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Assessing the Business Value of Information Technology in Global Trade Services

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1. Introduction

In 1980, the information technology (IT) capital as a share of capital stock was 4.1 percent for the financial services industry and 7.5 percent for all industries in the U.S. By 1991, IT's share of capital in the financial services industry had more than tripled to 15.3 percent compared to 13.8 percent for all industries (Roach 1993). The commercial banking industry spent 11.6 billion dollars on systems technology in 1988, which was almost 300 percent higher than it was in 1980 (Steiner and Teixeira 1990).

In view of the importance of IT in the FSS, the measurement of the value of IT is an important consideration for management. Unfortunately, the IT value measurement research is still in its infancy (Barua, Kriebel and Mukhopadhyay 1993). The majority of empirical analyses have not found any strong evidence for the impact of IT (Brynjolfsson 1993), even though a few recent studies have reported some positive findings (e.g., Brynjolfsson and Hitt 1993). In addition, the IT value research has not made much headway in the FSS.

Our assessment of the IT impact is at the product level. Since many banks organize product areas as profit centers, such an assessment would help managers make more informed decisions in terms of their IT investments. It should also be clear to an observer in the banking industry that the production processes across the different product areas are not homogeneous. The roles of IT and labor, as well as the information flows and decision tasks may vary from product to product. Hence aggregating across product lines may lead to spurious results if the IT impact is not uniform (Kauffman and Weill 1989).

We focus on the trade services application in Global Wholesale Banking. We use the production function approach to estimate the impact of IT in this application. Our estimate of the output elasticity of IT is positive and statistically significant. In addition, we find that the return on investment of IT (increase in dollar revenue per dollar spent in IT) is about 100% per year, holding labor input constant. Our study provides one direct evidence that IT has a favorable impact on productivity in the financial services sector.

The organization of the paper is as follows. In Section 2, we describe the trade services area and the role of IT in this business process. In Section 3, we present our results. We offer some concluding remarks in Section 4.

2. Trade Services

The main product in trade services is the letter of credit (LC). It is a fundamental import/export bank product. It constitutes the exporter's assurance of a payment to the seller if the terms and conditions of the document are met for goods or services delivered within a specified period. Letters of credit do not appear on bank balance sheets. Instead, they appear in the footnotes without the details on the credits the letters are backing. Since they provide a means for banks to increase earnings without having to reflect the transactions as income-producing assets on their balance sheet, trade services products represent off-balance sheet (OBS) financing activities (Khambata 1989). A bank essentially undertakes the guarantee that should a party to an export or import financing transaction not be able to perform according to the provisions of the LC, the bank will perform in its place. In return for this guarantee, banks are able to reap generous annual fees.

The issuance of a letter of credit is initiated when a customer submits a formal application to the issuing bank. The bank evaluates the credit standing of the buyer and issues a letter of credit and forwards it to the beneficiary through the advising bank (beneficiary's bank). The role of IT in the trade services business process is to enable buyers and beneficiaries to electronically initiate and track their requests. Moreover, it makes possible the integration of the trade services system with funds transfer and general ledger systems, leading to improvements in the service delivery value chain. This occurs through the automated initiation of trade services related payments. It also enables the appropriate financial controls to be effected on an intra-day basis to manage risks, and creates the link that supports automated accounting and financial performance evaluation.

3. Results

Our primary data collection effort began in 1992 and involves the trade services operations of banks located in the U.S. Our data collection instrument was pilot tested and mailed to eighteen banks that agreed to participate in our study. There are two main reasons that constrain our sample size. First, the off-balance sheet market is very concentrated with the top twenty U.S. banks dominating the market (Khambata 1989). Second, some banks do not track data at the product level. To increase our sample size, we ask for data from banks for multiple years.

We estimated the Cobb Douglas function that provides an excellent fit to our data set. The estimated parameters are all statistically significant. As expected, the estimated function exhibits a positive disembodied technological change. The function is characterized by mild decreasing returns to scale. That is, if we increase both labor and IT by 1%, the revenue will increase little less than 1%.

The most important result from our perspective is the estimate of the output elasticity of IT measuring the percentage increase in output for a percentage increase in IT input only. The estimate of the elasticity is 0.1 and significant. Since the value of the output is on the average 10 times the value of the IT input in our sample, the return on investment of IT (increase in dollar output per dollar invested in IT) is about 100% per year, holding labor input constant.

