The Technological University Library and Industry

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1. Introduction

The relationship between research universities and industry has been characterized in many ways. Some have called it a mutually beneficial arrangement of what we might call symbiosis. At the other end of the spectrum are observers who view the situation in a much more negative manner, using terms like parasitic, exploitative, and non-productive. One must hasten to add that not all of the detractors are to be found on university campuses any more than are all of the supporters in industrial research laboratories. There are many varieties of university–industry co-operation and most of them are of the successful variety, at least in the USA. This paper attempts to look at a particular model of such a relationship — the one existing at the Massachusetts Institute of Technology — to see what generalizations might be made as well as to look at a whole spectrum of activities, including those not immediately involving the MIT Libraries. This paper is divided into three main sections, as follows. 'The Environment' deals with the institutional environment as well as covering some of the history of MIT's co-operative programme with industry. 'The Resources' describes the various library and library-related activities that are provided to industry, including some that are still in the planning stage. 'Inhibitions and Controls' looks at some of the constraints that the Libraries in particular face in attempting to provide services to industry and in working with other university departments and offices in the whole area of industrial liaison.

2. The Environment

Established in 1861, the Massachusetts Institute of Technology was incorporated under the laws of the State of Massachusetts by the legislature '. . . for the purpose of instituting and maintaining a society of arts, a museum of arts, and a school of industrial science, and aiding generally, by suitable means, the advancement, development and practical application of science in connection with arts, agriculture, manufactures and commerce . . . '. The charter of the Institute was unique in the mention of 'industrial science', 'manufactures', and 'commerce', presaging the long and continuing close working relationship between MIT and industry.

In the current MIT *Bulletin,* the following appears in a section describing the organization of the university. 'The Industrial Liaison Program provides industry and other organizations access to research resources at MIT and a means of exchanging information with their MIT counterparts. Through the Program, technological developments made at MIT are transferred to industry for commercial application, helping to link work at the Institute to the solution of societal problems.'[1]

Close contact with industry is a tradition deeply rooted in the history of MIT. For well over a century, the Institute has maintained ties with the industrial community in order to preserve both the vitality and the relevance of its education and research. Over the years, the steady flow of ideas and people between the campus and the commercial world has helped inspire countless advances in such key areas as electronics, new materials, petroleum processing, engine design, health care, computers, and automation.

In keeping with the original charter of the Institute as a school that would not merely teach technical skills but rather scientific principles as the basis of industrial applications, and, at the same time, focusing on development of basic science as opposed to finished products, the current MIT programmes contain a wide range of relationships with industrial organizations. In addition to the Industrial Liaison Program, about which more will be said shortly, there are a number of other formal and informal programmes. These include but are not limited to the following:

- industrial support for research;
- exchange of faculty and laboratory personnel;
- participation of industry-based individuals in a variety of academic programmes, including Center for Advanced Engineering Studies, Sloan School of Management Program for Senior Executives, Program in Polymer Science and Technology;
- co-operative undergraduate programmes in electrical and chemical engineering;
- patent licensing;
- joint symposia and conferences.

The Industrial Liaison Program, founded in 1948, is the cornerstone of MIT's relationship with industry. The role of the ILP is to help members stay at the leading edge of advances in science, engineering, and management, allowing them to assess the potential of emerging technologies for the marketplace. In the rapidly changing world of business, the ILP can be a particularly effective resource.

The Program is especially useful to industry in understanding what has been called the 'intellectual map' of the campus. The growing complexity of modern research has caused the traditional lines between academic departments to disappear. New problems and opportunities have emerged that require the perspectives of a variety of disciplines. The structure of MIT reflects this evolution in research: new interdisciplinary laboratories and

research centres have formed, departmental names have been changed, and novel links have been forged between research groups in diverse fields.

The Industrial Liaison Program assists its member companies by providing a number of important activities:

- augmenting industrial research and technical efforts with information, perspective, and background;
- facilitating access to the expertise of MIT's faculty and research staff;
- providing information on the latest developments in almost any area of science, engineering, and management;
- establishing links to MIT resources, including libraries, laboratories, and the MIT Press;
- informing members of the latest patent licensing opportunities at MIT;
- notifying clients of special lectures, events, and educational opportunities at MIT relevant to the business community;
- introducing member organizations to the Institute's pool of talented undergraduate and graduate students.

The Industrial Liaison Program has about 300 member organizations from around the world, spanning every major industry from finance to manufacturing. Companies range in size from young start-up companies to established multinational organizations. Most often, companies which seek to join the Program see technology as the key to new product ideas and growth.

