THE ROLE OF INDUSTRIAL ADVISORY BOARDS IN TECHNOLOGY TRANSFER BETWEEN UNIVERSITIES AND INDUSTRY

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ABSTRACT

This paper suggests that industrial Advisory Boards (IAB) have a significant, yet sometimes underestimated role in the transfer of technology between universities and industry, in the context of university-industry collaborative arrangements. Some barriers to technology transfer are described, and the role of the IABs in overcoming them is discussed, as a valuable forum for dynamic interaction between researchers, thus acting as a facilitator in the process of technology transfer.

1. INTRODUCTION

The collaboration between universities and industrial companies, particularly in research development and technology, is currently receiving increased impetus from various quarters. The National Science Foundation (NSF), for example, has been involved in the past few years in the planning and partial funding of Industry-University Cooperative Research Centers (IUCR) and Engineering Research Centers (ERC) assisting universities in forming a multicompany arrangement with a technology center at a university setting (NSF, 1984). Companies participating in a center pay an annual contribution, and share in the direction of the R&D programs, as well as in its potential outcomes (Eveland and Hetzner, 1982; Fowler, 1984). Other university-industry cooperative arrangements abound, and may range from sporadic visits by academic consultants or short seminars/symposia, to long term collaboration in the form of research parks and technology centers.[1] (Hise, Futrell and Snyder, 1980; Rubenstein, 1983; and Praeger and Omehn, 1980).

The more comprehensive and lasting relationships between universities and industry are also the more productive and may lead to a more effective transfer of technology between both sides of the interaction (NSF 1983; NSF 1984, Volume I; Lindsay, 1982;

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and Bloch, 1984). Although visits to companies by academic consultants may solve pressing technical problems, their effect on a lasting and productive transfer of technology is minimal, seldom contributing to such benefits as allowing industrial researchers a window to the technological state-of-the-art, access to university facilities or creating through joint efforts, start-up businesses with potential economic payoffs to all parties involved (Praeger and Omehn, 1980; Clauser, 1981; NSF, 1984). From the university's perspective, a more durable and multi-year relationship with industry is preferable, since it provides academic researchers and administrators with financial stability and research program continuity as well as the continuing assurance of resources for research and teaching -- all in times of shrinking support from government sources (Dietrich and Sen, 1981; Culliton, 1982; and Norman, 1983).

Therefore, there is a widely held belief that, if universities and industry are to enter into cooperative arrangements, a viable mode would be stable, longer term and oriented toward maximizing the potential benefits to the participants (Giamatti, 1982; Cannon, 1980; and Chakrabarti, 1983).

In this context, when industry cooperates with universities, in both the single and multicompany modes, industrial advisory boards (IABs) are usually formed. These act as committees whose role is to guide university researchers in the planning and the conduct of research programs in light of such criteria as relevancy to industrial needs and a desirable mix of "exploratory" and "applied" R&D. In most cases, company researchers are assigned to the IAB, attending perhaps quarterly or semi-annual meetings, and confining the interaction with university researchers to these IAB meetings, in addition to the sporadic contacts with academic consultants (Lien, 1973; NSF, 1982; and Eveland and Hetzner, 1982). In this paper it is contended that IABs are a more powerful mechanism than, say, the board of directors of a corporation, in that the IAB may serve as a dynamic forum for the exchange and the transfer of technological knowledge.

2. SOME BARRIERS TO UNIVERSITY-INDUSTRY TECHNOLOGY TRANSFER

There is a growing body of literature in which the many differences between universities and industry are explored. Some authors emphasize differing values as a key barrier to successful cooperation and the resultant inadequate technology transfer (Abelson, 1982; Azaroff, 1982; Lepkowski, 1982; and Geisler and Rubenstein, 1986). Others express concern with organizational barriers, existing in both industry and academic, including such factors as rules, regulations, and other bureaucratic impediments to cooperation (Giamatti, 1982; Rothwell, 1982; Rubenstein, 1983; and Fowler, 1984).

