Course Syllabus

Biotechnology Entrepreneurship

JUNE 2018  Instructor: William Lekse, PhD  Email: WJLEKSE@pitt.edu

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<tr>
<th>Day</th>
<th>Date</th>
<th>Time</th>
<th>Room</th>
<th>Sessions</th>
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<tr>
<td>Tuesday</td>
<td>19. June.2018</td>
<td>08:00 am till 1200</td>
<td>S 32 (NWIEG2.00.15)</td>
<td>1 &amp; 2</td>
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<tr>
<td>Tuesday</td>
<td>19. June.2018</td>
<td>12:00 am till 1800</td>
<td>Room 3.12 (Prie033.12)</td>
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<tr>
<td>Wednesday</td>
<td>20. June.2018</td>
<td>08:00 am till 1800</td>
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<td>Thursday</td>
<td>21. June.2018</td>
<td>08:00 am till 1800</td>
<td>Room 3.11 (Prie033.11)</td>
<td>8 &amp; 9</td>
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Course Summary:

**A warm welcome! The focus of this course is YOU: your future.** This course is designed for individuals who are interested in exploring entrepreneurship and small business management as a career option. **In this course you are Steve Jobs a HIGH-IMPACT ENTREPRENEUR!!**

http://www.conference-service.com/conferences/biotechnology.html

Biotechnology is seen as a major pillar of economic growth in many countries. Small-to-medium enterprises (SMEs) are the driving force with start-up companies figuring predominantly in bringing biotechnology products and processes to the global marketplace. New ventures such as biotechnology start-up companies or projects in established corporations require champions with a sound knowledge of the relevant science and a familiarity of business principles relating to product innovation, market development and venture capital. Above all else, a strong entrepreneurial ability is required in an industry that is in its infancy. Since University of Bayreuth is principally about professionally managed businesses, the course will provide students with the knowledge base for exploring and establishing a new global business venture, whether in a corporate environment or in a standalone new business startup.

**GRIT:** https://www.youtube.com/watch?v=H14bBuluwB8

This course is intended to provide the core skills needed for the identification of opportunities that can lead to successful entrepreneurial high technology ventures, regardless of the individual’s “home” skill set, whether managerial or technical. The instructor has also observed that many people start businesses after successful careers – their motivation is not always financial. While the content is aimed at those who are interested in founding or managing an enterprise, this course will also be useful for those who will work with the small business sector in roles such as accountant, banker, consultant, economic development officer, etc. Additionally, as many large firms are attempting to nurture the "entrepreneurial spirit" within their ranks, the course content has many applications to large organizations; for example, many publicly traded firms as well as large privately held firms (including family firms) have identified entrepreneurial renewal as their biggest challenge. Therefore, in this course we will focus on what you will bring to your company to impact its performance and how you can rapidly advance your career.

We examine in depth successful approaches to opportunity recognition at entrepreneurial companies as a function of markets and technologies. Emphasis is placed on the special requirements for creating and executing strategy in a setting of rapid technological change and limited resources. This course is particularly suited for those who anticipate founding or operating of international technology companies.


**Primary Objectives**

The primary objective of this course is to develop critical analysis skills needed to compete aggressively as an entrepreneur in high tech. Many start-up entrepreneurs, as well as the people advising them have stressed the importance of writing a business plan as a foundation of the new venture process. The result of such perception has been an over-supply of business plans that look and sound similar, due to the formatting provided by many software programs, “templates” and literature available from a variety of sources (in particular the internet). Usually, the “ready-made” business plans end up having little relation to reality, being used only as a tool to raise financial backing, and not to plan the business. This course looks at the business plan as the corollary of a process of finding, screening and analyzing business ideas, the outcome of the development of the business concept and not its foundation.

Upon completion of the course, the student should have developed the following skills:

(a) Ability to assess and predict customer needs in biotech global markets that may not yet exist;
(b) Ability to create and execute marketing, biotechnology development and strategic plans that integrate technological development with evolving international customer requirements;
(c) Understanding of how the confluence of biotechnological innovation, marketing, market forces and venture finance drives new technology ventures;
(d) Knowledge of how to identify the various sources of financing for ventures; (e) an understanding the role of teams in the entrepreneurial process and the type of team partners that entrepreneurs must seek;
(f) Understanding of the types of venture partners and alliances that might be beneficial for global venture success;
(g) and a realization of how these preliminary steps lay the groundwork for the creation of an effective business plan.

Case studies
Case studies will be discussed in this class. Instructions for preparing for discussion of the cases will be reviewed during the first class meeting. Every company must prepare a one-page resolution argument including introduction, question that the prime decision maker must ask, analysis, and recommendation.

Texts
The readings must be completed by the class meetings indicated on the Course Schedule. Class discussion will refer to material covered in these texts. Three additional texts are recommended reading for the course.

