

# Entrepreneurial Economic Toolkit

Developed by the UC Davis iGEM  
Entrepreneurship 2012 Team



# Introduction

Over the past few years, we have seen the iGEM competition go from a small venture to the premier synthetic biology competition for undergraduates at universities internationally. With just under 200 teams competing in this year's competition, many new technologies and solutions to important problems are being tackled in creative and intuitive ways.

With the institution of the iGEM Entrepreneurial division of the competition, teams can look at the economic implications of their project, and begin to think about the aspects related to the instituting synthetic biology constructs in the real world. However, how do teams actually go about creating a real product out of laboratory constructs?



# Assessment

When looking at endeavors in synthetic biology, with an end goal of industrial development, there is a necessity for analysis of a multitude of factors, and an in-depth assessment is unrealistic to achieve in such a brief overview.

However, we hope that this overview gives teams a realistic set of guidelines to firstly assess a problem, and then secondly strive to generate a solution that will hopefully be beneficial, intuitive, and profitable.

This Economic Toolkit, created by the UC Davis 2012 iGEM team, is geared towards assisting the development of viable iGEM projects into the business atmosphere.



# Defining the Problem

- First off, a need or source of demand must be identified
  - What is the problem? What are you trying to solve?
    - Ex: The environmental impact of plastic materials in ecosystems.
- Once a problem is elucidated, a market must be defined
  - Who would be affected or interested in this problem?
    - Ex: Waste Management Companies, Materials Producers, Consumers
- Next, who else is involved in dealing with the problem?
  - Why has the problem not been solved? Who else is involved?
    - Ex: Not economically feasible, and technological constraints limit competitive alternatives
- And finally, identify your proposed solution to the problem
  - What does your process/product do differently? How will this improve current practices?
    - Ex: Synthetically engineer an organism that utilizes plastic in a beneficial way



# The Need

- There is a distinction between a problem and a need
  - Problem - Arms escalation is leading to greater national security risk, but is there a need to develop more and more weapons?
  - Problem - Earth is running out of sustainable resources, but is there a need to look towards space exploration as an escape route?
- Does your proposed solution resolve a problem, and if so, what implications will solving the problem entail.
  - Consider that you are asking others to invest their time, trust, and most importantly, money, into your business. If your answer to the question begins with "No, but..." then there is no need.

**This is the pivotal point in your venture. No need will lead to no market and therefore no business.**



# Identifying the Need

- Is there a need for this venture?
  - What is the scope of your solution? Is there an extremely specific niche your product/process is aiming to fill, or are there broader implications?
    - Ex: Plastic waste in the environment is having increasingly important economic and environmental implications to individuals and societies on a globalized scale
  - Find your market, if there is none go back to the beginning and find a new problem or solution.
- How are you fulfilling that need?
  - Fitting a solution to a problem is difficult. Clearly identify how your solution will solve the problem.
    - Is your idea an improvement on a technology? Is it cheaper than existing technologies? Is it novel to a rising issue or concern?
    - Ex: Synthetically degrading plastics is extremely incentivized, and further development will push
- Value proposal: What is the ultimate benefit to customers of your innovation?



# The Mindset

To make the leap from idea to venture the ultimate goal is to reduce uncertainty while increasing the value of your initiative.

Uncertainty are all the barriers causing your idea to not become reality. They are not measureable, but they are reducible.

Your company's worth will be determined by how much the potential value outweighs your uncertainty for success.

As you go along through this toolkit at the end of every section there will be a time to catalogue your uncertainty. In order procede you must make assumptions about your potential risks. These assumptions will hopefully come to reality as your idea develops and time goes on.



# The Market

- Innovation in this industry constantly induces demand, as improvements to processes foundationally alter the relatively new industry.
  - Your ventures should assume the role of market satisfying inquisitions, meaning they aim to serve a demand, above all.
- Large and established biotechnology firms often discourage market entrance for plans to industrialize a process or product.
  - Many viability factors go into fully deciphering competitive landscapes, but if done correctly, the development of a biotech corporation effectively addresses location, sustainability factors, quantity of customers, and competitive advantage.



# Uncertainty and Risk Factors

- Time- How long will a proof of concept take to present to investors?
- Results- Will it work? How well will it work?
- Scalability- Will we be able to produce on an industrial level?
- Performance- Will our product work outside of our own lab, with customers needs?
- Reliability- We will be able to maintain quality for a large customer base?
- Competitiveness- Will we outperform our existing competitors?



# Revenue Models

- What is the classification of your venture? i.e. Revenue Model?
  - Unit sales: selling a product or service (most common for biotech companies)
  - Advertising: marketing or promoting other's ideas or messages
  - Franchise: create a chain of companies to grow and later sell
  - Utility: selling a product or service on a per-use basis
  - Subscription: selling access to a certain good or service for a period of time or per-use basis
  - License: Selling the rights your intellectual property
    - DO NOT JUMP TO LICENSING!



# Competitors

Who are your competitors?

