How does basic research become a product that can cure disease or otherwise change the world?

Jack M. Wilson, Distinguished Professor
of Higher Education, Emerging Technologies and Innovation
President Emeritus
Former Chairman, President and Founder of ILinc Corporation

Schedule (all times approximate)

- 9:00 AM start
- Introductions
- 9:10 Recognizing Opportunities
  - How are they generated?
    - Example: Craig Mello, UMass Medical School wins the 2006 Nobel Prize for RNAi
  - How do they get out of the lab into the market?
    - Example: UMass -Rabies monoclonal antibody
  - How do you protect your investment?
    - Example: CRISPR
- 10:00 Small Group Discussion on Opportunities You May See
  - Report out to group
- 10:30 The Lean Launchpad and Business Model Canvas
  - Example: Privo Technology
  - Example: ILinc Corporation
- 11:30 Do a Business Model Canvas for an opportunity you have discussed.
- 12:00 Finish

Part 1: Recognizing Opportunities and Generating Ideas.

Dr. Jack M. Wilson

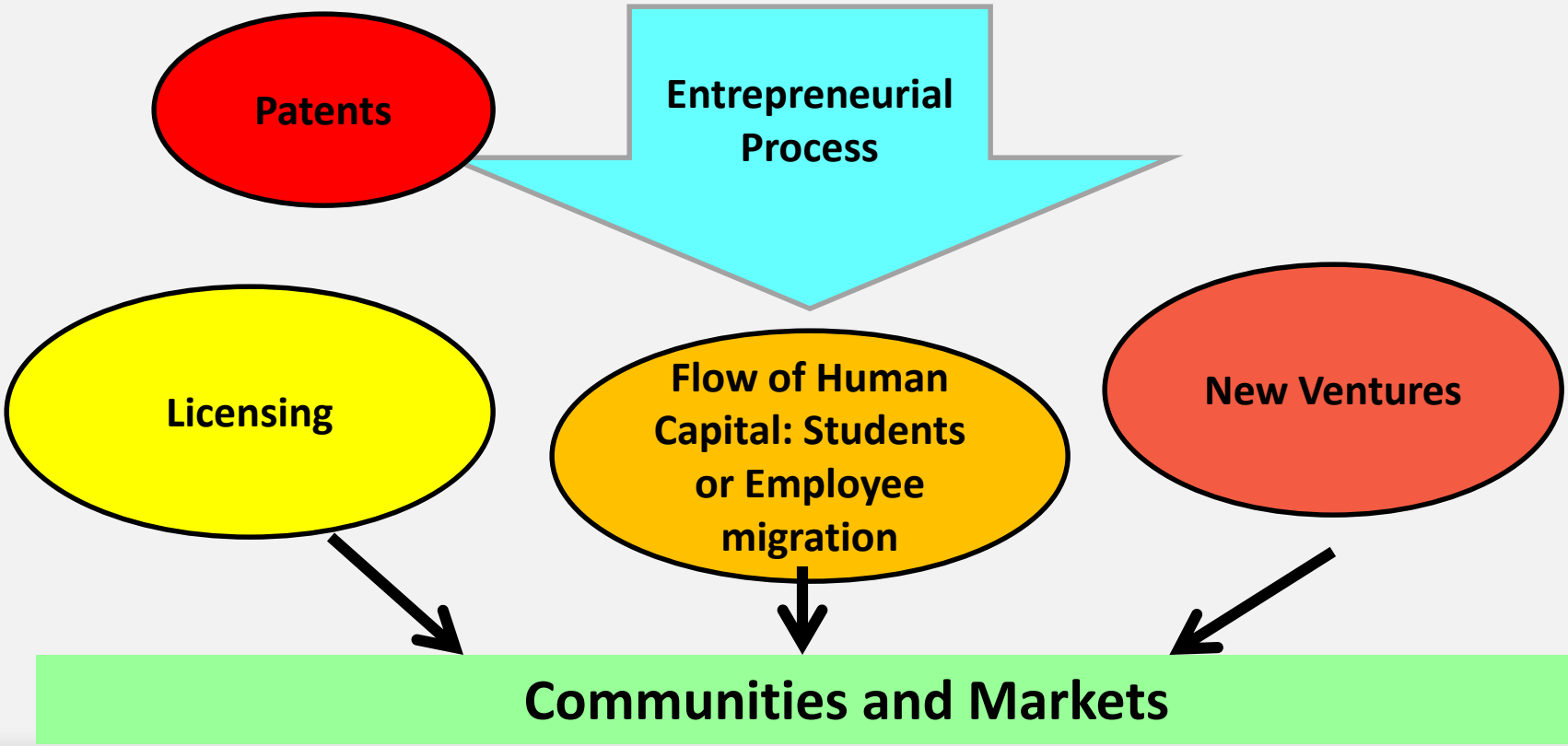
Distinguished Professor of Higher Education, Emerging Technologies, and Innovation

