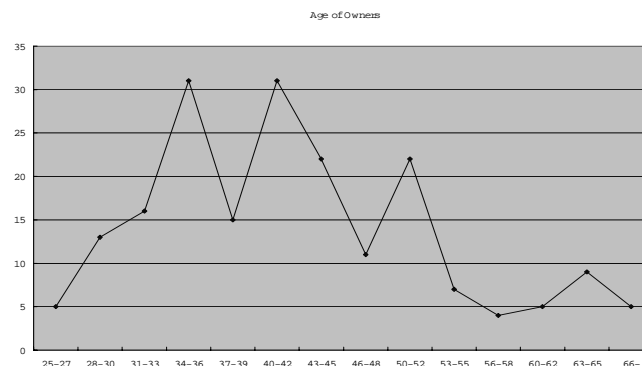


Figure 5: Age Distribution of Companies

The average size of firms measured by the number of total employees is 40.10 and 11 firms have more than 100 employees. Several performance indicators and the influence of the recent global financial crisis are considered. First, the rate of profit (gross profit expressed as earnings before interest and taxes) to revenue is investigated.

Changes in profit rates are presented in Table XI. Among those firms which reported profit rates each year, the effect of the recent global financial crisis is not found. On the other hand, when firms are restricted to those which reported sales figures in 2004, the profit rates seem to have been affected negatively by the global financial crisis. This ambiguity of the impact of the crisis measured by profit rates could be caused by the fact that some new entrants, which joined after 2004, are relatively performing better. We also consider the correlation between profit and the rate of engineers as this is frequently used in the analysis of the IT sector (See Kumar 2001, 2005).

TABLE XI
CHANGES IN PROFIT RATES

Changes in Profit rates (all obs.)				Changes in Profit rates (for sales in 2004>0)			
Year	Obs.	Mean	Std. Dev	Year	Obs.	Mean	Std. Dev
2008-2007	77	0.0054	0.0890	2008-2007	39	0.0144	0.0889
2007-2006	69	0.0107	0.0762	2007-2006	37	-0.0095	0.0831
2006-2005	62	0.0060	0.0377	2006-2005	37	0.0003	0.0363
2005-2004	50	0.0037	0.0497	2005-2004	36	0.0003	0.0495

It can be concluded that when the rate of engineers goes up, if the scale economy works in a positive manner, the performance of firms may improve. On the other hand, if the cost disadvantage of hiring engineers prevails over the scale effect, the performance of firms may deteriorate. Next, the relationship between profit rates and the rate of engineers are examined. Table XII presents the correlations between these two variables. In the given five year period, except for 2004, other years show negative relationships. In 2007 and 2008, the negative correlations are significant. Therefore, there might be a chance that the cost burden of hiring engineers overcomes the scale effect. This tendency did not change much when large firms are taken out from the analysis. Now the questions are how the shares of engineers changed over time and whether firms adjusted the global financial crisis by cost adjustment and/or by the reduction of engineers. In order to answer these questions, the movement of shares of engineers is examined by different categories of firms.

TABLE XII
CORRELATIONS BETWEEN PROFIT RATES AND SHARES OF ENGINEERS

Share of Engineers	Profit rates				
	2004	2005	2006	2007	2008
2004	0.0653 (0.6629)				
2005		-0.0562 (0.667)			
2006			-0.0647 (0.6032)		
2007				-0.1907* (0.0989)	
2008					-0.2473** (0.027)

Note: ** significant at 5% level, * significant at 10% level.

Table XIII shows changes in shares of engineers' overtime. A decrease in the share of engineers is observed between 2006 and 2007 for SMEs with less than 100 employees. On the other hand, this decrease between 2006 and 2007 is not detected for large firms with more than or equal to 100 employees. This probably coincides with the view that the scale effect might work better in large firms rather than in SMEs, thus large firms tend to keep hiring more engineers despite the downturn of the economy. Alternatively, for SMEs, the cost disadvantage might be stronger and they reserve hiring engineers in difficult time.

