
Introduction: Improving manufacturing performance through technology diffusion, implementation and management

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The role of technology management in achieving improved manufacturing performance has been receiving increased attention as enterprises are becoming more exposed to competition from around the world. In the modern market for manufactured goods the demand is now for more product variety, better quality, shorter delivery and greater flexibility, while the financial and environmental cost of resources has become an urgent concern to manufacturing managers.

This issue of the *International Journal of Technology Management* addresses the question of how the diffusion, implementation and management of technology can improve the performance of manufacturing industries. The authors come from a large number of different countries and their contributions cover a wide range of topics within this general theme. Some papers are conceptual, others report on research carried out in a range of different industries including steel production, iron founding, electronics, robotics, machinery, precision engineering, metal working and motor manufacture. In some cases they describe situations in specific countries. Several are based on presentations made at the UK Operations Management Association's Sixth International Conference held at Aston University at which the conference theme was 'Achieving Competitive Edge: Getting Ahead Through Technology and People'.

The first two papers deal with questions of advanced manufacturing technology implementation and management. Firstly Beatty describes a three year longitudinal field study carried out in ten Canadian manufacturing companies using CAD/CAM and CIM systems. Her findings relate to speed of implementation, choice of system type, the role of individuals in implementation, organization and job design. This is followed by a paper by Bessant in which he argues that a more a strategic approach should be taken towards the management of technology in the 1990s and beyond. Also considered in this paper are the capabilities necessary in order to deploy advanced manufacturing technology as a strategic resource and the way such capabilities might be developed within the firm. These two papers, which deal largely with the implementation of hardware, are supplemented by Samson and Sohal's contribution in which they argue that a much wider perspective should be adopted based on a new approach to manufacturing strategy formulation.

Technology transfer is the topic of the following two papers. Pohlen again takes the case of advanced manufacturing technology and reports on his research which considers the factors contributing to successful realisation of AMT transfer. The paper by Lee then provides a more detailed account of technology transfer in the foundry industry. Using a case study based on a firm which has implemented a number of transferred innovations a model is illustrated in which the 'performance gap' can be identified and closed.

The diffusion of technology is addressed in the next two papers. In the first of these,

by Lowe and Sim, the managerial technologies of 'Just in Time' and 'Manufacturing Resource Planning' (or MRP II) are examined. A study is described from which a number of factors are found to influence the adoption process including, rate of diffusion and size. Dahlin then considers the case of a specific item of hardware technology, the industrial robot. Her paper reviews the history of robot diffusion since the early 1960s and then tries to predict how the industry will develop in the future.

The following two papers deal with the future of manufacturing in a more general sense. The future implementation of advanced manufacturing technology is the subject explored by de Haan and Peters who describe the results of their Dutch Delphi forecasting study conducted among a panel of experts including scientists, consultants, users and suppliers of AMT. Busby and Fan then consider a type of organisational model, 'the extended manufacturing enterprise', which would represent a distinct alternative to pure market-led and command structures by exploiting the shared knowledge of suppliers and customers.

The three country-based papers consider some strategic issues relating to manufacturing technology. In a paper based on investigations conducted in China He, Liff and Steward report their findings from strategy analyses carried out in the steel and watch industries with a view to assessing technology needs and organizational change requirements. This is followed by Tang and Nam's paper which examines the case of the machinery industry in Korea and its emerging importance as a key sector in the Korean economy. In his paper which focuses on Venezuela, Ernst then considers the particular problem of how this country can address the problem of falling oil revenues. He sees manufacturing as being an important contributor to Venezuela's future economy and proposes a means whereby government and private enterprise can co-operate in the development of the manufacturing sector.

The last six papers all deal with specific topics relating to the management of manufacturing. Firstly Youssef looks at the question of manufacturing flexibility, introducing and testing a conceptual model that relates computer based technologies to flexibility. Dangerfield's paper which follows is based on research conducted in the steel industry. He considers the question of scale and proposes a modelling approach for determining the plant configuration necessary to meet market demand. Engström presents the results of a detailed investigation into the need for reorganising material flow where group assembly of products has been adopted. Sherwood, Guerrier and Dale then report the findings of a study into the effectiveness of Quality Circle implementation. Stillwagon and Burns, consider how manufacturing competitiveness can be improved in individual firms by describing how the application of 'human performance engineering' can be used to motivate individual performance as well as to integrate organizational goals. Finally Sohal, Lewis and Samson describe, using a case study example, how just-in-time control can be applied within the context of computer numerically controlled flexible machining lines.

The papers in this issue of the *International Journal of Technology Management* cover a wide range of topics relating to the general question of improving manufacturing performance through the dissemination, implementation and management of technology. Although they differ markedly in content and approach, they have the collective aim of addressing the concepts, principles and practices which provide a better understanding of the technology of manufacturing and assist in achieving and maintaining a competitive edge.