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A global study of graduate management of technology programs

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Abstract

In the last decade, the field of technology management has attracted considerable attention from practitioners and scholars. The rapid emergence of powerful and innovative technologies in manufacturing, computing, telecommunications and the life sciences, such as biotechnology are making the strategic management of technology, a critical task in virtually all organizations. Reflecting this trend, several universities offer graduate programs in the management of technology (MOT). These programs have originated from various academic schools and disciplines (business, engineering, public policy) creating considerable diversity of focus, themes emphasized, courses, and student backgrounds. The rise of these programs, in part, reflects the growing need for managers and technologists who are able to understand, contribute to, and manage a wide variety of technology-based programs and organizations. This paper presents the results of a global study of graduate MOT programs. Over fifty (50) universities participated in the research reported in this paper. Findings related to research trends, curriculum developments, staffing, program implementation, and program emphases are examined. Several recommendations are advanced for universities considering initiating or further developing their MOT program. In addition, observations about the future direction of the field are made.

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1. Introduction

Since technology is a major driver of global economic development, industry increasingly seeks more effective ways to manage existing and nascent technology. Technology has become a great equalizer among companies and countries (Badawy, 1998). The strategic alignment of technological assets with a company's direction and management is a major issue in terms of impacting profitability and growth. Unfortunately, there have often been important mismatches between the graduates of universities and the skills needed by today's technology-based organizations (Mignogna, 2002).

Responding to this, management of technology (MOT) educational programs have been developing worldwide. Originating largely in the US and in a few Western European countries, MOT programs are now housed under the various academic schools (business, engineering, science, etc.) and have considerable diver-

sity in their themes, focus, and course offerings. According to Kocaoglu, director of the engineering management program at Portland State University, more and more academic institutions are creating MOT programs. In 1976, there were fewer than 30 engineering management programs, but now there are nearly 200 worldwide, mostly at the graduate level (Santo, 2001). Particularly, the MOT field has emerged from its relative obscurity during the 1970s and 1980s to mainstream business management during the 1990s (Nambisan and Wilemon, 2002).

There have been several studies on the definition, scope, and skills needed in the MOT educational field (Hauck, 1999; Mallick and Chaudhury, 2000; Zehner, 2000). The National Research Council defined MOT as "linking engineering, science, and management disciplines to address the issues involved in planning, development, and implementation of technological capabilities to shape and accomplish the strategic and operational objectives of an organization". It also identified eight primary needs in the technology management field (Weimer, 1991):

- How to integrate technology into the overall strategic objectives of the firm

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- How to get in and out of technologies faster and more efficiently
- How to assess/evaluate technology more efficiently
- How to accomplish technology transfer
- How to reduce product development cycle time
- How to manage large, complex and interdisciplinary or interorganizational projects/systems
- How to manage the organization's internal use of technology
- How to leverage the effectiveness of technical professionals

Badawy further defined MOT as “a field of study and a practice concerned with exploring and understanding technology as a corporate resource that determines both the strategic and operational capabilities of the firm in designing and developing products and services for maximum customer satisfaction, corporate productivity, profitability, and competitiveness” (Badawy, 1998). Simply stated, MOT attempts to answer the question of how an organization can maximize gains from its technological assets (Nambisan and Wilemon, 2002).

A few researchers are currently examining the differences between MOT and engineering management (EM) despite the existence of several areas of common interest. EM primarily focuses on the process of managing the engineering function itself, while MOT is a much broader concept (Mallick and Chaudhury, 2000). Khalil and Garcia-Arreola point out that “MOT is not an easy task. It combines a variety of technical fields with business insight, requiring a wide perspective of both engineering and business issues. Such perspective is not provided by current MBA or engineering programs” (Santo, 2001).

All these attempts to delineate the emerging MOT field converge into a few common thrusts: interdisciplinary efforts, industry partnerships, international perspectives, and integrative, multidisciplinary approaches. While scholars and practitioners are becoming more knowledgeable about the special focus of the MOT field, many organizations are facing the demands of fast-changing markets requiring a shift of focus from the “traditional factory model” largely designed for manufacturing to a new paradigm that demands a more sophisticated, diversified graduate program curricula. Our “Global Survey on MOT Graduate Programs” was conducted by surveying over 170 US and non-US universities. The study aims at assessing the state-of-the-art of contemporary graduate MOT education by exploring various dimensions of these programs.

2. Research objective

The objective of this study is to report the status of graduate MOT education worldwide and to highlight

emerging trends regarding program types, major program themes, anticipated program directions, and the various program management issues encountered in the field. Specifically, we focus on the following:

- Types of MOT programs (i.e. administration entity, duration, degree type)
- Major MOT curriculum focus
- Growth patterns of MOT graduate programs
- Faculty staffing issues
- Types and extent of internal/external cooperation
- Future direction of MOT programs

3. Research method

3.1. Sampling procedure

The sampling method employed was a convenient and non-probability sampling approach. The sample included faculty members, MOT program directors, university administrators, or deans from the US and non-US universities that offer MOT programs.

In the first phase, our target population was framed by identifying universities that provided MOT programs through an Internet search as well as major MOT-related journals, conference papers, and organizations such as International Association for Management of Technology (IAMOT; www.iamot.org), Institute for Operations Research and Management Sciences (INFORMS; www.informs.org), Portland International Conference on Management of Engineering & Technology (PICMET; www.picmet.org), etc. We also sent letters to the Deans of 392 American Assembly of Collegiate Schools of Business (AACSB) member schools to identify MOT directors and/or MOT faculty members. Once our target sample was identified, a questionnaire was sent to the sample population. After the first phase, follow-up letters were sent to those not responding to our initial questionnaire to increase the response rate. As a result, our total sample population size was 170.

3.2. Instrument development

The major data collection instrument was a questionnaire. The final version of the questionnaire was developed after preliminary tests in an effort to increase the reliability and validity of the questionnaire. There were 38 questions. The questions were composed of single or multiple choice questions as well as open-ended questions. The purpose of the open-ended questions was to capture more detailed information that could not be communicated via single/multiple choice questions. The questionnaire was designed to identify the current thrusts and practices of MOT programs as noted in our study research objectives (i.e. MOT program types, faculty

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