Recommended Books to support your Future Endeavors:
THE GENE An Intimate History, Siddhartha Mukherjee
Business Model Generation: Osterwalder & Pigneur
Start With Why: Simon Sinek
Crossing the Chasm, Moore, Geoffrey.
The Innovator’s Dilemma, Christensen, Clayton.
The Lean Startup: Eric Ries
Swim With the Sharks: Without Being Eaten Alive: Outsell, Outmanage, Outmotivate, and Outnegotiate Your Competition. Mandino, Og, The Greatest salesman in the world, Mackay, Harvey
Guide to Managerial Communication, Munter, Mary,
Competing Against Time, George Stalk and Thomas Hout,
New Venture Creation, Timmons and Spinelli
Entrepreneurial Venture, William Sahlman
Patterns of Entrepreneurship, Jack Kaplan
Entrepreneurial Strategy and Leadership
Art of the Start and Rules for Revolutionaries, Guy Kawasaki
The New Business Road Test, John Mullins
The Origin and Evolution of New Businesses, Amar Bhide
Primal Leadership, Daniel Goleman
Design Thinking for Entrepreneurs and Small Businesses: Beverly Ingle
The Tipping Point, Malcolm Gladwell
Weird Ideas that Work, Bob Sutton
Living on the Fault Line and Crossing the Chasm, Geoff Moore
The Art of Innovation, Tom Kelley
Blue Ocean Strategy, W. Chan Kim and Renee Mauborgne
Zero to One, Peter Thiel

YOUTUBE videos:
• https://www.youtube.com/channel/UCw0jLaaM53RS4jn_HSe1Qnw

Individual Case Study Deliverables (Appendix A)
Each student’s resolution paper focuses on the most important business issue within the case (the student will become the decision-maker), summarizing the decision-makers best means to analyze the problem in the case. The student will use the position paper to state a brief introduction outlining the background’s important items of the case (approximately 6 sentences). The student then will state the question they believe is the most relevant for the decision-maker to solve. The student will then use all of the knowledge to
solve their question and finally give three recommendations. Papers will be evaluated based on the following criteria:

**Clarity and Intelligibility:** Have you stated and defended your position with sound logic and appropriate frameworks and state-of-the-art professional knowledge which allows the readers clearly to understand your line of reasoning?

**Decision-maker Relevance:** Have you identified the relevant stakeholder and decision-maker items of concern and interest. Does your analysis discuss their pertinence to the case while avoiding irrelevant digressions?

**Consistency:** Have you presented a unified argument and avoided contradictions and inconsistencies?

**Thoughtfulness:** Have you specifically presented your position on the case with both awareness and thoughtful consideration of different viewpoints, including those which disagree with your position?

**Preparation:** Have you exhibited sufficient preparation and background research to demonstrate a thorough understanding of the case being discussed?

**Structure:** Have you proofread your document and corrected errors in grammar, spelling, punctuation, style, and format?

**Assignments:** IDENTIFY—INVENT---IMPLEMENT

“Progress lies not in enhancing what is, but in advancing toward what will be.”

1. **Group Idea Generation/Elevator Pitch (Group Project)**

The entrepreneur is able to see and act upon ideas and opportunities to which others are seemingly blind. Course members should be continually looking for new venture ideas. This assignment is intended to provide an opportunity for you to generate an idea that has the potential to be successful within the context of your experience and environment.

- Each group will present their idea in an in-class “elevator pitch” format. Presentation must be LESS THAN 10 MINUTES.
- Examples of the elevator pitch:
  - [http://www.youtube.com/watch?v=Tq0tan49rnc](http://www.youtube.com/watch?v=Tq0tan49rnc): What are your objectives?
  - [http://www.youtube.com/watch?v=i6O98o2FRHw](http://www.youtube.com/watch?v=i6O98o2FRHw): Public, semi-formal, persuasive--notice the gestures
  - [http://www.youtube.com/watch?v=r_DgsF4iiZe](http://www.youtube.com/watch?v=r_DgsF4iiZe): use of simile (like Match.com) and evidence of success

2. **Group Project: Opportunity Assessment & Presentation**

Every successful business narrates a story of recognizing a potential opportunity and making the most out of it before others could even realize its true potential. Serendipity may occasionally help you to recognize an opportunity, but most often, it is the careful systematic analyses of the business environment that will help you to successfully identify an opportunity that is worth taking. You as a business owner should be smart enough to realize that a gap exists in the market and where your technological idea can “exploit” unsatisfied needs. Successful exploitation requires an understanding of the compelling value your opportunity will generate, resources needed to sustain value delivery, and the team needed to manage market introduction and grow the business to create global impact. (See Opportunity Assessment Guide)