The ILP is an original concept, singular in size and scope. The staff consists of nearly 50 individuals, including 20 Liaison Officers, as well as a communications group which produces videotapes and organizes meetings, and an office information group which maintains a database on the needs of MIT faculty and member organizations. The Industrial Liaison Officer is assigned to each company as its principal on-campus contact. Officers are assigned to one of four industry groups: electronics and power, chemicals and process technology, basic manufacturing, and service (including banking, insurance, and finance). Within the groups, each officer works with a portfolio of 15 to 20 members.

The ILP provides the following basic programmes:

(1) personal meetings with faculty and staff,
(2) symposia,
(3) publications,
(4) recruiting,
(5) access to the MIT Libraries,
(6) co-operative and internship programmes,
(7) undergraduate research opportunities programme,
(8) opportunities to study,
(9) MIT Press publications at a discount,
(10) discounted subscriptions to the *Technology Review,*
(11) discounts on rental or purchase of MIT-produced videotapes,

(12) opportunities to engage in jointly sponsored research,
(13) visiting scientist and engineer programme,
(14) patent licensing.

The effectiveness of the Industrial Liaison Program during its almost 40 years of existence is evidenced in the steadily increasing number of members as well as steadily increasing volume of activity recorded.

A final word about the industrial environment. MIT is located in one of the most dense areas of scientific and technological research. The 'Route 128' complex, which rivals Silicon Valley and Triangle Research Park, is the home of hundreds of small, developing entrepreneurships, many of which are 'spin-offs' from MIT. In some cases, the MIT 'starter' has left the Institute; in others, MIT faculty and research staff maintain a joint association. Among the more famous of the 'spin-offs' are Digital Equipment Corporation, the Mitre Corporation, and the Kurzweil Company (now a part of Xerox Corporation).

3. The Resources

The resources available to industry at MIT come in many forms. As the world's leading research university, MIT presently has more than 3000 research projects underway with a total budget of more than US $500 000 000. This work is conducted by 1000 faculty, a full time research staff of 2250, nearly 4500 graduate students, and about the same number of undergraduates. Each year, the Institute graduates about 2000 students; all of the doctoral and masters degree candidates and most of the undergraduates are required to produce a thesis. All of these theses are available for a fee to the world in general, including industrial partners.

The MIT Libraries contain more than two million printed volumes, almost two million microforms, and another two million 'things', including slides, sound recordings, photographs, maps and plans, motion pictures, video recordings, machine-readable data files, drawings and scientific instruments, not to mention more than 40 million pieces of paper in the archival and manuscript collections. The Libraries subscribe to more than 22 000 serials, add more than 300 000 items each year, maintain a staff of almost 300, and remain open 106 hours per week in most libraries but 24 hours per day in the Science Library.

Services provided to industry include the following.

(1) *Borrowing privileges.* ILP company members can receive as many cards as they wish for research staff. The average is 15 per company but a few companies have as many as 100. Non-ILP companies and individuals not connected with the Institute can also obtain cards for a fee. Alumni of the Institute are given a substantial (60%) discount. Industrial borrowers may not borrow theses or reserve books and are restricted in the length of time they may charge out other material. Bound periodicals do not circulate to anyone.

(2) *Copy service.* ILP companies are given a 10% discount off the non-MIT rate. The Microreproduction Laboratory offers a full range of copying services, including electrostatic prints, microfilm, microfiche, aperture cards, and COM.

(3) *Literature searching.* ILP companies are given a 10% discount off the non-MIT rate for literature searching, including SDI services. ILP card holders are also given a discount when they utilize online quick reference services for which a fee is normally charged.

(4) *Access.* Industrial card holders have access to the more than six million items in the collections. In addition, their company libraries may obtain photocopies and interlibrary loans; in the latter case, the normal fee to for-profit organizations is waived.

(5) *Consultation.* In accordance with general ILP programmes, members of the Libraries' staff are accessible to ILP companies for advice in areas such as collection management, preservation, archives, records management, information policy, library organization, buildings, microservices, and computerization. Members of the Libraries' staff have spoken at various company locations, and the Libraries have offered regular symposia on library and information science.

(6) *Reference.* Services are provided in person, by mail, by telephone, and through electronic mail.

(7) *Publications.* In co-operation with the ILP, the Libraries provide copies of materials in the collections as well as copies of preprints and working papers written by the faculty and research staff. Library publications that are offered to ILP companies include a COM list of serials currently received with KWIC index; acquisition lists; and the catalogue of the MIT Libraries from 1861 to 1964 on microfiche.