A general barrier seems to be the ongoing disagreement on the ownership and the utilization of research results. Several lawsuits have been filed since 1980 (Wade, 1980; Sun, 1984). As more high technology companies spring off university-industry cooperative effort, disagreements and open conflict will continue to mar whatever positive image is cast by successful cooperation between academia and industry (Battenburg, 1981; Wade, 1981; Cujert, 1985).

Another set of barriers includes psychological impediments to a smooth and conflict-

free cooperation. Industry researchers have formed, over the years, certain attitudes which tend to negatively stereotype academic researchers as "blue sky explorers" usually detached from practical topics (Giamatti, 1982). University researchers may generalize their perception of industrial R&D as "non-scientific" (Conway, 1981 ; Bachrach, 1983; Rubenstein, 1980). In both cases the outcome may be a widening of the gap between the groups, making cooperation more difficult.

In addition to barriers to university-industry cooperation, there are several factors inhibiting the inter-company cooperative efforts, thus also influencing the propensity of industry to cooperate with academia. Industrial companies and their R&D functions are under competitive pressures, translated into concerns about proprietary R&D effort and confidentiality. Coupled with these are concerns about antitrust regulations, all of which lead to reluctance of business executives to authorize the sharing of R&D information with other companies (Bruce and Tamaribuchi, 1981; Business Week, 1982; Denny, 1983; White, 1985).

3. THE ROLE OF IABS IN OVERCOMING BARRIERS TO TECHNOLOGY TRANSFER

3.1 FUNCTIONS OF THE IAB

Industrial Advisory Boards (IABs) are formed with the purpose of guiding university researchers or consultants in the design and the conduct of cooperative or industry funded R&D projects and programs.[2] Table 1 summarizes the various functions attributed to the IABs.

In essence, the IAB's major functions may be summarized as guidance, evaluation and diffusion of technology acquired in the cooperative effort. In order to accomplish these functions or tasks, members of the IAB need to establish a concensus on the directions the cooperative effort should take. Therefore a dynamic relationship tends to evolve among IAB members, leading to the development of interpersonal collaboration, the exchange of information and even an increase in the desire of members to explore and perhaps accept another member's perspective.

The important factor arising from the workings of the IAB as a group of professionals is the interaction among members and the dynamics of interpersonal relations thus achieved. Members bring to the IAB meetings diverse and sometimes opposing R&D priorities, directions and performance criteria, even in the case of IABs from a single corporation. The diversity is magnified in IABs composed of members from several companies (Kiefer, 1980; Chakrabarti, 1983).

3.2 HOW CAN IABS OVERCOME BARRIERS TO TECHNOLOGY TRANSFER?

There are mechanisms, activities and functions which emerge as some positive outcomes of the group dynamics of IABs. These mechanisms, listed below, enhance the capacity of IABs to overcome may barriers to technology transfer between universities and industry, and among the companies themselves.

Table 2 suggests some of the ways by which selected IAB activities and functions may overcome certain barriers. The main theme which emerges from Table 2 is the con-

TABLE 1: FUNCTIONS OF THE INDUSTRIAL ADVISORY BOARD [3]

RESEARCH AND DEVELOPMENT	ADMINISTRATIVE
-to establish general research priorities, directions, and guidelines	-to establish performance evaluation criteria
-to assess balance in the R&D program between "basic", "applied", "development" and other R&D activities	-to select and implement performance evaluation models, techniques, and procedures
-to assess the "relevance" or "utility" of research ideas, techniques and potential outputs	-to report to management on programs and performance of the cooperative effort
-to implement, or assist in the implementation of knowledge, techniques, methods and technology generated by the cooperative effort	-to recommend to management any actions on termination, continuation, renewal or changes desired in cooperative effort
-to diffuse, transfer, and channel information, knowledge, and techniques provided by the cooperative effort to the rest of the company	-to maintain communication mechanisms with the cooperation partners and to serve as "gatekeepers" for technical and administrative information from the cooperative effort and its participants