Where do opportunities start

- Technological opportunities almost always start with breakthroughs in new technologies. Those breakthrough can come from:
  - University research labs
  - Industry research labs like Bell Labs, Google Labs, IBM Labs, General Electric Labs, Phillips Research Labs,
    - Industrial laboratories are generally seen as sources of incremental innovation rather than radical innovation.
      - http://www.jstor.org/discover/10.2307/1828511?uid=3739696&uid=2129&uid=2&uid=70&uid=4&uid=3739256&sid=21104913961097
    - Over the last three decades, the center of gravity of research has shifted further toward universities and away from industrial laboratories.
    - The biotech industry has been an exception –particularly in the applied research areas where considerable applied research is still done in industry labs.
  - Government research laboratories like FermiLab, Argonne National Laboratories, Sandia, National Institutes of Health, National Institute of Standards and Technology, and others.
- To get to market they need to either be licensed to existing organizations or used to develop new ventures.
- Students who graduate and then go into existing organizations also carry the intellectual property with them into their new positons. This is an important flow of ideas into the marketplace or community.

From Idea to Market or Community Use

Idea Generators: University Research, Corporate Innovation, Individual Invention, Government Labs, Social Innovation, Intellectual Capital



The virtuous value chain

- Research
- Applied Research and Development
- Licensing to new or established ventures

- New venture
- Business plan
- Elevator speech
- Early stage funding from bootstrapping, friends and families, angels, loans, or other sources such as the Small Business Innovation Research (SBIR) program.
  - http://sbir.nih.gov/
- Establish company structure (Corporate, partnership, LLC, sole proprietorship, etc)
- Prototyping the product or service
- Middle stage financing from venture capitalists or others
- Growth of new company
- Exit strategy
  - Acquisition
  - IPO –Initial Purchase Offer for stock
  - Remain a private business

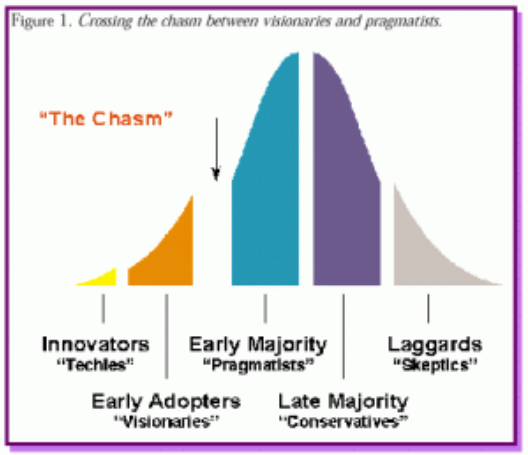
- Licensing to established ventures
- New Product Development process.