Next, another performance indicator, productivity of firms is investigated.

TABLE XIII
SHARES OF ENGINEERS

	Obs.	Mean	Std. Dev.
2008	191	0.4888	0.2526
2007	187	0.4820	0.2549
2006	170	0.4704	0.2517
2005	136	0.4622	0.2417
2004	102	0.4493	0.2444

TABLE XIV
CHANGES IN SHARES OF ENGINEERS

Panel A: For Firms with Less than 100 Employees

Less than 100 employees Changes in Share of Engineers				Less than 100 employees Changes in Share of Engineers (for sales in 2004>0)			
Year	Obs.	Mean	Std. Dev.	Year	Obs.	Mean	Std. Dev.
2008-2007	174	0.0109	0.0793	2008-2007	73	0.0125	0.0688
2007-2006	159	-0.0038	0.0549	2007-2006	71	-0.0050	0.0415
2006-2005	127	0.0037	0.0556	2006-2005	71	-0.0036	0.0566
2005-2004	94	0.0079	0.0706	2005-2004	69	0.0117	0.0711

Panel B: For Firms with more than 100 employees

More than or equal to 100 employees Changes in Shares of Engineers				More than or equal to 100 employees Changes in Shares of Engineers (for sales in 2004>0)			
Year	Obs.	Mean	Std. Dev.	Year	Obs.	Mean	Std. Dev.
2008-2007	12	-0.0374	0.1331	2008-2007	5	0.0254	0.0304
2007-2006	11	0.0012	0.0245	2007-2006	5	0.0055	0.0237
2006-2005	9	0.0175	0.0476	2006-2005	5	0.0046	0.0280
2005-2004	8	0.0050	0.0470	2005-2004	5	-0.0102	0.0243

IV.2 Total Productivity

Productivity here is measured by Total Productivity (TP) defined according to the Hicks neutral efficiency term in the production function.

$$\ln TP_{it} = \ln Y_{it} - LS_{it} \ln L_{it} - CS_{it} \ln K_{it} \quad (1)$$

where Y represents sales, L is labour, LS is labour share, CS is capital share, K is capital, *i* represents a firm and t represents year. Capital was constructed by reported Capital in 2008 and investment each year. Capital share was calculated

from the replacement cost and sales. Labour share was computed from wages and the number of employees and sales⁶. Total Productivity here resembles Total Factor Productivity (TFP). Since for IT firms materials may not be major components, TP and TFP may not differ much. Nevertheless, in order to differentiate the method to lead the difference in results, here we call Total Productivity following Hulten, Bennathan, and Srinivasan (2006). Productivity growth between 2004 and 2008 is presented in Table XV. The negative growth rates in the 2005-2006 period and the 2006-2007 period are observed for SMEs. In contrast, in large firms, the negative growth rates were found both in the 2006-2007 period and the 2007-2008 period. This might be partly from the retaining the input structure as much as possible in the downturn, whereas SMEs seem to have adjusted input structure in those periods more quickly. In the following section, total productivity is revisited in order to find out the sources of the productivity.

TABLE XV
PRODUCTIVITY GROWTH BETWEEN 2004 AND 2008

A. Less than 100 employees TP growth rate				B. Less than 100 employees TP growth rate (for sales in 2004>0)			
Year	Obs.	Mean	Std. Dev.	Year	Obs.	Mean	Std. Dev.
2008-2007	140	0.0065	0.8805	2008-2007	70	0.0692	1.0344
2007-2006	123	-0.0254	0.5668	2007-2006	69	-0.0757	0.4692
2006-2005	89	-0.0456	0.3702	2006-2005	69	-0.0453	0.3386
2005-2004	67	0.0056	0.3915	2005-2004	67	0.0056	0.3915
C. More than or equal to 100 employees				D. More than or equal to 100 employees			
TP growth rate				TP growth rate (for sales in 2004>0)			
Year	Obs.	Mean	Std. Dev.	Year	Obs.	Mean	Std. Dev.
2008-2007	8	-0.3565	2.0725	2008-2007	4	-1.2902	2.2591
2007-2006	8	0.0355	0.3664	2007-2006	5	-0.0872	0.1077
2006-2005	6	0.0678	0.3319	2006-2005	5	0.0644	0.3710
2005-2004	5	0.0282	0.3035	2005-2004	5	0.0282	0.3035