Look at the following clips and see what you notice in terms of presentation style and interaction

---Arthur Benjamin
---Guy Kawasaki
---Carol Bartz
---Catherine Mohr; Catherine Mohr2
---Daniel Pink
---Tina Seelig

3. **Group Project: Technology Commercialization Assessment Form (Appendix Ba)**

The goal of your group completing the Group's Technology Assessment Form is to move beyond the hype, and provide an unbiased view as to the realities related to the inherent risk and/or opportunities present in your group's chosen technology investigation. Commercialization Assessments are written as if they were developed by your internal marketing and/or product development group, but armed with the inside information and knowledge of specific application and user segments that only an industry insider can know. This allows you to cut to the chase, and make specific decisions regarding the potential fit.
4. Biotechnology Commercialization Project Executive Summary: The key deliverable in this course will be an executive summary length technology commercialization plan. This will be a team endeavor. The executive summary should be between 5-7 double-spaced pages. Please use regular font (12 point) and margins (1 inch). All plans should be well documented and include a complete bibliography. If information is gathered from internet web sites, please document the web address, the day that you viewed the information you used, as well as the author of the web page if available. The purpose of this exercise is to gain “real” experience in understanding and analyzing the potential of some idea/technology to be commercialized.

Note that a technology commercialization plan is not a business plan! Technology commercialization plans emphasize early stage technologies, products and services that are not ready for market introduction. They concentrate on how your chosen technology can be developed by establishing proof of concept, a prototype, and a target product/application market direction to guide technology/product development. Business plans deal with products and services that are ready for market and require a fully developed business model and more extensive market knowledge. The difference between the two are illustrated below:

![Diagram of Technology Commercialization Plan vs Business Plan]

More details on developing a technology commercialization plan are provided in Appendix b (Note that you only need to provide an outline & an executive summary for the purposes of this class). Also, all teams will give presentations on their projects at the end of the course. You will need to decide on a project very early on in the course as I expect you to be working on these projects throughout the week. Since the projects are the core emphasis in the course, they will constitute a large percentage of your grade.

4. Group Project: Innovative Business Model (Discussion and Canvas) (Appendix C)

As ideas grow into viable operations, entrepreneurs need to increase the scope of their thinking: is a new product or service viable? Can a profitable business model be developed? Can an organization be created to deliver the value of our new product through the business model? The Business Model presentation will include a detailed discussion of your team’s canvas from a minimum of three perspectives: the customer, decisions, and finance & economics. The grade will be based on how well the team understands the concept of a business model and the appropriateness and consistency of the business model developed for their new venture idea.

Transitions and conclusions in presentations:

- [Link to video]
- [Link to video]
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- [Link to video]
### Deliverables

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<thead>
<tr>
<th>Number</th>
<th>Date</th>
<th>Session</th>
<th>Deliverable Description</th>
<th>% of Grade</th>
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<tbody>
<tr>
<td>1</td>
<td>19</td>
<td>1</td>
<td>Class Participation</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>2</td>
<td>Too Cool (individual)</td>
<td>5</td>
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<tr>
<td>3</td>
<td>19</td>
<td>4</td>
<td>Opportunity Assessment &amp; Presentation (Group)</td>
<td>10</td>
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<td>4</td>
<td>20</td>
<td>5</td>
<td>Biotech Commercialization Form (Group)</td>
<td>10</td>
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<td>5</td>
<td>20</td>
<td>6</td>
<td>Idea Pitch: Group Presentation: (10 minutes)</td>
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<td>Technology Commercialization Plan (group)</td>
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<td>Business Model Canvas Group Presentation</td>
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<td>Individual Case Studies</td>
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### Class Participation

Much of the learning that takes place in a course is a result of classroom discussion. Therefore, classroom participation will constitute a significant portion (20%) of the student’s final grade. Students who excel in contributing to a positive learning experience take personal responsibility for the overall quality of the class discussion.

Students can’t contribute unless they are in attendance. Attending class is a minimum part of class participation. However, there will be times when students need to be absent. Students should notify the instructor by e-mail in case they have to miss a session. In the case of a missed session, students have the option of doing a make-up assignment, which should be discussed with the instructor.

Students are expected to prepare for each class by:

- Carefully read the texts assigned for that class in the schedule below, taking notes of difficult points and terminology – being aware that this course is being taught to people with little preparation in business and economics, it is expected that students will face some difficulties with economic/business terms and logic; most of these difficulties will hopefully be addressed in class, but students are encouraged to make notes of them and make an effort to overcome at least some of the barriers by themselves;
- Review the questions associated with the assigned readings and be prepared to discuss them in class.