- Competitive Landscape
  - Clearly outline a table your competitors in the first column, and their/your traits in the first row. Check off which companies contain certain qualities
  - insert example here
- Who are you potential partners?
  - Some companies that you would view as competitors could become your allies
    - i.e. A plastic degrading company could use a recycling companies facilities in order to cut their own cost and provide a service to the resource provider



# Competitive Advantage

- The most basic question startup ventures must answer lies in why would investors, customers, consumers, professionals, and institutions care about your product/service?
  - The concept of competitive advantage, when assessed, should outline the main reasons your company would be relevant, viable, and successful.
  - In order to convince venture capitalists to invest significant sums of money into a startup, you have to be able to clearly identify a revenue model that will be successful, or is projected to be.
- To outline a competitive advantage, research and development must go into efficiency of the given process.
  - Is your novel innovation reasonably achievable, given current technologies?
  - Are there other corporations doing the process or producing the product?



# Customers

The most crucial task in creating a business is identifying your customer.

Your analysis of your value from understanding your need, along with understanding your technological solution, and assessing your competitors, should lead you to a customer base.

Without customers you don't have a business.



# Calculated Risk and Assumptions

- Is our market clear?
- Is the market growing?
- Are we creating a new market?
- What are the needs of the market and how are we satisfying them?\*
- Who are our competitors/What is the competing technology?
- Is our customer base clear?
- What is our sales process?
- Will customers pay for our product or service?



# Communication

- What would you ask a potential advisor?
  - Advisors will be crucial in the early stages of infrastructure development, as business decisions made following the first round of funding often make or break a startup.
- What would you ask a potential customer?
  - It is also important to set up good relationships with a reliable network of customers that all actively strive to maintain beneficial relationships. It is often these customers that provide the greatest source of revenue and shape your company to be poised for success.



# Business Considerations

- Expenses
  - Total Fixed Cost
  - Total Variable Cost
- Lifecycle analysis
  - Input leading to output
  - Cost leading to returns
  - Must map all components from raw material all the way to final product
- Team and Advisors
  - What qualifications do you want?
  - Expert in the technology?
  - Expert in the industry?
  - Expert in the market?
  - Expert in PR and advertisement?
  - Experts in management



# Business Model

Culmination of everything in past three themes: Business, Market, Technology

- Elevator pitch: explain your company and it's value in one sentence.
  - Yolo Plastics focuses on reducing the cost of recycling plastic pollutants by engineering microorganisms to convert plastic waste into biomass and high-value chemicals, promoting a more sustainable plastics industry.
- How do you reduce risks while increasing value
  - Analysis your uncertainties and assumptions. How do you reduce your uncertainty, how do you make your assumptions more likely to happen?
- Ten Slide Deck
  - Concise presentation of proposed business



# Innovation

- Once you have properly assessed whether or not your idea is marketable the following needs to be addressed as quickly as possible:
  - Novelty
  - Usefulness
  - Legal Considerations
  - Developmental Constraints



# Patent

- Is your idea not fully developed yet? Do you need time to develop it? Are you low on funding?
  - Provisional Patent: Allows you rights to invention for a 12 month period. Prevents anyone from pursuing your process or cell or products.
- After filing a provisional patent develop your idea, gain profit, hire a lawyer, and begin working on a nonprovisional patent
  - Protects right to distribute, sell, license, or market your idea.
- The United States Patent Office has an accessible database of existing patents that span the international scale. It is important to ensure uniqueness of your project here, and there is a plethora of information regarding patent development, processing, and finalization.



# Intellectual Property

- One of the most important, but not obvious, issues with product development is the consideration of security of the ideas behind the product/service.
  - In protecting the developed knowledge of the inventor, steps can be taken to prevent the use of the idea by others.
  - Many universities have technology transfer offices and protocols that can be extremely useful and informative to a group of innovators.
- There are also rules and regulations that differ by region, either by state, general geographic region, and country.
  - The World Intellectual Property Organization acts as the governing body in cases of intellectual property concerns or disputes. Information regarding specific regions can be found on their website.
- What can you do about protecting your idea?
  - Currently, the iGEM competition does not require the submission of non-disclosure agreements or other legally binding documents that exclusify ideas. Attention should be given to this notion.



# University Considerations

Due to university involvement in the iGEM program, the university may have partial ownership of the ideas and concepts generated through the project. It is essential to check University bylaws on rights, delegations, and faculty participation.

The issue mainly arises in faculty involvement, as infrastructure and faculty availability is facilitated by university spending. Complications can also occur if the university is publicly or privately funded.

There are costs and benefits to university involvement. Patent prosecution, for example, can range in the tens of thousands of dollars, however most major universities will cover many of these costs if they deem interest for pursuit of the issue. However, with university involvement comes partial ownership, which associates certain costs depending on specific policies.



# Your Options

- Once the concept has been developed, and it has been analyzed to be viable and hopefully successful, there are a few options depending on the situation of the project
  - Allow the university to license out your idea, accept the loss of your idea
  - Attempt to gain funding through investors and begin developing your project in a research facility
- Many ideas will need additional research and development to actually become plausible and economically viable.
  - For most projects, in an iGEM sense, much more development will be necessary to make the product/service comparable to industry standards. Often times, there are university or private business development programs known as incubators that are set up in order to assist with company startup.