IV.2.1 Determinants of Productivity

In the previous section, total productivity growth and the impact of the recent global financial crisis have been examined for the period between 2004 and 2008. As seen in the trend of total productivity growth as well as in the change of shares of engineers, the difference in firm behaviours among SMEs

⁶Here capital was calculated from the average investment rate and depreciation rate in the data. For input shares, reported figures in 2008 were used to calculate shares of inputs. Then the average of those figures was used for all firms and all years.

and large firms is detected. Whereas some firms stay productive from the beginning, others face difficulties. Firms can also take several approaches during the downturn, such as adjusting cost structures to become more efficient, exploring new markets, building a strategy to emphasise strength and/or lessen weakness etc. In this section, factors that contribute to a higher level of total productivity are investigated. The logarithm of total productivity may be considered as a summation of factors, which are firm and time specific as indicated above. Thus,

$$\ln TP_{it} = \ln \alpha + \beta x_{it} \quad (2)$$

where α is the sector specific factor and x_{it} are firm specific factors. Firm specific factors are divided into 4 groups: (1) cost structures, represented by log of the number of engineers and shares of engineers, (2) market structures, expressed by percentages of outsourcing, export shares, and main market activities, (3) strategies based on strength and weakness, such as participations in external training programme (yes or no) and financial access indicators,⁷ and (4) other firm specific characteristics, such as years of experience of owners and the age of firms. As strength, human resource management was mostly quoted. On the other hand, as weakness, access to finance was the one most widely cited. In addition, since the behaviour of SMEs is a main concern, only those firms with less than 100 employees are included for the rest of the analysis here.⁸

Results of regression analyses are demonstrated in Table XVI. It is evident that for most firms the higher the share of export is, the larger total productivity would be. On the other hand, the percentage of outsourcing within the domestic market has a significant negative relationship with total productivity, especially for those firms which are more than 5 years old. This can be due to the fact that those firms, which are less efficient, may outsource tasks to others in the domestic market. As for activities, E-governance tends to increase the level of total productivity for those firms which are more than 5 years old. For younger firms, which are less than or equal to 5 years old, not a single activity seems to significantly contribute to their level of total productivity. Although training of senior managers seems to be positively correlated with total productivity, the coefficients are not significant. The age of company also seems to have no strong relationship with total productivity. Overall, although the signs of coefficients seem to mostly coincide with predictions for the abovementioned 4 sets of

⁷A dummy variable was created based on replies of owners. When owners said interest rates, fees, or collateral are major or severe obstacles, it is indicated as one.

⁸Due to the availability of some of the explanatory variables, total productivity in 2008 is examined only.

explanatory variables, the variables that represent market orientations and market structures explain total productivity of SMEs in the Bangladeshi IT sector the most.