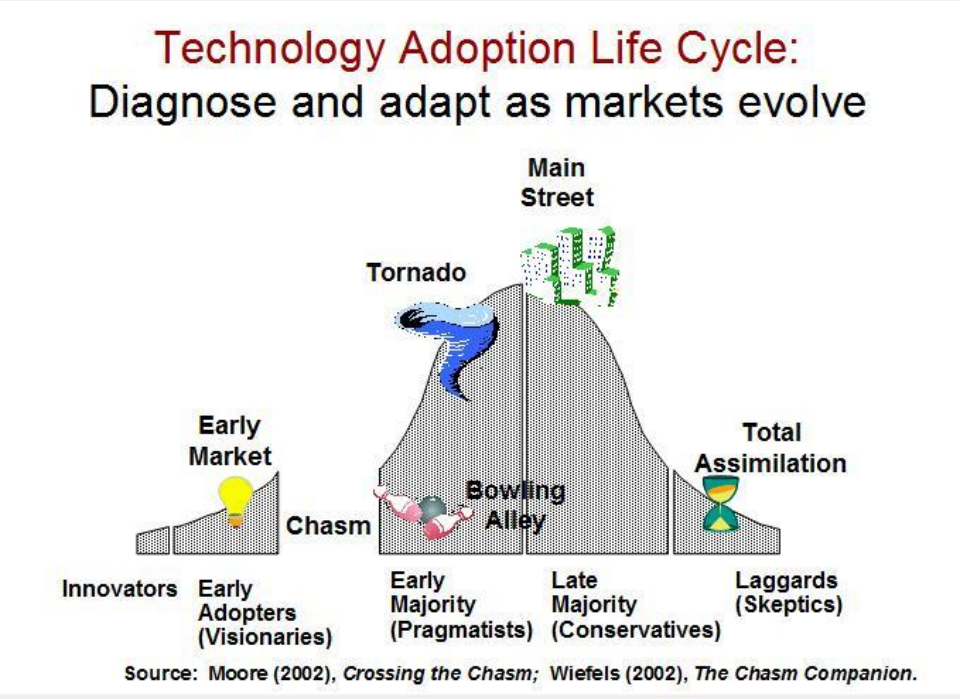
Example: RNAi –from Nobel Prize to….

- Craig Mello wins the Nobel Prize with Andrew Fire in 2006 for the discovery of RNAi –
- They conducted their research at the University of Massachusetts Medical School and the Carnegie Institution for Science
- Their work had shown that RNA plays a key role in gene regulation.
- Suddenly whole new world opened up for medicine.
- UMass Medical School was granted a series of patents. They decided to collaborate with MIT who had some complementary patents, and then license the technology.
- Another company, that did not get a license, decided to go ahead and infringe and deal with the legal fall out. A multimillion dollar lawsuit ensued but was eventually settled.
- Mello become involved in the Umass spin-out of Rxi.

Crossing the chasm: some jargon

- Early market – the early adopters
- Chasm –getting from the early adopters to the early majority.
- Bowling Alley –once established in the early majority
- Tornado – as the innovation moves from early majority to late majority it becomes a tornado of adoption.
- Main Street –we made it!
- Total Assimilation
  Now it is old news!





- Crossing the Chasm is closely related to the technology adoption lifecycle where five main segments are recognized:
  - innovators,
  - early adopters,
  - early majority,
  - late majority and
  - laggards.
- According to Geoffrey Moore, the most difficult step is making the transition between visionaries (early adopters) and pragmatists (early majority). This is the chasm that he refers to.
- Innovators-> early adopters-(the chasm)-> early majority-> late majority -> laggards
  - - http://en.wikipedia.org/wiki/Crossing_the_Chasm

Two Key Concepts

- Joseph Schumpeter –Harvard University economist from Austria
  - **Creative Destruction** – 1934- new products and technologies make old products and technologies obsolete

- Clayton Christensen –Harvard University Management
  - **Disruptive Innovation**-1997 – new products begin in new, unexplored markets but grow in quality and capability to displace older markets.
    - Mini-computer disrupted mainframes and were in turn disrupted by PC's.
    - Steel mini-mills created poor quality steel at low prices to take the least profitable part of the steel market. They then grew to displace the old-line steel companies.

- Often the established companies never see it coming.
  - http://www.claytonchristensen.com/key-concepts/
  - http://en.wikipedia.org/wiki/Clayton_M._Christensen
  - http://en.wikipedia.org/wiki/Disruptive_innovation

What is an Opportunity?