### Long-Term Advantage: Choosing a Mentor/Adviser & Corporation-of-Focus

Each individual should consider the finding of a mentor/adviser to share wisdom with you on an ongoing basis. A mentor/adviser is someone with technological and business experience who serves as a trusted confidante over an extended time period usually through startup. Mentors/advisers do this as a means to give back to the community. You will benefit from the mentor/adviser as a sounding board, second opinion, and just for emotional support.

**Required Reading:** *The Real Leadership Lessons of Steve Jobs* by Walter Isaacson

### Online Information Sources

<table>
<thead>
<tr>
<th>Universities</th>
<th>Online</th>
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<tbody>
<tr>
<td>Stanford</td>
<td><a href="https://ecorner.stanford.edu/podcast/answering-common-startup-questions/">https://ecorner.stanford.edu/podcast/answering-common-startup-questions/</a></td>
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Session 1: COMPANY FORMATION
YOUTUBE TEAM DEVELOPMENT: https://www.youtube.com/watch?v=lcJSD7j1mKI

TUESDAY 19: GETTING STARTED
Learning Objectives: Commercializing Your Ideas
- Gain an understanding of what ‘high potential’ entrepreneurship is and how the process works: IDENTIFY—INVENT--IMPLEMENT
- Gain a thorough understanding of course requirements
- Distribute questionnaire on student backgrounds and interests
- Overview of the business plan: purpose, contents, and relation to other business building blocks

High-Impact Entrepreneurs: Endeavors: http://www.endeavor.org

Overview/Review Course Outline
The Entrepreneurial Process
Finding YOUR opportunity:
- http://www.youtube.com/watch?v=3LmsdnZWZN4
- http://www.colorado.edu/business/about-us/sustainability

#1 DUE: “Too Cool” Idea Evaluation Exercise
Optional Readings:
2. Deloitte & Touche Business Plan outline commentary

Required Viewing: BBC Horizons, Biomimicry: https://www.bbc.co.uk/programmes/n3csys30

Session 2:
TUESDAY 19: COMPANY FORMATION
Entrepreneurship Process: Understanding the Problem
See: https://www.youtube.com/watch?v=lwJfs4309uU

Idea Generation: RECOGNIZING & EVALUATING OPPORTUNITIES
Idea Pitch: Example of a simple idea pitch:
https://www.youtube.com/watch?v=IxunO4S96F4

#2 Due Company: Company Formation: Name, Names and position of members
Bioentrepreneurship is a “contact sport” and your ability and willingness to make meaningful contributions are an essential facet of course value. This is your chance to focus on learning a very unique process by sharing your concerns and ideas with the entire class; not just the person sitting next to you.

Session 3:
TUESDAY 19: STRATEGY CANVAS, OPPORTUNITIES
In-Class Assigned Case: Howard Schultz and Starbucks Coffee Company
As a COMPANY examine STARBUCKS entire global supply chain network from suppliers to customers. Match specific existing processes throughout the entire supply chain with biotechnological ideas that would promote sustainability through adoption of new and unique
biotechnology innovations. Prepare one sheet table matching stages of supply chain, biotechnological idea and expected results from 2017 till 2030.

Red Ocean – Blue Ocean: https://hbr.org/2004/10/blue-ocean-strategy
Strategy Canvas

Idea Generation: RECOGNIZING & EVALUATING OPPORTUNITIES

Session 4:
TUESDAY 19: BUSINESS MODEL CANVAS
Value – Capturing Value – telling the story of the business!
BUSINESS MODEL CANVAS: http://www.youtube.com/watch?v=QoAOzMTLP5s

#3 DUE: Opportunity Assessment & Presentation

Optional Reading:
- HBR: Knowing a winning business idea when you see one
- Ten Lessons from Peter Thiel's Class On Startups
- Business Model Generation Canvas_mini
- How to Design A Winning Business Model; Harvard Business Review

Optional:
HBR How To Write A Great Business Plan
HBS Starting A Business? Where To Go For Information

Biotechnology Support Reading:
- Biotechnology Industry Report – 2011
- Industrial Biotechnology:
  - Biotech Industry Clusters – 2009
- Entrepreneurship:
  - Innovation Overlaps – 2011
  - Biology Engineering
  - Biotech Entrepreneur 2009

Session 5:
WEDNESDAY 20: BIOTECHNOLOGY

#4 DUE: BioTechnology Commercialization Form - Outline
See: https://www.youtube.com/watch?v=cqVp-j7FVVw

Session 6: IDEA PITCH

#5 DUE: Presentation: Company’s IDEA PITCH
Creating value & wealth generation
Discussion of issues within Biotech Industry
Develop your company’s Idea Pitch: Idea Pitch Presentations: Preliminary identification presentation of the business venture opportunity and team composition. You should include: Business Product or Service Description, Target Market, Potential Scale and Principal Resources needed.