TABLE XVI
DETERMINANTS OF TOTAL PRODUCTIVITY

	All firms		Firms: more than 5 years old		Firms: less than or equal to 5 years old	
	Coefficients	Std. Err.	Coefficients	Std. Err.	Coefficients	Std. Err.
Ln (Experience of owner)	-0.10	0.16	-0.11	0.25	-0.08	0.23
Ln (Age of firm)	0.12	0.13	-0.04	0.36	0.24	0.30
Ln (Number of Engineers)	0.11	0.13	0.19	0.16	-0.01	0.23
Ln(Share of engineer)	-0.65	0.56	-0.77	0.79	-0.35	0.88
% of outsourcing	-0.66*	0.38	-1.03**	0.47	0.15	0.68
% of exports	0.74**	0.28	0.46	0.46	0.81*	0.39
E-commerce	-0.0001	0.19	0.17	0.25	0.03	0.33
BPO	-0.13	0.23	0.36	0.32	-0.38	0.37
E-gov.	0.15	0.24	0.89**	0.32	-0.62	0.41
ERP	0.005	0.23	-0.17	0.30	0.15	0.40
GIS	0.57	0.36	0.45	0.45	0.96	0.67
Website	0.31	0.18	-0.01	0.25	0.43	0.31
Call centre	-0.17	0.55			-0.18	0.64
Training	0.14	0.22	0.08	0.27	0.02	0.39
Access to finance	-0.20	0.24	-0.35	0.28	-0.19	0.52
Constant	5.54**	0.49	5.85**	0.87	5.47**	0.82
R ²	0.14		0.26		0.18	
Obs.	156		79		77	

Note: ** significant at 5% level, * significant at 10% level.

V. USEFUL POLICIES FOR THE IT INDUSTRY

In this section, useful policies for the IT industry are considered from the responses of IT firms. Infrastructure development and tax exemption seem to be the most preferred policies for the development of the IT sector (Table XVII). Export promotion and training of engineers are other preferred concerns of the

firms. These are consistent with the results on productivity derived in the previous section.

TABLE XVII
USEFUL POLICY FOR IT BUSINESS (PER CENT)

	1 st preference	2 nd preference	3 rd preference
Infrastructure development	64.8	0	0
Tax exemption	21.2	51.7	0
Export promotion	6.7	20.0	34.4
Trade licensing facilitation	2.2	8.3	9.4
Export licensing facilitation	.6	2.5	10.9
Training of engineers	2.8	14.2	43.8
Others	1.7	3.3	1.6

Establishing more IT parks could solve the infrastructure bottlenecks for the IT industry. About 87 per cent respondents shared the view that IT parks are necessary for the development of the IT industry in Bangladesh. They suggest that a Park should have the facilities like training institute (41 per cent), uninterrupted electricity (42 per cent), foreign companies contact points (20 per cent), etc. (Table XVIII).

TABLE XVIII
IMPORTANT FACILITIES FOR IT PARK (PER CENT)

Facility type	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Training Institute	40.6	22.8	13.9	6.8	4.8
University	4.0	9.4	6.7	9.5	11.2
Conference centre	4.6	18.7	21.8	18.9	18.4
Library	.6	4.7	9.7	18.2	17.6
Hostels	1.7	1.8	2.4	4.7	5.6
24 hours electricity & other infrastructure	42.3	20.5	18.2	10.8	2.4
Bank		2.9	9.1	14.2	12.8
Foreign companies contact points	5.1	18.1	16.4	14.9	24.8
Other	1.1	1.2	1.8	2.0	2.4

For the overall development of the IT industry in Bangladesh, more IT clusters/parks, more skilled workforce, more infrastructure, more training institutes seem to be required. Moreover, industry-academia linkages and foreign direct investment (FDI) are necessary to reap the benefits of this industry (Table XIX). They also suggest that these facilities will further help attract more foreign investment in this sector.

TABLE XIX
SUGGESTIONS FOR FURTHER DEVELOPMENT OF THE IT INDUSTRY

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
More clustering	10.9	6.0	4.0	3.7	6.9
More skilled workforce	35.1	19.9	8.5	6.9	6.3
More training institutes	14.4	21.4	15.6	8.0	6.9
More infrastructure	21.3	18.9	21.1	5.3	2.9
Industry-academia linkage	3.5	10.0	14.1	13.8	8.6
Foreign investment	6.4	10.4	16.6	18.1	11.4
Political stability	4.5	6.5	13.6	23.9	15.4
Reduce corruption	3.0	2.5	2.0	8.5	22.3
Partnership with other companies in the same sector in Bangladesh		2.5	1.5	6.9	9.7
Decrease VAT		1.0	2.0	4.8	9.1
Others	1.0	1.0	1.0		.6

VI. CONCLUDING REMARKS

This study analyses the productivity and performance of IT firms in Dhaka, Bangladesh. The results show that export-oriented firms are highly productive and e-governance investments are contributing to greater productivity of relatively older IT firms.