- **Opportunity**- a favorable set of circumstances that creates a need for a new product, service, or business.
- **Opportunity gap** – identifying a missing piece, a NEED, and a new way to fill that gap.
- An opportunity is NOT driven by a desire to make and sell.
- An opportunity is NOT an IDEA –unless that idea is directed at solving a problem that people will pay for.
- An opportunity is driven by filling a markets need to (and ability to) buy.
- Some innovations are radical –an entirely new way to solve a problem or an entirely new product.
- Other innovations are incremental, or sustaining, and are extensions of existing solutions that are somewhat better.
- Incremental innovation rarely works for new business, but is often the hallmark of established businesses.
  - Building a better mousetrap rarely leads to the market beating a path to the inventor's door – unless it visibly and significantly changes the game for mouse catching!
- **Window of Opportunity** – timely, not too early or too late. Opportunities depend upon acting at the right time. Too early and too late are sure ways to fail.

Example: Rabies Mono-clonal antibody –UMass Biologics Lab

- Researchers at the UMass Biologics lab of the UMass Medical School discovered a monoclonal antibody for rabies.
- It is spectacularly more effective than current treatment regimen of a 30 day series of rabies vaccine shots.
- It reduces the cost of treatment dramatically from current treatments
- It reduces the suffering of person being treated.

- Now, This is a great **IDEA**!

- Is it a great **OPPORTUNITY**?

- For an idea to become an opportunity it needs a market ready and willing to pay for the alternative.

Example: Rabies Mono-clonal antibody –UMass Biologics Lab -2

- Is this a great opportunity? Ask yourself:
  - Is there a huge need and demand for this product by a group that is willing to BUY it?
  - Does that identified market represent enough economic incentive to create a business and justify the investment?
  - What investment would be needed to bring this to market?

- The market:
  - The market in the U.S. is very small. Very few persons are treated for rabies each year. The few patients are generally treated by public health organizations.
  - The cost of doing animal and human clinical trials is huge.
    - Pre-clinical, Phase 1,2,and 3
    - Cost of bringing a drug to market $1.2 Billion (Tufts -1990-2003)
    - It takes an average of over 8 years to bring that drug to market.

Example: Rabies Mono-clonal antibody–UMass Biologics Lab -3

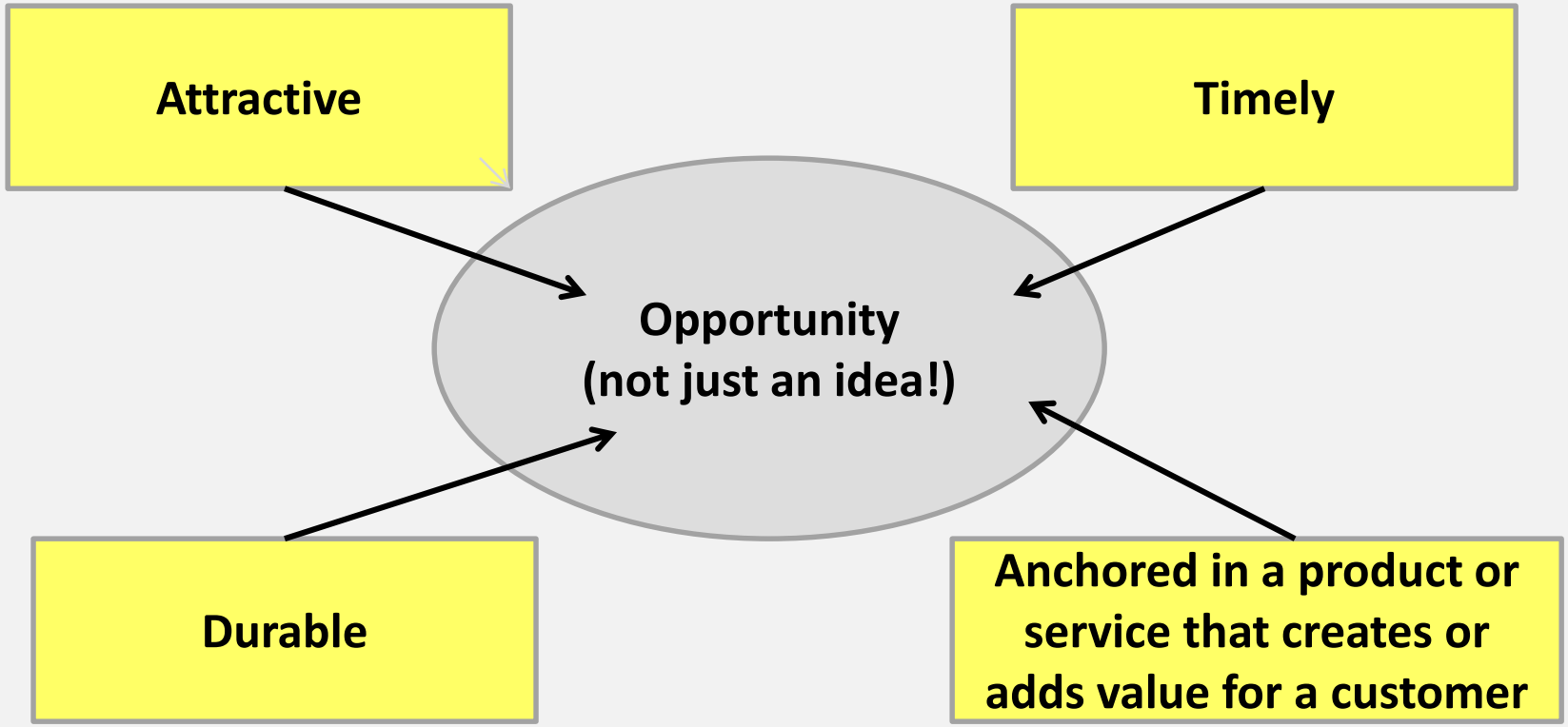
- Conclusion: there is no viable US market to justify the investment. There is no (immediate) U.S. opportunity.
  - It is to expensive and takes too long to reach a very small market.
  - That is agonizingly sad, but absolutely true
  - It is also not that unusual in the medical field.