Optional Reading:
HBS: How to Design a Winning Business Model

GOLDEN CIRCLE: https://www.youtube.com/watch?v=l5Tw0PGcyN0

THURSDAY 21: Session 7: BUSINESS MODEL

Biotechnology Business Model:
In-Class Individual Assigned Case: MorphoSys AG: The Evolution of a Biotechnology Business Model

DUE: Hand-in one page Business Model Canvas of MorphoSys AG (NO RESOLUTION SUBMISSION!)

BIOTECH VOTE
Learning Objectives:
Think, think, and think some more!

- Ask yourself why you want be an entrepreneur, is it for money, fame, sanity (insanity), or a passion to change the world?
- Ask yourself, what skills do I have, what can I learn and where can I go for help when needed?
- Do you believe the work enough to hang-in when things get rough?
- Will it make people’s lives better?

Optional Readings:

THURSDAY 21: Session 8: TEAM RECOGNIZING & EVALUATING OPPORTUNITIES
Assigned Case: NanoGene INCLASS: Stakeholder Role Play: Tompkins, Paige Miller, scientists, VCs, Angels, (No Resolution Paper Due)
The current nature of the pharmaceutical and biotechnology industries & how difficult it is to succeed in these industries
What are the resources & constraints, leveraging strengths to exploit opportunities?

Optional: HBS: Good Ideas and How to Generate Them
How to Research a Business Opportunity
A Conceptual Framework for Describing the Phenomenon of New Venture Creation

#6 DUE: Biotechnology Commercialization PLAN & Presentation
SESSION: 9 #7 DUE: Group Presentations: Business Model Canvas: each department will explain how their department is connected to different areas

1. How each department participates in the commercialization of the technologies;
2. What & How will different technologies support performance in each function?

Is this the best opportunity for my given interests, talents and resources?
- Measure cost, risk and reward in being an entrepreneur.
- What are future growth possibilities for both you and the company (stages of growth, chance of unforeseen opportunities and competitors)?
- Possible partners, who can I get to join the effort and share the vision?
- Think out possible contingencies for unforeseen opportunities and threats.

Developing a Successful Biotechnology Business
See: https://www.youtube.com/watch?v=wbkuGP5R-uE

Learning Objectives:

Needed assets:
- Ideas – get familiar with technologies, industry, products and markets
- People – find talent people who know the technology and how to reach markets, people with energy that share the firms passion and vision
  - Places to find talent
    - Universities
    - Industries
    - Research labs
    - Mentor and advisers who know your market sector
- Money – have an idea how much money you will need, how much things cost and where the needed the money will come from surviving lean times.
- Time – how long will things take to get going, plan for a changing market
- Network – customer, suppliers, distribution, knowledge creators & holders

Know (at least have an idea of) what you are getting into:
- Research existing similar products/technologies (is your idea a noticeable improvement?)
- Market (know customers, is there a big enough market?)
- Capabilities (given talent and resources can your goals be accomplished?)
- Costs and profit (can you make enough money or provide enough social good to make it worth while?)
- Execution (can you put together the operation in time to make the product a success?)
- Refinement (can you move quickly to find new opportunities?)

AGILITY – ADAPTABILITY - ALIGNMENT

Optional:
HBS “Note on Business Model Analysis For The entrepreneur”

Optional Reading:
1. Peter Kolchinsky, “People” in The Entrepreneur’s Guide to a Biotech Startup, p 19-21, download at www.evelexa.com (have to register with the site)
3. The Entrepreneurial Process
   Peter Kolchinsky, “The Entrepreneur’s Guide to a Biotech Startup”, p 1-14,
APPENDIX A: GUIDELINES FOR CASE ANALYSIS

A case is a description of a management situation. The description comprises statements of fact, opinion, and judgment supplied by actors in the case, as well as supplementary information about the organization or industry that is pertinent to the situation at hand. A case presents a specific problem or opportunity that is faced by one or more key decision-makers. You need to find whom that person is – you become that person. Then you need to find the problem or opportunity and state this in a question format.

1. The purposes of case analysis are to provide students with an in-depth and real-world look at the complexities of managerial situations, and
2. The opportunity to practice analytical skills that will be important in the real world.

Cases provide the opportunity to associate relatively “clean” theoretical concepts and models with the messiness of management in action. The objectives are clear thinking and sound analysis.

The general procedure for case analysis is to distill the essence of the problem or opportunity faced from details provided in the case (The Question), analyze the case, and then to recommend specific courses of action.

The following steps are provided as a guideline to help students prepare cases for class discussion.

