

# Effective University – Industry Interaction: A Multi-case Evaluation of Collaborative R&D Projects

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There is a growing world-wide trend toward greater collaboration between academia and industry, an activity encouraged by governments as a means of enhancing national competitiveness and wealth creation. Warwick Manufacturing Group (WGM) is well known for its extensive links with industry, and provided an excellent opportunity for a study of management practice within university–industry collaborative research projects. This paper evaluates the findings of six collaborative research projects. The objective was to identify factors which, if managed correctly, increase the probability of a collaboration being perceived as successful by both academic and industrial partners. The outcome was a good practice model for successful university–industry research collaborations. © 2002 Elsevier Science Ltd. All rights reserved.

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## Introduction

Against a background of increasing international competition and rapid technological change, governments are actively encouraging collaboration as a means of improving innovation efficiency and thereby enhancing wealth creation. Collaboration provides companies with the means by which to

advance technologically, at lower cost and with less inherent risk. Collaboration also provides access to a greater breadth and depth of knowledge and technologies than would normally be possible through internal development. For universities the benefits include additional public and private funding, and increasingly, licensing and patenting income, as a result of technology transfer activities.

However, these considerable potential benefits are often not realised in practice. The major reason is that collaborations between, often diverse, organisations, need considerable management effort in order to be successful (Dodgson, 1991). Given the substantial investment (both public and private) currently being made in collaborative research activities, it is clearly important to ensure that collaborations are managed effectively, and the benefit achieved maximised.

Warwick Manufacturing Group (WGM), University of Warwick has, since its foundation in 1980, established a substantial involvement in collaborative research with industry. The Group therefore provided an excellent opportunity for a study of management practice within university–industry collaborative research projects. This paper discusses the findings of six case study research projects involving WGM and a number of industrial partners. The objective was to identify factors which, if managed correctly, increase the probability of a collaboration being perceived as successful by both academic and

industrial partners. This was achieved by conducting a thorough review of current research in this area through the published literature, thus providing a basic framework of success factors which were then validated through empirical evidence provided by the case study projects. The outcome was a good practice model for successful university-industry R&D collaborations. Furthermore, the success factors identified from the case study projects have been organised according to a number of key themes, thus providing a useful structure to the model. This structure provides some insights into the key areas which require particular attention in the successful management of such ventures.

## Research Approach

This research brings together the results of a thorough review of the published literature in the field of collaboration management and empirical evidence provided by six separate case studies. A cross-case analysis was subsequently conducted in order to identify any common themes and factors to emerge from the cases, as well as to facilitate comparison between the cases and the literature. Many of the WMG's joint research activities involve the automotive and aerospace industries, and it was therefore logical to select cases within the Group's research portfolio with representation from these industries. Of the six cases, five projects were components of a larger research programme involving the automotive industry. These projects therefore formed a natural multiple case study; the projects had a number of common characteristics thereby providing natural boundaries for the study, limiting the extent of environmental variation. At the same time, these projects also differed in a number of ways, thus providing scope for a significantly different outcome in each case. The sixth project involved the aerospace industry, and whilst it shared some of the characteristics of the other five cases, it too differed in such a way as to contribute substantially to the study.

The collection of data for this research was carried out primarily through interviews with key participants in each of the projects, with supplementary evidence provided through project documentation, and direct observation of project meetings. The success of each project studied was evaluated primarily on the basis of the perceptions of these key participants, i.e. the value of the research outcomes to individual partners, and how well the expectations of each partner had been met. To balance these subjective measures of success, an objective measure of innovation was also applied, based on measurable outcomes such as number of journal papers published, number of patents filed and evidence of new product/process/technology developments. However, the emphasis placed on the *perceptions* of the key participants is justified on the basis that collabor-

ative ventures are often perceived as failures despite some significant technological and/or tangible outcomes. Since such perceptions are likely to influence the decision to collaborate in future, these subjective views are considered worthy of further study.

Influential success factors to emerge from each individual case were tabulated together in order that the cases could be compared, and patterns of similar factors could be identified. The initial cross-case analysis provided the basis for a detailed evaluation of the case study evidence, in order to establish the background and the circumstances behind the major factors to arise from these projects. The results of this evaluation are discussed in the fourth section in order to set the common factors and themes identified in context, thus providing a clearer understanding of the common issues and problems experienced across the case study projects. Further, examination of this detailed cross-case evidence, coupled with relevant findings from published research, was used as a means of identifying possible solutions to the problems experienced. The result is a good practice model which provides important insights into the key issues involved in the successful management of university-industry collaboration on R&D projects.

## Results of Cross-Case Analysis

Table 1 summarises the findings for each individual project, listing all factors found to have had a significant impact on the success of the project, as perceived by the participants. In each case, the factors identified were found, if correctly managed, to have a significant positive effect on the perceived success of the projects. Furthermore, the case studies also showed that where the same factors were neglected or mismanaged, there tended to be a corresponding negative impact on the perceived success of the projects. The results therefore provided clear indicators on which to base the development of a good practice model (presented in the fifth section) for the effective management of collaborative R&D projects.

Success factors in the management of collaborations, as identified from published literature in the field, can be organised into a number of key themes such as *choice of partner, environmental factors, ensuring equality and project management*. Since these key themes were also apparent in the case study evidence, the success factors identified were similarly categorised in Table 1. As the discussion in the fourth section will show, detailed examination of the case study evidence revealed a number of new success factors specific to university-industry interactions. However, the main themes or categories into which these success factors fall emerged from this research largely unchanged.

It is noted from Table 1 that no one factor or set of factors is clearly indicated to have discriminated

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