- Is there an alternate strategy to convert this IDEA into an OPPORTNITY?
  - Rabies is endemic in India and tens of thousands die each year
  - The cost and duration of treatment is unsustainable for so many victims in very poverty stricken regions..
  - The cost (and regulatory burdens) of clinical trials and development in India is much lower

- Solution: license monoclonal to an Indian company for development.
- Future strategy? Bring it back to the US after it is established in the market in India and other regions with more patients.

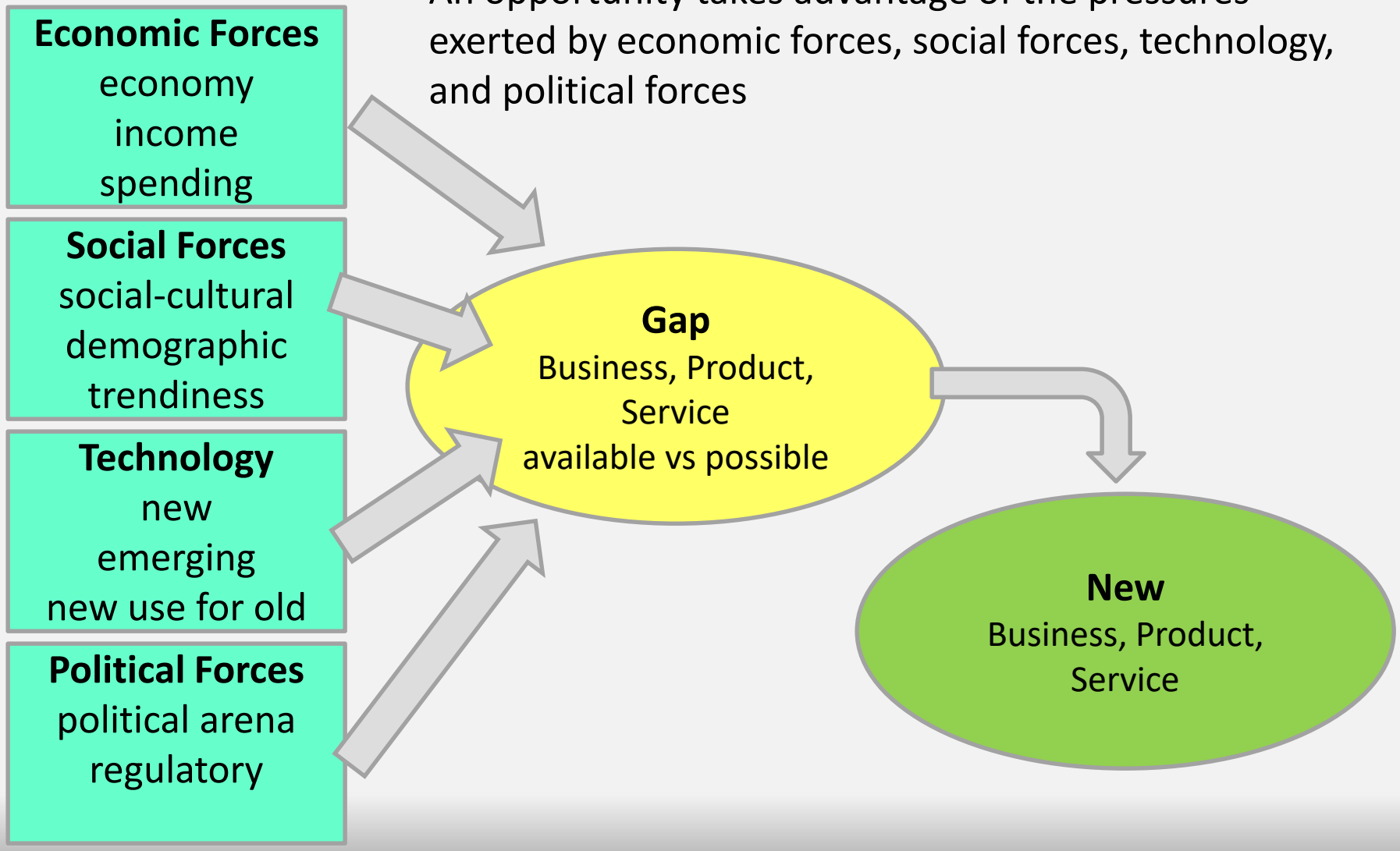
Four Essential Qualities or Dimensions to an Opportunity

