

**ICT - FIRM LEVEL PRODUCTIVITY
– A SELECT DIAGNOSTIC ANALYSIS**

by

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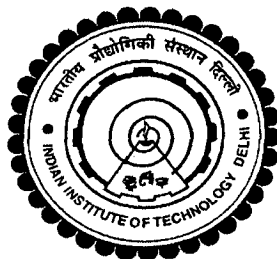
Department of Management Studies

Submitted

in fulfillment of the requirements of the degree of

Doctor of Philosophy

to the



**INDIAN INSTITUTE OF TECHNOLOGY DELHI
OCTOBER 2008**

CERTIFICATE

This is to certify that the thesis titled 'ICT - Firm Level Productivity – A Select Diagnostic Analysis', being submitted by Pappu Raja Sekhara Sarma for the award of degree of Doctor of Philosophy by the Indian Institute of Technology, Delhi, is a bonafide record of research work carried out under my guidance and supervision. The results presented in this thesis have not been submitted to any other University for award of any degree or diploma.



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ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my guide Prof. Vinayshil Gautam whose valuable guidance and help during the entire doctoral program, has enabled me to carry out this research work. His sagacity and vision has been imperative in guiding me throughout the study. This thesis could not have been conceived, designed and delivered without his explicit support. I would like to testify to highly supportive role that my supervisor played throughout my doctoral journey.

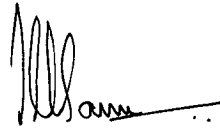
I am extremely indebted to all other distinguished faculty members of the department for their encouragement, help, and timely advice for keeping my spirits high throughout the study to enable its successful completion.

The study would not have been possible without the active participation of the organizations that formed a part of this study. I am grateful to all those executives and managers who spared their valuable time in providing me with useful data and information, required for research study.

I feel obliged to place on record, my thanks to the entire department, colleagues and friends who not only were a great support but also made stay IIT a memorable one.

Last but not the least a special thanks to my father, mother who always have been my source of inspiration. I feel short of words to express my gratitude to my wife and other family members for their support, love, encouragement and blessings during the course of my research study.

Above all, without the blessings of God Almighty, this endeavour would not have borne.

A handwritten signature in black ink, consisting of stylized, overlapping loops and a long horizontal stroke at the end.

(PAPPU RAJA SEKHARA SARMA)

ABSTRACT

Convergence of Information Technologies (IT) and Communications has opened up a new vista in the business scenario of almost all industries. The usage of Information and Communication Technology (ICT) systems at different levels in firms irrespective of their industry of operation has brought a sea change in the development of firms. Office systems of many organizations are gradually moving from physical offices to virtual offices and from virtual offices to mobile offices.

In the present day situation, firms are spending increasing amounts of capital on information and communication technologies, it is felt very important to understand the relationship between information and communication technology investments and firm's productivity. This study tries to look into the relationship between investment in ICT systems and the over all output of the firms. For this research the impact of commitment from the leadership is also studied. The experimental/observational domain of the study is spread across several industries where in firms having ICT infrastructure for a select dimensions of usage.

The impact of usage of ICT is reflected in many ways, such as changes in Work flows and job designs, Staffing patterns, Performance appraisal systems, Office document systems, Operational flexibility, Inter-organization and intra-organization communications, Methods of monitoring and control, Approaches to decision making, Product development to production to marketing to sales to customer service, Finance and accounting etc. The use of ICT could help the firms to be fast in response, be more efficient, be better coordinated at reduced costs and generate strong linkage

between man-machine resources. Of particular interest is - the ability of ICTs to raise firm level productivity. In simple terms 'Productivity' measures the efficiency of transformation from inputs to outputs and is an important determinant of economic growth and also refers to how efficiently inputs are transformed into outputs.

Because productivity is the fundamental economic measure of ICT's contribution, it should be closely examined at macro level (the industry level) and micro level (firm level). Porter (1990) mentions, "Firms not nations compete in international markets". This necessitates ascertaining the productivity improvement at firm level for measuring improvement in productivity at industry level. Therefore it is worthy to observe the impact of ICT on productivity at firm level.

This study tries to explore the relationship between ICT investments and productivity at firm level. While the impact of ICT spending on firm level performance has been studied for the past several years, some findings of the studies have been inconclusive, that lead to 'Productivity Paradox'.

As several of the firms, in the recent past, have involved in reengineering their business processes and ICT is used at every business activity and between different activities, there is a need for commitment from apex leadership for better usage of ICT and better coordination between different activities and systems across all functional areas of the firms. In this study the dimension named leadership commitment is considered as an important dimension along with ICT spending to diagnose the impact on firm level productivity.

A comprehensive review of literature was carried out in the field of Information and Communication Technologies along with its related concepts of measuring impact of ICT on firm level perspectives. This meant undertaking a detailed study of published material, research journals, dissertations, conference proceedings, governmental and non-governmental reports, books and other publications. This helped to group the schools of thought viz., measuring impact of IT/ICT on firm and industry level productivity, ICT's contribution to economic growth, measuring importance of top leadership commitment for improved firm level usage of ICT systems, impact of ICT on strategic and operation productivity and finally the relationship between improved ICT usage and its impact on work methodologies. Also earlier studies that are similar to the present problem are studied.

The research undertaken is diagnostic in nature. The conceptual frame work once developed led to the defining of the universe of study. The scope of the study was confined to select Indian firms that are having ICT infrastructure from several industries. The study was conducted by observing the firm level impact of ICT in a cross-sectoral scenario. About 53% of firms of the sample are from manufacturing sector and 47% of firms are from service sector. To complete the picture from the primary and secondary sources, a structured questionnaire was developed. SPSS software version 15.0 was used for quantitative data analysis. The statistical analysis was both descriptive and inferential and included regression analysis techniques. For qualitative study, two different firms were selected and data was collected through the study of various available documents in the two firms. Also semi-structured interviews were conducted with the ICT managers of the two firms. To study how the other factors affect the relationship between ICT and firm's productivity and for

developing an analytic frame work Interpretive Structural Modelling (ISM) methodology was used. The method supported group judgment on the extent and nature of relationship among elements. The interpretations of the group were used to draw an overall structure from the complex set of elements. A detailed examination of cases led to the identification and analysis impact of investments in ICT on firm level productivity and the importance of commitment from the top leadership that is acting as catalyst in the whole process of improving productivity.

The findings from the qualitative analysis were corroborated with the findings from the quantitative data analysis. The findings from qualitative analysis were validated and strengthened the findings of quantitative study. The collation of qualitative and quantitative findings helped in delineating an integrated framework.

The cross analysis using the quantitative and qualitative data led to a detailed insight in to the overall impact on firm's productivity with the intervention of ICT across the firm. Finally the study led to a network of relationships depicting the complex web of interactions between the various parameters that are involved in improving the ICT usage and the resulting improved select dimensions of productivity. The study also helped to understand and identify the importance of leadership commitment in the overall usage of ICT systems that helped in improving firm level productivity.

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