

# Developing Information Literacy Skills in Engineering Entrepreneurs: A Collaborative Approach

Constance Adamson, Dale Dilamarter, and Michael White  
Queen's University, Kingston, Ontario

## **Abstract**

Technology entrepreneurship is information intensive. Technology entrepreneurs must be able to locate, understand, evaluate and apply a variety of technical, business, regulatory and intellectual property information in order to successfully launch new products and services. Good information literacy skills are critical at each step in the entrepreneurial process. Decisions made in haste without complete information can be costly if not fatal to a new venture. While engineering students may be familiar with researching technical information, they are often unfamiliar with business, government and patent information. In order to overcome this deficiency, the authors propose a new collaborative model embodied in an on-line tutorial that integrates information literacy-building exercises into the technology entrepreneurship curriculum. By using the tutorial, students develop research and analytical skills that enhance their understanding of the entrepreneurship process.

## **Introduction**

What makes a successful entrepreneur? What skills and abilities distinguish highly successful technical entrepreneurs such as Thomas Edison, Steve Jobs and Jeff Bezos from unsuccessful entrepreneurs? There are many possible explanations, but one key trait has long been recognized: successful entrepreneurs are especially adept at identifying, acquiring, synthesizing and applying information, i.e. converting data into knowledge, and applying that knowledge to the entrepreneurial decision-making process. [1]

Technical entrepreneurship is especially information intensive. Technology entrepreneurs, on their own or as part of a team, must be able to identify locate, understand, evaluate and apply a variety of information in order to successfully launch new technology-based products and services. This includes technical information and standards, business information, market, industry and demographic data, regulations and, of course, intellectual property information. According to Dorf and Byers, authors of a widely used textbook on technical entrepreneurship, “entrepreneurs distinguish themselves through their ability to accumulate and manage knowledge as well as their ability to mobilize resources to achieve a specific business or social goal.” [2] The ability to locate and apply eclectic information is a distinguishing characteristic of technical entrepreneurs that sets them apart from other professionals such as scientists, engineers, physicians and attorneys who are required to acquire and apply a very deep but relatively narrow body of knowledge.

Technical entrepreneurs identify and acquire information by two methods: 1) continuous broad background reading in business, science and technology in order to identify trends and opportunities and 2) directed research in order to answer a specific question. [x,x]

Directed research requires identifying a specific information problem, forming a question and then seeking out the appropriate information resource. For example, an entrepreneur considering a new safety device for a table saw might start by researching the annual number of power-tool related hand injuries in Canada and the U.S. Possible sources of data on injuries include government agencies responsible for consumer and worker health and safety, medical literature, trade associations and insurance companies. Other questions the entrepreneur would need to answer include: What is the hand power tool market? What safety standards and regulations apply to hand power tools? What companies manufacture hand power tools? What are the recent innovations and patents on safety devices for hand power tools?

### **Course Background CHEE 410 Technical Entrepreneurship**

CHEE 410 Technical Entrepreneurship is a fourth-year course offered by the Department of Chemical Engineering at Queen's University. It was first offered in the 1994-1995 academic year and has evolved over the past decade.[ ] Like many engineering entrepreneurship programs, CHEE410 is designed to engage students in all aspects of the innovation and entrepreneurial process using real-life case studies. Working in small teams, students are required to conduct pre-commercialization research for technology-based innovations provided by Queen's researchers. This process exposes students to the nature of innovation and entrepreneurship and builds their entrepreneurial competencies in project management, financial analysis, customer relations, industry and market research, and intellectual property.

The CHEE 410 curriculum conforms to the vision of the Queen's "Renaissance Engineer." A "Renaissance Engineer" must possess a broad and deep technical knowledge, creativity, excellent communication skills, a sense of aesthetics, the ability to work in interdisciplinary teams, an aptitude for lifelong learning, a concern for the environment, and sensitivity to social, cultural and individual variability. [3] The curriculum of the "Renaissance Engineer" emphasizes, among other things, the ability to integrate ideas and information from different sources.

On campus, students can

But in the real world, entrepreneurs don't have the luxury of libraries for different information needs.