- Read the case quickly once to gain the general overview of major issues presented in the class. Identify key actors. Try to gain a general grasp of their opinions, attitudes, and relationships to one another.
- Reread the case more carefully now, annotating, highlighting, and questioning. Read to gain a thorough understanding of the facts of the case. Unless otherwise instructed, take on the role of an independent observer. Do not disagree with facts that are presented as such. Consider the opinions, judgments, attitudes, and feelings of actors in the case as “facts” that bear on the situation even if the opinions or judgments are clearly erroneous or biased. As objectively as possible, try to learn everything that contributes to understanding of the situation.
- Once you understand the facts, you can begin to interpret them. You must make decisions about the nature of the underlying problems and/or opportunities. You are trying to find the question what is going on here and why? Wherever possible, in the analysis apply concepts and models discussed in class or in the readings. Analysis requires you to distinguish between important and unimportant information. Then you must arrange important data in order and interpret them so you can draw clear conclusions about the sources of a problem. Understanding the source of a problem is critical to devising solutions that will work. Concepts and models are specifically designed to help ferret out real problems and thereby to suggest the beginnings of solutions. Do not assume that problems identified by actors in the case are necessarily the things that need to be solved. For example, a supervisor may indicate that the “problem” underlying a major conflict between two employees stems from personality differences. This might be true. Alternatively, it might be that the conflict derives from discontinuities in the flow of work between employees or from an inequitable distribution of resources. If either of the latter is true, then “solving” the personality problem will not be helpful. Be very careful not to confuse symptoms of a problem with the problem itself. Do not be afraid to make some reasonable assumptions if specific data are not available. For example, you may believe it is important to know the economic performance of the firm to understand a developing morale problem in a subunit. Make a sensible assumption, state it clearly as an assumption, and continue. Be careful that your assumptions are not contradicted by other information in the case. Try to draw assumptions directly from case evidence. In any event, you will usually find that your overall analysis is not terribly sensitive to the assumptions.
- After you have identified what you believe is the real underlying problem or opportunity, outline a clear statement of your analysis that leads to this particular conclusion. You need a cogent argument that will convince anyone familiar with the facts of the case that your conclusions are correct. Your analysis of people, attitudes, events, structures, and relationships, which always underlie the problem or create the opportunity, constitutes the single most important step in case preparation. It sets the
stage for recommendations. Outlining the argument of your analysis will lead you to discover where your thinking is faulty and so will lead you to refine your thinking toward a better understanding of the situation. Note: Problem identification and analysis are obviously intertwined. Ideally, problem identification follows analysis. Often, however, you will make a good and intuitive “leap” to problem identification. Regardless of how sure you are about your first assessment of the situation, it is critical that you conduct a formal analysis. Recommendations for action based on first insights, even correct and creative insights, often fail to account for other important information.

- Decide on a series of possible courses of action that address the problem or opportunity you have identified. Be very specific about your alternatives. If your analysis suggests that the organization needs a new structure, what should the new structure look like and why? How does the structure you recommend solve the problem specifically? Your argument's proposed alternatives must be linked explicitly to the analysis you have conducted. Try to understand why your chosen alternative, and not some other, is best. Recommendations are rarely credible unless coupled with a discussion of the pros and cons of all alternatives. Try to think about what challenges others might rise regarding your recommendation and answer the challenges. If there are any important timing issues or contingencies that affect your recommendation, spell these out. You need to think through what happens if you do this or that? What if things do not go as you expect they will? About what issues are you most uncertain? What recommendations can you make that accommodate these uncertainties? Managers need to be decisive, but not blind.

Submission Format – Argument development within the following space constraints:
2. Introduction: 3 sentences – relevant background
3. Question: one question
4. Analysis: remainder of the one page
5. Recommendations: 3 sentences
APPENDIX B: A TECHNOLOGY COMMERCIALIZATION PLAN

What is it? Technology Commercialization Plans focus on translating technological ideas into products—that is, developing a market application for the technology.

Technology commercialization plans are not business plans! Technology commercialization plans emphasize early stage technologies, products and services that are not ready for market introduction. They concentrate on how the technology can be developed by establishing proof of concept, a prototype, and a target product/application market direction that will guide technology/product development. Business plans deal with products and services that are ready for market and require a fully developed business model and more extensive market knowledge. The following diagram graphically illustrates this difference in emphasis. (FROM NASA)

What should be in a Technology Commercialization Plan? There are several standard sections that should appear in every Technology Commercialization Plan. The important thing to remember is to customize the Technology Commercialization Plan to fit your particular goals and directions. The following sections are a good guideline for your plan:

Executive Summary: This may very well be the most important section of your Commercialization Plan. Often times the Executive Summary is the ONLY portion of a Technology Commercialization Plan that is read by outside sources. The Executive Summary should be concise, but informative about potential innovation(s) while creating interest. Describe the potential product(s), their unique competitive advantage, and development and technical milestones.