TABLE 2: SOME SUGGESTED MECHANISMS FOR OVERCOMING BARRIERS TO TECHNOLOGY TRANSFER IN UNIVERSITY-INDUSTRY RESEARCH RELATIONSHIPS

Some Barriers to Technology Transfer	May be Overcome By: Some Suggested Mechanisms of IABs
-Reluctance of industrial R&D managers to assemble in light of anti-trust regulations	-IAB meetings/symposia are a neutral mechanism for assembly and inter-company conferencing
-Psychological barrier: Negative or disparaging perception of the "other" researchers	-IAB contacts/meetings/exchanges/group dynamics provide opportunity to learn about each other and dispel negative perceptions
-Disagreement on ownership of research results	-Meeting within IAB framework allows for discussion of policy, guidelines and mechanisms which may lead to concensus and acceptable arrangements
-Time constraints for industry researchers to absorb current state-of-the-art	-IAB meetings allow for interaction with academic researchers and other industry researchers and the free exchange of information
-Organizational constraints on university and industry researchers in their interaction with external sources	-IAB sponsored contacts remain, are strengthened by periodic interaction and allow for increase in informal communication and transfer
-Lack of recognition of interests common to both industry and universities	-IAB sponsored contacts, meetings and interaction may help to generate and reinforce common interests

tribution by IAB activities to the formation of communication links among university and industry researchers. IAB sponsored activities provide a periodic forum for the exchange of information, ideas, and technology. These activities (meetings, symposia, seminars, exchanges of materials and memos) are held in a "neutral" atmopshere, directed toward a common objective agreed upon by both parties to the interaction. In a simplistic manner, the IAB is instrumental in simply bringing together, into the same place and at the same time, a diverse agglomeration of researchers, who, under other conditions would have not consented to assemble. The resultant dynamics of such a grouping is then translated into an improved communication network, the weakening of resistance factors and possible changes in the perceptions, attitudes and behavior of the researchers. Recently, Bailey, Cooper and Kramer (1985) suggested that: "For an effective technology transfer system to function between the educational community and the private sector community.... the institutional thinking of both must change" (p.22).

The changes advocated require on-going linkages between the parties, and unless there is a "resident agent" in each institution (university and company), a plausible alternative is a forum for personal interaction and exchange of information. IABs may provide such a forum, thus facilitating technology transfer.

4. CONCLUSIONS

This paper advanced the notion that IABs are a forum for interaction between industry and university researchers, thus facilitating the transfer of technology between the parties. Not all IABs are successful at creating lasting and effective interactions. This paper suggests that there is potential for improved communication, although the actual scenarios may vary. Moorehead (1985) lists universities as "...an increasingly fertile source of technology transfer opportunities" (p.11). In addition, Blumenthal et al, in a 1984 study of biotechnology companies, estimates that industry accounts for 16 to 24 per cent of all university biotechnology R&D (p.44).[4] Such massive support would require joint guidance and this is provided by IABs. However, the setting up of a UIRR framework does not guarantee a problem free enterprise. On the contrary, there are many risks and difficulties involved (Geisler and Rubenstein, 1986 and Blumenthal et al, 1986). Finally, the success of UIRRs and the many high-tech companies which evolve from them, depend on an effective transfer of technology between universities and industry. IABs exist in many UIRRs, therefore both industrial companies and universities should recognize the role of IABs as facilitators in the process of technology transfer.

ENDNOTES

[1] A commonly used term which describes the relationship discussed in this paper is: University-Industry Research Relationships (UIRRs). See Blumenthal, Gluck, Louis and Wise (1986).

[2] The term Industrial Advisory Board (AB) is used in this article in a generic mode.

The term includes any committee or group of people established by corporations and/or universities with the purpose of fostering communications, guidance and exchange of information of all kinds between the business community and academia, in the overall area of research, development and innovation.

[3] The main source for the compilation of the table was the author's interviews with 22 members of IABs during several periodic meetings within the framework of the IUCR.

[4] See also Abelson, Phillip (1983).

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