- An opportunity needs to be attractive, timely, durable, and anchored in a product or service that creates or adds value to a customer.



From Trends to Opportunity

- An opportunity takes advantage of the pressures exerted by economic forces, social forces, technology, and political forces



Economic forces -examples

Here are some examples of economic forces:

- A rising economy – more discretionary income
  - Until recently the growing China market has been one of the key factors driving the world economy.
- A falling economy – products that cut costs or expenses
- Increasing or decreasing energy prices
  - Gas prices are falling. Hybrid sales are down and truck sales are up.
- Increasing income disparity between groups.
- Interest rates are rising or falling, are low or high.
- Access to less expensive labor for products
- There are many others. Can you think of some?

Social forces

- This is the biggie for the last four decades: the **baby boomers** have changed every part of society as they have gone through the many stages of life from birth to retirement!
- The increasing diversity in the workforce has created many new opportunities.
- The formation of online communities and popularity of social networks
- The change from wired phones to mobile phones as the dominant communication device.
- An interest in healthy living (see boomers above!)
- Increasing use of alternative energy –especially “clean” energy.
  - Popularity fluctuates wildly with variation in energy cost.
  - As oil and gas prices decrease –alternative energy is less economical
- Educational need –continuing education. We are living in a learning economy in which a large premium is paid for education and skills.
- Income disparity is also a social force as well as an economic force.

Technology advances

Here a few technology advances that have helped to define the economy we live in today:

- Personal computing
- The Internet
- Mobile phones.
- Medical Imaging
- Pharmacology
- Biologics
- RNAi – microRNA- gene silencing
- Genomics –personal medicine

Take a few moments to reflect and consider some of the new products, services, and companies that have been enabled by these advances.

Political and Regulatory Changes

- Tax policy –gasoline, cigarettes, oil depletion allowances
  - Taxes do 2 things:
    - 1. raise revenue
    - 2. decrease the use of the thing being taxed
- Health and safety regulation –OSHA, EPA
- Energy policies –alternative energy tax credits etc.
  - Solar energy credits
  - Net metering –forcing utilities to buy energy back from homeowners solar panels.
- Cyber-security
- National Health Policy –Medicare, Medicaid, Obamacare, Drug coverage, etc.
- Education policies –financial aid, standards, compliance, Clery Act, FERPA, Deemed Exports,

Tesla Motors -all electric high performance cars

- Economic Trend – increasing gas prices
- Social Trend –desire to be green
- Technology Advances –Battery and motor improvements
- Political Regulatory Trend – favorable treatment and support for alternative energy systems.