The information needs of technical entrepreneurs are diverse and eclectic. Technical entrepreneurs must be able to:

- Define potential uses and applications of a technology
- Identify potential customers, partners and competitors

- Find existing patents and other “prior art” that
- Determine trends in industry and marketplace
- Determine patent status and ownership
- Locate suppliers of raw materials and component parts
- Locate manufacturers
- Determine the price point, break even
- Identify industry standards and government regulations

## **Literature Review**

Librarians and faculty have been collaborating on library instruction sessions and online course guides for years. There are literally thousands of examples on the web of library course guides covering engineering and business topics. [ ] However, there are few

However, there are a few published articles concerning the design and assessment of online library tutorials for engineering entrepreneurship programs.

Feeney and Martin (2003) describe a collaborative approach toward teaching students in a fourth-year materials engineering design course at the University of Arizona. No formal assessment was conducted

The business and science librarians taught business and technical information resources. Mellinger (2004) describes teaching to students in two entrepreneurship programs at Oregon State University.

Early in his career, Thomas Edison is said to have visited public libraries in order to read patents in the weekly issue of the *Official Gazette of the U.S. Patent Office*.

Chester Carlson, inventor of the photocopying machine, spent countless hours in the New York Public Library’s science and technology department scanning scientific journals and books trying to work out the problem of a better way to duplicating documents.

## **Tutorial Design, 2005-2006 (Beta Version)**

During the 2005-2006 academic year, the authors created an online tutorial that was organized along the lines of the traditional “stage-gate” model into five modules. The modules were:

- Technological Readiness
- Market and Industry Analysis
- Financial and Risk Analysis
- Business Strategies
- Determination of Commercialization Path

Each module included a set of learning outcomes matched with appropriate information resources. For example, Gate 1, “Technological Readiness,” required students to evaluate the technological readiness of their projects based on:

- Purpose of the technology
- Stakeholders
- State of development
- Competing technologies
- Sustainable competitive advantage
- Patent status
- Standards

patent document and how to conduct a patent search. The module included links to patent databases and the Engineering and Science Library’s standards resource guide.

In the “Market and Industry Analysis” module, students received instruction on how to use various business databases and market research tools.

The authors found that

### **New Design, 2006-2007**

### **Conclusion**

### **References**

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### **Biographical Information**

CONSTANCE ADAMSON is the business librarian in Stauffer Library. She is

DALE DILAMARTER is the instructor for CHEE 410 and the business advisor for the Faculty of Applied Science's TEAM program. He was the founding director of the Fleming Centre for Manufacturing Studies, a technology transfer service for small and medium-sized enterprises. He is also co-author of *Training in Management Skills*, published by Prentice Hall in 2004.

MICHAEL WHITE is the librarian for research services in the Engineering and Science Library. He is the subject specialist for patents, chemistry, chemical engineering and electrical and computer engineering. He has worked as a librarian at the U.S. Patent and Trademark Office in Alexandria, Virginia, the University of Maine in Orono and Loyola University Chicago.

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Submitted by:

Michael White  
Engineering and Science Library  
Queen's University  
Kingston, Ontario, Canada  
michael.white@queensu.ca

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Good information literacy skills are critical at each step in the entrepreneurial process. Decisions made in haste without complete information can be costly if not fatal to a new venture. While engineering students may be familiar with researching technical information, they are often unfamiliar with business, government and patent information. What skills and abilities distinguish highly successful technical entrepreneurs such as Thomas Edison, Steve Jobs and Jeff Bezos from unsuccessful entrepreneurs? Feeney and Martin (2003) describe a collaborative approach toward teaching students in a fourth-year materials engineering design course at the University of Arizona. No formal assessment was conducted. Gaining skills in information literacy multiplies the opportunities for students' self-directed learning, as they become engaged in using a wide variety of information sources to expand their knowledge, ask informed questions, and sharpen their critical thinking for still further self-directed learning. Achieving competency in information literacy requires an understanding that this cluster of abilities is not extraneous to the curriculum but is woven into the curriculum's content, structure, and sequence. This curricular integration also affords many possibilities for furthering the influence. Developing information literate students is the key role of the teacher librarian in today's schools. It is an educational as opposed to an administrative role, and the increasing use of digital resources by students in the school and at home means that information literacy skills are now a vital part of a student's repertoire of learning skills. A number of definitions of information literacy in the school context claim that lifelong learning skills, transferable from school to the workplace and society in general, can be taught in schools.