We also compare our results with two recent studies. Both Loveman (1994) and Brynjolfsson and Hitt (1993) used the Cobb Douglas formulation to study the productivity impact of IT. Loveman found that the output elasticity of IT capital was either zero or negative based on data from sixty large manufacturing companies for the period 1978-84. Brynjolfsson and Hitt, on the other hand, found the elasticity to be positive based on a more recent data set of 380 large firms for the period 1987 to 1991. They calculated the return on IT investment to be about 54.2% per year. Our results seem to be more in line with Brynjolfsson and Hitt who attribute the positive results to the recency of their data. Our data covers roughly the same period as theirs. However, the higher return on IT investment we obtained is probably specific to the trade services area.

4. Conclusion

In this section, we discuss the strengths and weaknesses of our work. In addition, we also explore the managerial implications of our results.

Strengths and Weaknesses. Much of the earlier work on the business value of IT did not have a strong theoretical foundation (Kauffman and Weill 1989). In this research, we build our work on microeconomic production theory. The extensive research on production economics makes the identification of the input and output variables for the production model a relatively simple task. A second advantage of using microeconomic production theory is that a variety of theoretically established functional forms and their estimation techniques are available for the production model estimation. However, one problem of using this theoretical framework is that data availability can be a difficult issue in the FSS. In our case, we were able to obtain cooperation from a number of banks to assemble our data set.

Another set of advantages of this research accrue from our strategy to focus on a specific application area. First, unlike assessing IT impact using the organization as the unit of analysis, it does not involve the aggregation across a large number of processes where some applications may be effective while others may not be. Second, it allows us to open the black box of information technology usage and trace the effect of IT on specific processes and tasks. Thus we were able to understand the role of IT in the trade services area and measure the output and IT input specific to this area. Third, from a practical perspective, the evaluation of IT applications is important because budget and investment decisions are often made at the application level.

We are also quite certain about the quality of our data. For each bank, we worked directly with the manager of the trade services area. As a result, we were able to discuss the goal of our study to the respondent and explain the definition of the variables used.

Managerial Implications. How do our results help management understand the impact of IT in trade services? First, it indicates that IT has a significant correlation with output in the trade services area. While our production function analysis does not establish causality between IT investments and output, our results seem to indicate a substantial positive contribution of IT toward output in this product area. We suspect that the largely negative or insignificant IT impact reported by a large number of studies in the past (see Brynjolfsson 1993) has caused a dilemma for management today. On one hand, the popular press is replete with stories of successful strategic use of IT. On the other hand, the research results do not seem to bear out the positive contribution of IT. Our results seem to be consistent with a growing recognition that the prior work in this area did not contend with the difficult measurement problem involved in this area (Kauffman and Weill 1989).

We have attempted to address the measurement problem by taking at least four steps. First, we have adhered to the rich theory base of microeconomic production research. Second, we focused on a specific product area to avoid the aggregation of IT impact over a number of areas. Third, we carefully defined the measures of output and inputs for the trade services area. Fourth, we embarked on primary data collection to overcome the lack of data problem and to exercise a high level of control over data integrity.

We want to express at least three cautions against over interpreting our results. First, our results are based on one product (trade services) area of one industry (global wholesale banking). Obviously, the magnitude of the IT impact will vary across financial products and industries. Moreover, the direction of the impact can not be guaranteed to be positive in all cases.

Both the rapid rate of change of the technology and the competitive pressures to improve customer service using IT may force negative returns in some cases. We call for more work in this area across different products and industries within the financial services sector.

Second, we want to point out the difficulty of measuring the IT input. Very often, secondary data do not capture all components of the IT input. We were able to account for expenditure on hardware, software, telecommunications and peripherals in this study from our primary data collection effort. However, the prevailing norms of accounting for IT expenses are less than satisfactory. For example, while some items of the IT expenses are the result of direct purchases made by the product group (e.g., desktops and consulting services), other items are allocated to the product group from the central facility. In addition, the current accounting procedure treats software development cost as an expense item although the software is used for multiple years.

Third, we should restate the simple fact that IT alone does not guarantee higher performance to organizations. Our results show that the output elasticity of labor far exceeds that of IT. The same is true for the return on investment measure. This result is consistent with the fact that IT in trade services involves more in the way of decision support than simple automation of processes. In other words, the labor input still holds the key to the output achievement in this area.

While justifying the past IT investments in itself has significant managerial implications, it does not provide specific directions for making future IT investments. Future work should be aimed at understanding the relationship between system characteristics and performance which will enable us to make prescriptive suggestions to managers designing their future IT investment strategies.

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