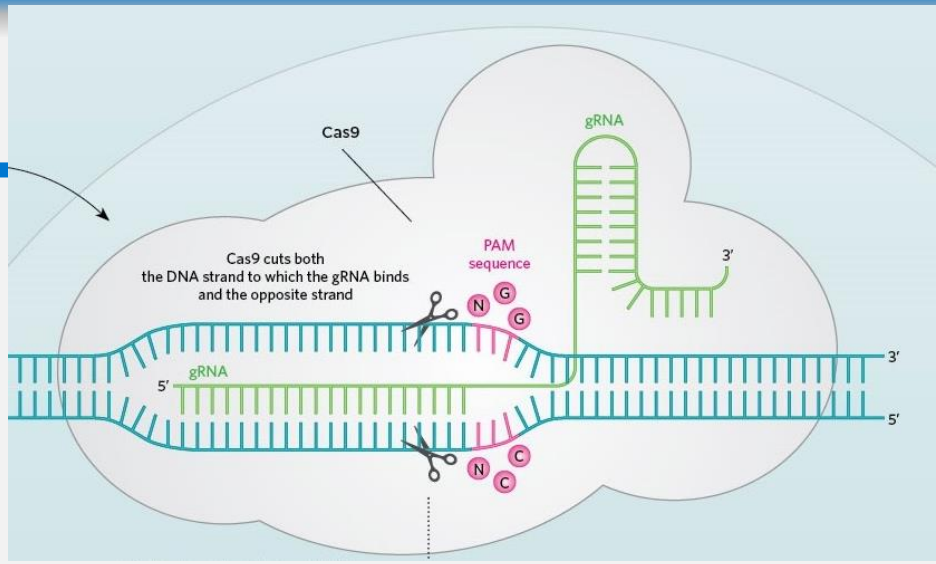
Protect Ideas –Intellectual Property

And finally, when a good idea is found and developed, please protect it from being lost to you and taken by others.

- Put into tangible form with dates and key ideas. An idea can be protected as a
  - Patent –
    - Note: until 2013, the patent went to the first to invent, so many older texts give the incorrect information. Today the patent goes to the first to file. So do not delay.
  - Trade secret
  - Copyright
  - Trademark

- Keep it in secure manner
  - Industrial cyber-espionage has been an epidemic and large countries have even been accused of being involved on behalf of key industries.
- Avoid prior disclosure
  - If you disclose an idea publically –either in a talk or paper –you forfeit the right to patent it.
- More on Intellectual Property:
  - http://www.jackmwilson.net/Entrepreneurship/TE/TE-Chap4-IntellectualProperty.pdf

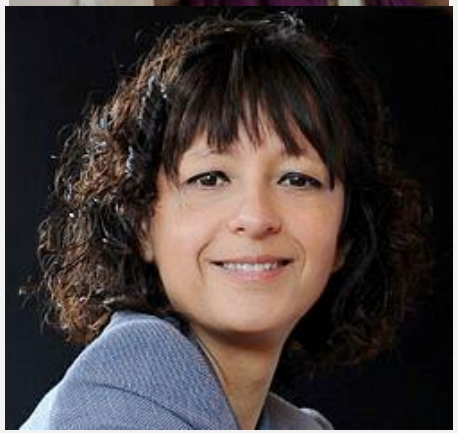
Example: CRISPR



- CRISPR – Editing your Genome: Who invented it and owns the patent? MIT or the University of California?
- From 2016 to now we are seeing one of the epic fights over intellectual property. The potential monetary implications were huge!
  - http://www.statnews.com/2016/03/08/crispr-patent-fight/
- Who invented CRISPR?
  - Feng Zhang of MIT's Broad Institute? He presently received the patent.
  - Jennifer Doudna of the University of California Berkeley? She was the first to file –but she did it on March 15, 2013.
  - MIT filed on behalf of Zhang in October 2013
- MIT paid for an expedited review of their patent claim, but UC did not.
- The Broad was granted about a dozen CRISPR patents for genome editing.
- UC claimed that it, and not the Broad, was entitled to those patents.
- And now the dispute is in the courts.
- Who will win?
  - First: http://www.statnews.com/2016/03/18/crispr-patent-dispute/
  - Later: https://www.statnews.com/2017/02/16/crispr-patent-decision-six-takeaways/
  - Now: https://www.the-scientist.com/news-opinion/uc-berkeley-team-to-be-awarded-crispr-patent-65453

Patents are actually easier to get than to defend.