It is found that performance indicators measured by profit rates for the IT firms in Bangladesh got worsened in 2006-2007. The share of engineers seems to be negatively correlated with profit rates. This fact indicates that firms in the IT sector have adjusted market structures rather than cost structures during the downturn. This tendency is supported by the results from the regression analysis based on total productivity at the firm level. The rate of outsourcing within the domestic market is negatively and the share of exports is positively related to the level of total productivity in 2008 in this sector. It can be concluded that as for relatively old firms, which are more than 5 years old, e-governance activities

significantly contribute to the higher level of total productivity. This result indicates that if the Bangladesh government properly undertakes policies to create a Digital Bangladesh as laid down in its Perspective Plan (2010-2020), more e-governance projects will be generated, which might help the IT sector to grow up properly and efficiently.

In terms of suggestions to policies, overall infrastructure development and tax exemption are more preferred policies by the surveyed IT firms, followed by export promotion and training of engineers. For further development of the IT industry, it is recommended to target these factors in supporting this industry.

REFERENCES

- BASIS. 2010. Bangladesh Association of Software and Information Services website, <http://www.basis.org.bd/>
- Dachs, B., B. Ebersberger, S. Kinkel and B. Waser. 2006. "Offshoring of Production—A European Perspective." European Manufacturing Survey. Bulletin No. 2.
- Houseman, S. 2007. "Outsourcing, Offshoring, and Productivity Measurement in U.S. Manufacturing." *International Labour Review*, 146 (1-2): 61-80.
- Hossain, M., N. Shinkai, M. Yunus and Z. Bakht. 2011. *Integration of ICT Industries and Its Impact on Market Access and Trade: The Case of Bangladesh and India*. SANEI Working paper series, Nos. 11-16. South Asia Network of Economic Institutes.
- Hulten, C., E. Bennathan and S. Srinivasan. 2006. "Infrastructure, Externalities, and Economic Development: A Study of the Indian Manufacturing Industry." *The World Bank Economic Review*, 20(2): 291-308.
- Kraemer, K., J. Dedrick and D. Dunkle. 2010. *Offshoring of Software Development: Patterns and Recession Effects*. Irvine: University of California.
- Kumar, N. 2001. "National Innovation System and the Indian Software Industry Development." Background paper for the World Industrial Development Report, Vienna, UNIDO.
- Kumar, N. 2005. "Indian Software Industry Development: National and International Perspectives." In S. Ashwani and M. Vijayabaskar (eds.), *ICTs and Indian Economic Development*. SAGE Publications.
- Lateef, A. 1997. "Linking up with the Global Economy: A Case Study of the Bangalore Software Industry." NIOP, DP/96/97. Geneva: International Institute for Labour Studies.
- Lewin, A. and V. Cuoto. 2007. *Next Generation Offshoring: The Globalization of Innovation*. Durham, NC: Offshoring Research Network. Duke University.

- Marugami, T., T. Mimura, K. Saito, M. Suzuki and T. Kotaka. 2005. "Survey Report on Overseas Business Operations by Japanese Manufacturing Companies." JBIC Review No. 13.
- NASSCOM. 2009. *Strategic Review 2009*. NASSCOM.
- OECD. 2002. *Measuring the Information Economy*. OECD.
- _____. 2010. *OECD Science, Technology and Industry Outlook 2010*. OECD.
- Piazolo, D. 2001. "The Digital Divide." *CESifo Forum*, 2(3): 29-34.
- Poverty Reduction and Economic Management Unit, the World Bank .2007. *Bangladesh: Strategy for Sustained Growth*. Bangladesh Development Series Paper No. 18. The World Bank.
- Solow, R. 1957. "Technical Change and the Aggregate Production Function." *Review of Economics and Statistics*, 39:312-20.