Consideration is being given to a number of future services. Among those being evaluated are copies of the online catalogue in either machine-readable, COM, or CD-ROM form; dial-up access to the online system; document delivery, both analogue and electronic/digital; and an expanded set of research services such as compilation of bibliographies, translations, and document delivery of material not in the MIT Libraries' collections.

4. Inhibitions and Controls

So far, this paper has dealt with what one could easily characterize as the positive side of the university/industry relationship. Needless to say, there are some concerns that might be placed on the negative or 'down-side' of the ledger. At the university level, there is the overriding question of whether or not industry has too much of a voice in the establishment of research directions. Are faculty being pushed in certain directions because of the availability of funding? There are also proprietary issues involved with patents and copyrights. It has been interesting to note in recent years, however, that there is considerable sentiment on the MIT campus for the diversion of research efforts away from governmental support to industrial support.

The MIT Libraries have to maintain a careful balance with regard to services to industry. On one hand, the Libraries must be supportive and responsive as part of the overall university programme. In addition to the public relations aspects, there are substantial dollars involved; the Industrial Relations Program's income from membership was $8 million, all of which is used for educational and research purposes, much of it 'shared' with Institute participants. On the other hand, care must be taken that services to the primary constituency of the Libraries — the faculty, research staff, and students — should not be adversely affected. Competition for service, for materials, for access to the staff, and often for space, is a continuing concern.

The Libraries must also balance services to industry with a wide range of other co-operative enterprises. In the case of MIT, the list is long: Harvard University, the Boston Library Consortium, OCLC, the Association of Research Libraries, and a small but growing number of international commitments.

A third concern is the need for venture capital in order to expand services and/or develop new services. A number of the activities cited above that seem worthy of experimentation and possible development, require large infusions of capital. As is the case in many research libraries, new programmes require new sources of funds and one must first invest funds in order to generate income. In many areas, the use of outside funding sources is essential. One project that would benefit both the MIT Libraries and their industrial partners is the retrospective conversion of monographs in technology. An article on this topic appeared in the last issue of the *IATUL Quarterly*.[12] Recent discussions with several ILP companies have opened the possibilities of some co-operative research and development ventures in information storage and retrieval.

A fourth set of constraints and controls has to do with copyright and royalty payments. In the pursuit of regular interlibrary lending and photocopying activities, the MIT Libraries rely heavily on the fair use provisions of the Copyright Law. Should the Libraries engage in document delivery on a broader scale, there is a clear need to establish careful controls with regard to copyright and royalties.

A fifth area that needs to be examined carefully is under the general rubric of 'unrelated business expenses'. Essentially, that means that MIT is vulnerable if the Libraries, or any other part of the Institute for that matter, engage in operations not directly related to the normal business of the university. While some of this already takes place in the area of real estate development, it has not yet appeared within the Libraries panoply.

Finally, there is the matter of staffing. It is clear that services to non-institutional users must support themselves, including the use of staff. The creation of a dedicated staff, however, creates another set of problems. One is the possible establishment of an 'information elite'. Another is the matter of how one utilizes all of the talent available without shortchanging the library's regular users.

5. Some Generalizations

That MIT is a unique institution should be abundantly clear from what has been said earlier. MIT's relationships with industry are older and deeper than those found in any other university. The nature of research at MIT makes these relationships both necessary and useful. The continuing and growing support for Institute programmes among industrial partners is testimony to the success of the venture to date. There are, however, a few lessons that can be taken from this story, as follows.

- The programme must be carefully planned and constantly monitored.
- The central staff serving as liaison to industry is a most critical element in the process.
- Programmes must be geared to institutional strengths.
- Industrial services should be corollary to university programmes, and not the other way round.
- Faculty and staff participants have to be supported both financially and intellectually. A system of rewards based on participation levels is essential.
- Care must be taken that services to non-University patrons do not interfere with services to the local, basic community.
- Constant feedback and testing of the market-place is essential.

The Massachusetts Institute of Technology recently celebrated its 125th anniversary. During the same year, 1986, the MIT Libraries celebrated the acquisition of their two-millionth printed volume and the inauguration of the online information system named Barton after MIT's founder, William Barton Rogers. In the fall of 1986, work was begun on the development of a major research and industrial park within easy walking distance of the campus. The intersection of these events points out well the intricate and intriguing relationships and the many and varied forces that are involved when a major research university and a major research university library work in close proximity to industry.

References

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