Product/Service Description: Clearly describe the commercial product(s) you aim to create in terms that a "layperson" could understand, and include in the description:

- A technology description that is suitable for review by individuals with technical and business backgrounds;
- How the product(service) will benefit the customer (what is its uniqueness); and
- Projections of technology readiness (e.g., how long and how many resources will it take to produce a transferable product). That is, what is the timeline and resources needed to develop proof of concept and a prototype, and ultimately a product.

Target Market, Competition and Intellectual Property Assessment: This section should demonstrate strong market knowledge and list those market area(s) to be targeted. Included in this section should be:

d. A description of the target applications, including (if appropriate) a priority ranking that identifies the highest impact applications that deserve primary attention. Include possible fields of use for later licensing action;

di. A market analysis and research reports that show the market need for the particular product(s) and lists key customers;
dii. An overview of the tactics to be used to connect to industry, which may include news releases, publications in government periodicals, direct mail, networking, technology briefings, and presentations at technical conferences, trade shows, or workshops;
diii. The timelines and action steps to develop early partnerships, collaborations, field testing, etc; and
div. Specific patent and licensing strategy. This should include a due diligence patent analysis that identifies potential claims for your technology that make it unique and non-obvious. Is it patentable? Is a patent necessary to provide your product/technology competitive advantage? The intellectual property protection and business development tactics, including marketing plans, need to mesh with the technical development and partnering activities.

Management Description: Identify the key business and technical management personnel. Include technical experience and skills, and show how these individuals give a distinct competitive advantage to the venture.

Operations: Describe the plan and schedule to develop and/or produce the end product, and include:
An understanding of the technologies that will be applied to produce the planned product and an understanding of the new technology as it may impact the commercial market. This step consists of developing an understanding of the unique capabilities, limitations, characteristics, or other features of the technology. To do this, the planner must develop an understanding of the state of the art in the intended fields of use. Questions to be answered include the following:
1. What are the competitive technologies? Emerging technologies? Note: Information on competitive technologies is derived from Web-based searches, previous market and technology reviews, and direct contact with industry experts.
2. Is the new technology expected to be better than existing technology - in what ways? Example: A new joint may be a stronger design, allowing the assembly to handle much higher service loads.
3. Will it be faster - by what measure? Example: A new joining procedure may take fewer steps, allowing the manufacturer to double the process throughput.
4. Will it be cheaper - as a unit or in an assembly? Example: A new joint may not require an adhesive where the existing technology always requires this expense.

Potential development obstacles: Questions to be answered include:
- PRODUCT DEVELOPMENT – INCUBATION -- PROTOTYPING
- What are the known potential barriers to market acceptance? Example: The primary user may be in a heavily regulated industry, e.g., involving public safety, where new ideas (even great ones) face many months or years of acceptance testing and certification.
- Will the new technology eliminate (or add) an environmental problem? Example: The new joining technique may eliminate a machining step that required expensive capture and disposal costs for hazardous waste scrap.

Approaches for connecting with the market: Presuming that the new technology can be shown to be of sufficient value to industry, the next consideration is to analyze the possible paths to market. Many options can be explored and different models may make sense for different situations. You should outline commercialization options, develop financial projections and analyze the strengths and weaknesses of various approaches to commercialization. Below are some examples:
- Pricing
- Create a start-up/spin-off
- Develop technology yourself and plan to license it.
- Develop a partnership with a company early in technology/product development. Example: The software example mentioned above may benefit from a collaboration early on, where the company may be much more likely to develop a commercial version. Also, specific technical expertise from a company may be brought in to save time and money in developing your technology.
- Wait until the core technology is proven on the bench, then form partnerships. Example: Many trials and failures often characterize materials development. It may make sense to wait until confidence is high before expending the resources to develop collaborations. Collaborations often are necessary in
order to have larger batch samples made for end users and to have materials characterization tests performed.

**Identify a target range of milestones** for expected commercialization success. Develop specific milestones for partnerships and all stages of development.

**Document the Plan.** The final step is to document the plan based on the findings of the analysis of the technology and the market. Before a plan can be documented, key conclusions and decisions need to be made. Based on the research and analysis outlined above:

- Create a commercialization roadmap.
- Decide whether the commercialization effort (and technology development effort) will benefit from early industry involvement.
- Determine the most effective level of industry involvement.
- Create the general plan for protecting important intellectual property.
- Anticipate the mechanisms for marketing the technology.

**Risk Management:** Identify possible risks (YOURS, CUSTOMERS, OTHERS) associated with the technology and discuss how they will be managed.

