

**EFFECTIVENESS OF TECHNOLOGY TRANSFER
FROM
DEFENCE R&D TO PRODUCTION AGENCIES –
A STUDY OF SELECT TECHNOLOGIES**

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**Submitted
in fulfillment of the requirements of the degree of
Doctor of Philosophy
to the**



**INDIAN INSTITUTE OF TECHNOLOGY DELHI
HAUZ KHAS, NEW DELHI**

DEC 2003

CERTIFICATE

This is to certify that the thesis entitled '**Effectiveness of Technology Transfer from Defence R&D to Production Agencies - A Study of Select Technologies**' being submitted by **Mr. Vijay Kumar Devgan** to the Indian Institute of Technology Delhi for the award of the degree of **Doctor of Philosophy (Ph.D.)**, is a record of *bona fide* research work carried out by him. He has worked under our guidance and supervision and has fulfilled the requirements for the submission of the thesis, which has attained the standard required for a Ph.D. degree of the Institute. The results presented in this thesis have not been submitted elsewhere for the award of any degree or diploma.



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ACKNOWLEDGEMENTS

I wish to acknowledge, with a deep sense of gratitude, the valuable guidance, inspiration and encouragement that I received from Prof Sushil, in accomplishing this work. It is only due to his immense help and continuous encouragement that it was possible to undertake and complete this work.

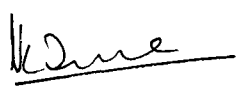
I am indebted to Dr. Kiran Kumar Momaya for his help and useful guidance at various stages of this study and in its completion.

I am also highly grateful to the Head of Department, Chairman and members of SRC, and faculty members of the Department of Management Studies, IIT Delhi, for their very useful suggestions, from time to time, during the study.

My sincere thanks go to Director ITM, DRDO HQrs and DRDO establishments for their unstinted support in providing useful and relevant information in the preparation of this thesis. In particular, I owe to Maj Gen (Retd) R Swaminathan, then CC R&D (R), for sparing his valuable time in discussing the real issues and the encouragement given in completing this thesis.

Last but not the least, I am beholden to my wife Neha, and little children, Sahil and Surbhi, who patiently suffered their neglect on my part, due to my busyness during my work.

I also wish to record my sincere thanks to all those, who helped me in completing this work in time.


(VIJAY KUMAR DEVGAN)

Abstract

In the present scenario, science and technology play a vital role in the existence and development of a nation. National security, industrial dominance, economic growth, environmental preservation and protection, and in fact the very survival of a nation depends on technology. Its role in economic growth has been well recognized by the well-known economists Boskin, Lau, Mansfield and Solow.

Technology and warfare are closely related and in modern times technology is viewed as force multiplier in defence parlance as much as an economic multiplier to a society. Al Ali (1995) has emphasized that more than 50 per cent of world investment in science and technology is directed towards the production of ever more sophisticated weapons and armaments. Technology being the source of competitive advantage compels a nation to be self-reliant in defence also, if it wants to hold the key to power and key to structuring international relations.

In order to achieve self-reliance, technology has not only to be developed indigenously but the indigenous developed technology has to be effectively transferred to production agencies for achieving the desired objectives. In India, out of the national investments on R&D activities, 67 per cent of R&D expenditure incurred by the central government (in 1998-99). Out of the central government R&D investments, Defence Research and Development Organization (DRDO) was the biggest spending agency (31.8 per cent) towards R&D. Technology transfer from Indian defence R&D unlike other R&D organizations has some peculiarities and faces challenges to fulfill the objectives of concerned organizations. It was, thus, imperative to understand the factors governing the effective technology transfer from defence R&D to production agencies and evolve a model showing the impact of various input factors on the outcome of technology transfer effectiveness.

An extensive literature was reviewed in order to identify the important variables leading to the formulation of constructs of input and output factors of technology transfer effectiveness. Six case studies were conducted in the select organizations and were analyzed using Situation-Actor-Process Learning-Action-Performance (SAP-LAP) framework for the identification of important issues of technology transfer and hypotheses formulation.

Questionnaire approach was used for the primary data collection and the same was analyzed using statistical package. Factor analysis was used for the construct validity of input and output factors along with their variables. Total 23 projects selected for the data collection were grouped into two clusters using cluster analysis. These groups were identified as effective and less effective technology transfer projects. Project wise analysis has found the difference between the actual and ideal values of all the variables of the total projects. Percentage deviations of actual from ideal values were calculated for all the variables of total projects and were totaled up project wise. Projects having more percentage of deviation values were segregated into less effective projects. Percentage deviation of actual from ideal was also used in the identification of important variables needing more attention for making technology transfer an effective process. Nine hypotheses of association made in the study like active and continuous communication between Production Agency (PA) and Development Agency (DA) has a positive correlation with effectiveness of technology transfer etc. were tested by using correlation analysis. Here correlation among three output factors and four input factors were identified. For testing the Null hypothesis that there is significant difference between actual and ideal values of variables of each project, 't' test was performed.

A structural model of technology transfer effectiveness showing the impact of four input factors 'design and organizational flexibility, mutual trust and motivation of PA, PA's interest in production and user's participation and

commitment' on the three output factors 'time and cost performance, operational performance and user's satisfaction and induction' was developed which was validated with the feedback from the production agency and the user.

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