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Background information for use by Alex d'Arbeloff and others (me?, Dick Schmalensee?)

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For much of the past century industrial firms and government agencies have been engaged in accelerating efforts to develop technology-based products, processes and services. But only for the past forty years has there been systematic academic investigation of what underlies organized research, development, and technological innovation. And MIT has been the pioneer and leader in this effort throughout the forty year period.

In 1962 the MIT Sloan School initiated, with prodding and generous funding from James Webb, the Administrator of NASA, the first organized program of studies on what was then seen narrowly as the management of R&D. Professor Donald Marquis led this research effort until his untimely death a few years later, stimulating young faculty and graduate students to begin organizing theory-building and empirical field research in a managerial area that had not previously existed in business schools. Marquis himself contributed importantly to understanding what was the innovation process itself, and he inspired and counselled his colleagues and students. He was succeeded as leader of the group by Professor Edward Roberts, who was soon joined by three other MIT faculty stalwarts, Professors Thomas Allen, Eric von Hippel and James Utterback, all of whom continue to this day as academic leaders of the field of technology management.

A word about each of those "four horsemen"! From the early '60s Tom Allen pioneered studies of the process of technical problem-solving, focusing heavily on factors affecting technical communications and engineering productivity. He invented the term "gatekeeper" to describe the key players who brought outside scientific and technical information into the organization and to influence its engineering development. Allen's efforts on architectural design of technical organizations are evidenced in many outstanding laboratories, such as Corning's Manufacturing Engineering facilities, sometimes called "the talking laboratory". Ed Roberts began key studies on effective management of R&D projects, and then turned to examining how such work got started via contractual ties between

government and industrial R&D contractors. In 1964 Roberts pioneered research which continues until today on the formation and growth of high-tech entrepreneurial firms, and later showed that these processes were paralleled in large companies by so-called "internal entrepreneurs". Eric von Hippel created the recognition of the user's role in invention and innovation. He generated the concept and the label of "lead user" to describe those prospective customers who in fact invented their own solutions to their own advanced needs, long before manufacturers were ready to supply off-the-shelf products to meet these needs. Jim Utterback focused early on the linkage between product development and process development, and with his colleague William Abernathy developed and documented the revolutionary concept of the technology life cycle and its managerial implications. Utterback's work on emergence of dominant designs in technological fields provided deep insights into competitive strategy for technology-based companies.

But these four were soon joined by many other new young faculty in growing the broader field of managing technological innovation. George Farris and then Ralph Katz contributed early insights to the motivation and determinants of performance of scientists and engineers, both individually and in groups and larger organizations. Katz continued his efforts on the human side of technology in close and continuing collaboration with Tom Allen to understand how large R&D projects ought to be organized and staffed. Eleanor Westney and then Michael Cusumano broadened these perspectives globally, initially from research into Japanese technological organizations, with Westney examining international R&D projects and Cusumano studying the Japanese automobile industry. Both then went on to broader international studies, with Cusumano emerging as the critical analyst of the software development process with well-received books on Microsoft and Netscape. Rebecca Henderson extended the research frontiers into strategic considerations affecting technology management, her insights into organizational barriers to continuing corporate innovation anticipating many other researchers' movement into this domain of study. Her more recent and continuing research on the pharmaceutical industry is featured in today's symposium program.

The growing base of research and faculty knowledge fueled the conceptual design and implementation of the MIT Management of Technology Program, co-founded by Professors Herbert Hollomon of the School of Engineering and Ed Roberts. This 12-months full-time executive education program, leading to the degree of Master of Science in the Management of Technology, became MIT's first degree offered jointly by two schools, with all of the departments of the Engineering School joining with Sloan in the program sponsorship. Following the departure from MIT of the late Professor Hollomon, the Engineering School's co-leadership role was taken on by the late Professor Thomas Lee, and then more recently by Professor Jim Utterback who directs the program today. The program faculty, its highly experienced and motivated graduate students, and many of their organizational sponsors worked together to accelerate the Sloan School's research thrust in technology management, with 20 years of MOT theses becoming key contributors to research definition and progress.

During the past decade this overall research program has been recast into a new form, the International Center for Research on the Management of Technology, ICRMOT, whose ten year life we celebrate today. It was born from a view that it was time to broaden the frontiers of technology management to become more interfunctional, more interorganizational, more international, and more integrated. The ICRMOT co-founders were Professors Tom Allen from Management of Technology and Innovation and Glen Urban from Marketing, who envisioned a very different level of cooperation and collaboration, not only across Sloan School groupings but with industry as well. With the encouraging sponsorship of Michael Koerner, the partnership was designed from the outset to include close ties with corporate and governmental sponsors from North America, Asia and Europe, who would hopefully interact on research design, execution and eventual transfer into managerial use and impact. In varying degrees that approach worked well over the years with organizations such as BP, Cable & Wireless, Chevron, Electricite de France, Ford, Hoechst Celanese, IBM, ICI, NEC, the U.S. Army, Yazaki, and 3M. Shortly after ICRMOT's initiation both co-principals moved into the Sloan School Dean's office, leaving the organization's leadership in the hands of Professors John Hauser and Edward Roberts, ably aided by Roger Samuels and then Dr. William

Lucas as Executive Directors. New research directions were undertaken and new faculty were encouraged and funded over the ten year period.

The broadened charter for management of technology in the Sloan School now included a heavy amount of marketing content. Involvement of MIT Professors Sandy Jap, John Hauser, Duncan Simester, Glen Urban, and Birger Wernerfelt moved technological innovation concerns into that needed direction. Recognition of the importance of R&D's ties with manufacturing and operations management brought Professors Steven Eppinger and Charles Fine into active engagement. Professor Deborah Ancona tied the Sloan School's Organization Studies Group into ICRMOT with her work on product development teams, and Professors Thomas Malone and Wanda Orlikowski linked the Information Technology group into this wide-ranging research endeavor. And the baseline efforts in the Management of Technological Innovation were strengthened by new initiatives by Professors Michael Rappa, Marcie Tyre, Scott Stern, Henry Weil and the late Professor Stephan Schrader.

The ten years of ICRMOT, as documented by the nearly 200 working papers produced under ICRMOT funding, were marked by the launching of major new projects on R&D metrics, strategic alliances, emergence of new scientific fields, multi-project and product platform management, innovation in financial services, customer inputs to product development, international technology transfer, dynamic modeling of technology-based competition, and research strategy and organization. Major research-based books were produced with ICRMOT financial support on high-tech entrepreneurship, various approaches to software and hardware product development processes, the human side of technological innovation, dynamics of innovation, and technology-based supply chains. ICRMOT achieved what an excellent academic research center ought to achieve. It stimulated new directions and results, helped to grow young faculty and younger graduate students, diffused ideas and outcomes to academia and to industry, hopefully helping to improve the world through technological innovation. Today and tomorrow's symposium marks the end of this ten year program and showcases some of its highlights.

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