**Schedule:** Provide the overall schedule (timeline) for development, production and marketing of the technology and end product(s). (Gantt chart) NOTE: include BREAK-EVEN, CASH FUNCTIONAL AREA SLIDE (include 1. How support primary technologies; 2. How use new technologies manage departments – SN, Mobile, AI, Cloud, Big Data

**Appendices**

Include any relevant attachments (e.g., patents, market research studies, agreements).
APPENDIX Ba: Technology Commercialization Assessment Form

In order to justify incurring the significant patenting costs (approx. $15,000 - $25,000 for patents in the U.S, Europe, and Canada) associated with technologies, it is important that a determination of commercial viability be undertaken prior to initiating patent protection. A thorough response to this Technology Commercialization Assessment Form will assist in your efforts to successfully commercialize your technology and thereby generate revenue. The provision of incomplete or limited information may adversely affect both the timely protection of the intellectual property and the subsequent negotiation of beneficial commercial agreements. Where the space provided to answer questions is insufficient, please attach supporting documentation referencing the appropriate question number.

1. What problem does this technology address? (What is the motivation for an end-user to purchase this technological product/service?)

2. How is this problem being addressed now? (What are the competing technologies?)

3. List known manufacturers/providers of competitive or substitute technologies.

4. What are the key distinctive benefits of this technology over the existing competitive or substitute technologies?

5. What are the potential impacts of this technological solution to end-user costs (labor, energy, materials, waste handling), manufacturing processes, product quality, increased product functionality, safety, etc......? Please answer this question in general terms. (e.g. lower energy costs, easier to manufacture, etc...)

6. List the target markets/applications for this technology:

7. List known companies who may have an interest in commercializing this technology. (Company name, contact person, phone number, web site, etc.)

8. Where are these markets geographically located? (list in order of largest to smallest markets)

9. Is this market affected by government regulations that may either impede or drive the acceptance of this technology in the selected application markets? If yes, list the regulations and describe the potential impact on the technology.

10. List any relevant industry associations that may be able to provide additional market information. (Full association name, contact person, phone number, web site, etc.)

Provide any additional information that you feel is relevant to the assessment of this technology for commercial viability.
Appendix C: PREPARING A BUSINESS MODEL CANVAS

A business model is a logical and internally consistent representation of the design and operations of a business, capturing the essence of how it will be focused and demonstrating how an interrelated set of decision variables will be addressed to create, deliver and capture value. By one definition, a business model consists of four interlocking elements:

- The **customer value proposition** (how does the firm create value for a customer)
- The **profit formula** (how does the firm capture value for itself while providing value to the customer)
- The **key resources** required to deliver the value proposition to the targeted customer
- The **key processes** that allow a firm to deliver value in a repeatable and scalable manner.

Business model innovation is focused on the design and development of new and unique business models that, by definition, challenge accepted conventions in a given industry about how to create and deliver customer value while making sustainable profits for the entrepreneur and his investors. Although it may be possible, under ideal circumstances, to “design” an innovative business model, an alternative view holds that business model innovation is a somewhat messy, iterative process of experimentation and refinement. The essence of this perspective is captured in the admonition of an experienced entrepreneur and venture investor to: “try it, iterate it until you get it right, then build a repeatable scalable business process”. This view is consistent with the assertion that “no venture succeeds with its original business plan”, and maintains that the principal difference between winners and losers is the ability of the winners to recognize the shortcomings of their initial approach, update their assumptions, and redirect the organization from Plan A to a more workable Plan B before their funding is exhausted.

**TEAM NAME HERE**

FILL OUT ALL 9 BOXES OF THE CANVAS IN ORDER 1 THUR 9

The business model canvas presentation for the project will be to define your business model aimed at Visionary customers. Use the Business Model Canvas to frame the business model. This should be based on information you develop through a handful of exploratory interviews. In your presentation you will explain
the contents of each of the elements and why you have chosen them. You will also explain what the major uncertainties are in this business model. Translate these into hypotheses. In your presentation: Describe how you will go about testing these uncertainties. How will you collect data? What results – be as specific as you can – would lead you to change the model (usually by changing the target segments or the value proposition)?

Tell us: How your organization will create, deliver and capture value!

Consider these items:
- Who’s your customer?
- What’s your value proposition?
  - What problem do you solve?
- What’s your basic model?
  - For-profit? Non-profit? Eyeballs first? Revenue first?
- What skills do you need besides yours?
- What other resources do you need?
- How are you going to get the word out?
- Who are your competitors? (Honestly)
- What could possibly go wrong? (Honestly!)
- How will you consider yourself successful? (How to measure?)

Your Business Model Canvas Presentation (at least 1 slide per member)

Slide perspectives:
1. Customer
   a. Marketing
      1) Target Customers
      2) Customer Segments
      3) Distribution Channel
      4) Relationship
   b. Management
      1) Value Configuration
      2) Capabilities
      3) Partnership
   c. Product/Service: Value proposition
2. Decisions
   a. Statistics
   b. Operations
      a. REAL TIME
      b. PREDICTIVE
3. Evaluation
   a. Finance
      1) Cost Structure
      2) Revenue Model