

ENGINEERING ENTREPRENEURSHIP FROM IDEA TO BUSINESS PLAN

This is a book for engineers and scientists who have the aptitude and education to create value through new products that could become income-producing businesses for them as well as for potential investors. The book uses short chapters without lengthy, distracting essays. The book is organized as a ten-week blueprint for value creation. Many first-time inventors going through the ten-week exercise covering the inventor's idea, patent application, and business model + business plan have become serial inventors of a wide range of products; they won multiple awards in business-plan contests and have attracted investment from wealthy investors, who see value in their technology-based innovations. Recent growth in business plan contests and angel investment clubs is evidence that many wealthy investors are seeking technology-based innovations in which to invest.

The book may be used by engineering students or engineers without a teacher. However, the book can be used in a college course as well, with teams made of three or four students per team. If you are a student or teacher, visit the book's website (www.engineer-entrepreneur-book.com) for useful supplementary materials.

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During 2010–2013, Swamidass conducted four annual business start-up or business plan contests, open to all Auburn University students, for cash awards to help kick-start new student businesses.

As a pro se inventor-applicant, Swamidass was granted four US patents. His experience is described in the *John Marshall Review of Intellectual Property Law* (2010) paper and in an *Inventor's Digest* article aimed at individual inventors. In 2013, at the American Society for Engineering Education (ASEE) national conference in Atlanta, he conducted a workshop for engineering college professors on teaching invention and entrepreneurship to engineers.

Engineering Entrepreneurship From Idea to Business Plan

**A Guide for Innovative Engineers
and Scientists**

Paul Swamidass
Auburn University



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This is a book for all engineers and scientists brimming with new ideas.

This book is not a legal document. It covers the practices of the US Patents and Trademarks Office (USPTO) that permit an individual to apply for and get a US patent without the representation of patent attorneys; such applicants are called pro se inventor-applicants. The USPTO provides many useful and practical services to all individual pro se applicants during the application phase as well as the examination phase through their website, phone consultations, and through the examiner assigned to examine the Nonprovisional (Utility) patent applications (see MPEP 707.07(j)). A majority of individual inventors may be able to secure a patent in the United States without the services of a patent attorney if they learn how to. This book can serve those who cannot afford the services of a patent attorney but are willing to learn and work diligently to secure patents for their inventions; a few patent applications should give the inventor considerable practical knowledge and more confidence to invent frequently and apply as a pro se. However, if you need additional or advanced legal advice, and if you can afford it, seek a legal professional.

*To my parents who modeled faith, hope and love (I Cor. 13:13)
with a good measure of hard work, which is the secret sauce in all
successful innovations.*

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Preface

This book is about value creation. Every day, engineers/scientists create value for their employers. The book is organized as a ten-week blueprint for value creation. It is designed to take a first-time inventor from an idea to his/her first patent application and business model + business plan in 10 weeks. Once inventors get the hang of it, they often enthusiastically turn into serial inventors of a wide range of products attractive to wealthy investors.

Thus, this book teaches readers how they can create value for themselves and for wealthy investors. Engineers/scientists have the education and training to invent and create new products, which could become income-producing businesses for inventors and wealthy investors. One graduate civil engineering student at my university, with the help of a workshop based on this book, developed two products and over two years won multiple awards for his products as well as his business plan, and received \$180,000 in funding from investors several months after graduation in early 2016. Over a two-year period, he wisely obtained and used suggestions from several mentors. Two undergraduate students using the contents of this book in a class have formed a team to commercialize an invention that can take small loads of cargo into upper atmosphere more cost efficiently than other commercial options today. They have won awards for the invention and attracted interest from investors likely to invest more than a million dollars in their start-up business in 2016.

This book may be used by individual inventors, business plan contestants, or as a resource material in makerspaces, inventor clubs, or classrooms. The book uses short chapters and tries to get directly to the point without lengthy, distracting, mind-numbing essays; it is based on the assumption that bright engineers and scientists quickly understand the essential substance of the chapter and are anxious to move on.

This book covers a wide range of topics, from innovation, to finding creative ideas, to product development, to patent application drafting and filing, to business model development, and finally to business plan development with cash flow to help with valuation of the business. Toward the end of the book a few chapters offer a glimpse of what lies beyond the business plan, including chapters on teamwork and leadership, essential for business success. With such a range of topics between the covers, the depth of coverage in more than forty chapters of the book is adequate for

a first-time inventor from the engineering/science field to get a complete picture of inventing, patenting and business start-ups – everything necessary to act. However, if the reader wants to know more about any given topic such as engineering product development, or marketing, etc., there are a number of outstanding books on the market that are devoted entirely to each topic.

There are numerous technology-based business plan contests with large monetary awards cropping up all over the United States, as well as in faraway countries such as India and China. The rapid growth in the number of business plan contests is a clear sign that many wealthy investors are looking for good technology-based businesses for investment. The TV show *Shark Tank*, premiering on ABC and with reruns on CNBC, is a good testament to this fact.

The book may be used with or without a teacher. The key features of this book enable readers to accomplish the following:

1. Sharpen their new idea
2. Turn an idea into a useful/commercial product
3. Conduct patent search and complete a Provisional and/or Utility patent application
4. Collect requisite data and prepare a business model
5. Collect additional data to prepare a business plan with five-year cash flow for valuation purposes to market the business to investors in exchange for equity, and to attract partners or company managers

A teacher could use the book in a college course with teams made of three or four students per team. The book is organized for a ten-week curriculum; however, I have used it in a fifteen-week semester quite frequently. The book enables teachers to pace the course over a ten-week or fifteen-week semester, even if they have never taught a similar course before; a course syllabus for the fifteen-week course can be downloaded from the website supplementing this book.¹ If you are a teacher, please visit the website and leave your suggestions and feedback. If you are a student visiting the website, please leave your feedback and share your success story as well as lessons learned.

I used a workbook of about forty pages with this book to enable students to plunge into prompt action after a short introduction to a chapter; information on the workbook is available through the same website.

The idea for the book was suggested by one of my students many years ago. Like all good innovations, it took shape slowly and, despite its current final shape, is still work in progress, subject to changes and improvements on the basis of the most current developments in engineering-associated industries and patent laws.

I sincerely thank Jay Clark, Haitham Eletrabi, David Mixson, and Hephzibah Stephen for sharing their valuable knowledge and experiences through the chapters contributed to this book.

¹ <http://www.engineer-entrepreneur-book.com/>

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I also gratefully acknowledge the contributions of patent attorney, A. J. Gokcek, BSEE, JD, LL.M., who served as a valuable resource for me over many years on matters concerning patents and the USPTO. He was my co-teacher for a few years in a course on Patent Application Drafting for Auburn University students. He served as an associate attorney at an IP law firm, director of IP at a major research university, and senior IP attorney at a US Department of Energy National Laboratory. He has personally drafted and litigated more than a hundred patents and patent-related legal cases, and, during his career, has counseled on all intellectual property matters including IP licenses, contracts, and litigation in the federal, academic, and corporate sectors. This book enables me to pass on to young inventors some of what I have gained from my association with him. Any errors in the book are, of course, mine alone.