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Financial analysis in management of technology programs: links in a clinical approach



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ABSTRACT

Economies rely on technological innovation for growth. To reap the benefits from technological innovation, managers, innovators, entrepreneurs and businesses need to understand the business environment so that they can successfully bring their products and ideas into the market. Pedagogy in technology management is directly linked to financial decision-making and yet few programs link both disciplines. The University of New Mexico (UNM) Management of Technology (MOT) program has evolved over the years with a critical link between technology and business, with programs and activities that not only train students to be experts at technology management but also to be financially competent. In this paper, we describe and prescribe the entrepreneurial finance and securities analysis courses, and how they can help technology managers, CEOs, strategists and technology entrepreneurs. These courses help MOT professionals in evaluating a range of decisions from the different sources of financing at the beginning of a venture all the way to the different exit strategies when they eventually exit the venture. Our recommendation is that a tighter link will help MOT programs around the world.

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1. Introduction

Regions interested in moving their economies from price-taking industries to price-setting industries have depended on scientific knowledge and technological innovations to drive this change (Kuznets, 1973; Teece, 1998; Baumol, 1999). This change depends on large and small firm entrepreneurial action as well as Schumpeterian entrepreneurship and on converting knowledge into economic growth (Audretsch et al., 2008; Carlsson et al., 2009; Shane and Venkataraman, 2000, 2003; Schumpeter, 1934). Technology financing and commercialization plays a major role in developing innovative firms that contribute greatly to the firm, regional and national wealth and job creation (Wonglimpiyarat, 2014).

Premus et al. (2003) indicate that universities have recognized this need and have stated working on technology

commercialization and transfer activities to enhance regional economic development. Dottore and Kasscieh (2014) have examined the role of university professors in entrepreneurial activities. Yanez et al. (2010) described the body of knowledge disciplines that are important for technology and innovation management. Economic development based on managing technology requires knowledge from strategy, finance and entrepreneurship among many others. There is a need for educational programs to link academic activities and regional development and to produce knowledge workers who can manage and improve the results of these activities.

This paper describes the finance components of Management of Technology (MOT) program at the University of New Mexico (UNM). The program has covered many of the topics listed in Yanez et al. (2010) but in this paper, we describe the link to the entrepreneurial finance course and propose to expand the strategic, financial, analytical, managerial and entrepreneurial knowledge base into the area of securities analysis to link innovation to investment strategy to the examination of potential exit considerations.

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The paper describes the origin of the MOT program at UNM and its progress throughout the years highlighting the changes to its curriculum and the impetus for the change. It will then describe the UNM Business Plan Competition (BPC) and the joint programs where MOT is an essential part. It will then describe the link to the entrepreneurial finance course including the role of venture capital in developing innovative firms (Wonglimpiyarat, 2007) as well as the potential link to the securities analysis course as a path to help entrepreneurs in exiting their companies through mergers and acquisitions (M&A), initial public offerings (IPOs) and/or buyouts. This helps the region in allowing the serial entrepreneurs in cashing out of current entrepreneurial activities and moving to new ones.

2. The management of technology program

In 1980, Professor Ray Radosevich received a grant from the National Science Foundation (Radosevich, 1993, 1995) to develop the Technology Innovation Program (TIP) at the University of New Mexico. This grant served as the foundation of the MOT program focusing efforts that assisted technology transfer from the federal laboratories such as Sandia National Laboratories and Los Alamos National Laboratory and the University of New Mexico. This was one of the first programs dedicated to the implementation of the new congressional legislation enacted by the US Congress in 1980. The Bayh–Dole Technology Transfer Act and the Stevenson–Wydler Technology Innovation Act encouraged technology transfer from public sector technology sources (Kassicieh, 1998). The program was highly successful in technology commercialization and the seeds of the MOT program at UNM were planted. Subsequent legislation was enacted to explain and expand the Bayh–Dole and Stevenson–Wydler Acts and as a result, the US government encouraged technology commercialization and its effect on the economic security of the country. Courses in the traditional business areas were offered with a focus on small high-technology start-ups but a program that specifically dealt with the growing and important field did not materialize until the early 1990s.

In the early 1990s, a conference held in Santa Fe attracted a list of who's who in public sector technology (Kassicieh and Radosevich, 1994). The planning for an MOT program at UNM resulted from these activities and the MOT program was designed to include:

1. An MBA concentration
2. A set of non-degree courses
3. A clinical research approach that involves faculty and students.
4. A close working relationship to governmental and industrial organizations engaged in managing technology.

The vision, mission and objectives of the program highlighted many areas such as:

The Management of Technology (MOT) Program at the Anderson School of Management emphasizes the importance of managing research and development (R&D) as part of the strategy, tactics and operations of the organization. R&D and the resulting innovative products, services and processes are essential for the competitive position of the US in the world economy. The MOT Program is designed to enhance the

knowledge, skills and careers of both public and private sector managers of technology. The MOT Program will collaborate with organizations such as Sandia, Los Alamos, the State of New Mexico, Intel and many others to support the economic development of New Mexico and to enhance the US position in world trade.

The program has a hands-on clinical approach orientation and seeks to educate current and future managers in the following areas:

- Assess the business potential of technological innovations
- Manage R&D projects
- Forecast technological needs of the world
- Build businesses based on technology
- Evaluate the strategic impact of technology on current operations
- Examine the role of strategic alliances in technology-based start-ups
- Start new ventures based on patents, licenses and other intellectual property positions
- Assist technology project and program managers
- Assist incubator and accelerator managers

The focus on technology management in large organizations as well as the creation of new ventures allowed the program to integrate well with other business disciplines as well as with many Science, Technology, Engineering and Mathematics (STEM) areas. Some of the courses that the program offered are:

- 1) Strategic Management of Technology
- 2) Technological Forecasting and Assessment
- 3) Technological Entrepreneurship
- 4) Innovative Product Development
- 5) Technology-based Strategic Alliances and Consortia (later expanded to Entrepreneurial Finance)
- 6) Technical Project Management
- 7) Project in Technology Commercialization

The clinical focus of the program meant that the faculty and the students had to work on projects with groups such as

- 1) High-technology start-ups: This support includes business plan development, technology market assessment and innovative product link between market needs and technology capabilities.
- 2) Support for high-technology established firms: The program has supported UNM, Sandia National Laboratories, Los Alamos National Laboratory and many other R&D organizations in assessing the potential of new inventions.
- 3) Support for the Globalization of New Mexico Businesses: The International Management program at UNM linked to the MOT program by exploring the idea that some of the markets for products and services might be in other countries.

These activities require financial analysis and we provide it through the entrepreneurial finance and securities analysis courses. Students of the program needed the necessary tools to develop the financial analysis to prove viability of these products in the markets for which they were designated. The financing of these ventures depends on investments from angels, investment banking groups and venture capitalists who require detailed plans that insure return on investments within

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