- The University of California, Berkeley, and its partners in developing CRISPR gene editing will receive the patent at the heart of an intellectual property dispute between the Berkeley team and the Broad Institute and its CRISPR collaborators.
- February 8, 2019, the US Patent and Trademark Office issued a “notice of allowance” for the UCB patent.
- Jennifer Doudna and Emmanuelle Charpentier have won a major battle, but not yet the war.
- At this time, companies will need to cross license the MIT and UC Patents.



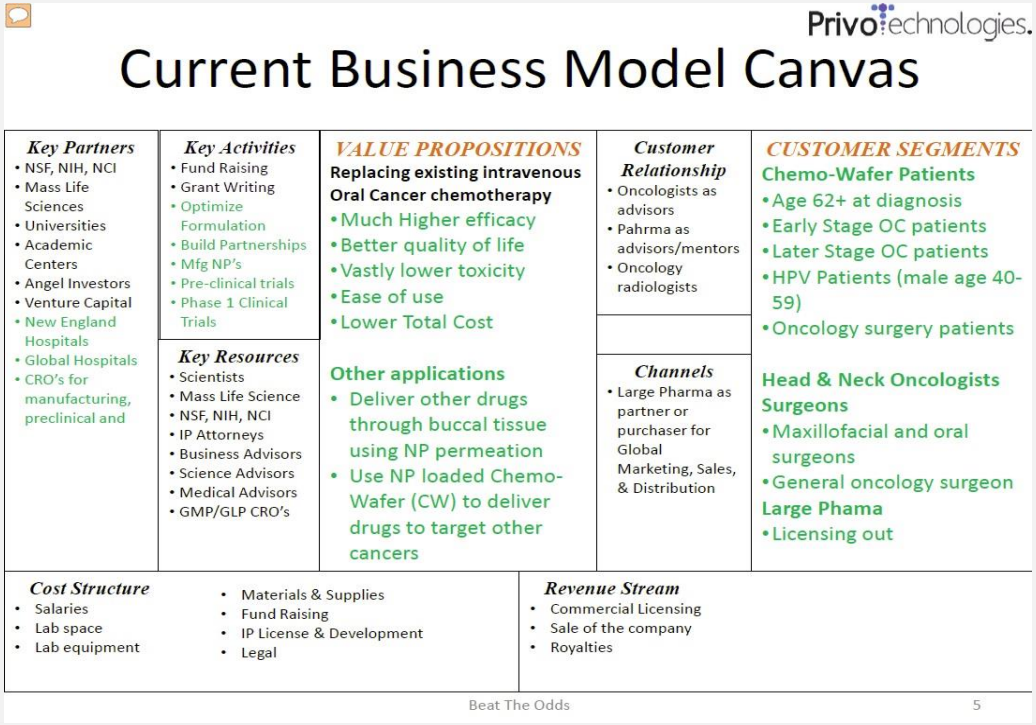
Small group discussion

- 15 minutes: Please form up in your teams to discuss one of the project choices you are working on.
- Is this an opportunity as we have just described?
  - Is the product viable?
  - Is the product valuable?
  - Is the product durable?
  - Is there a market that is ready, willing, and able to pay for this product.
- Is the product timely? Window of Opportunity? Too early? Too late?
- Is the product affected positively or negatively by the forces:
  - Economic Forces
  - Technology Advances
  - Regulatory and Political Forces
  - Social and Demographic Forces
- 15 minutes: Give a two minute report from the group to the entire workshop

Part 2: The Lean Launchpad and the Business Model Canvas

Dr. Jack M. Wilson

Distinguished Professor of Higher Education, Emerging Technologies, and Innovation



Entrepreneurship is more of an Art than a Science

–from business plan competitions to the lean launch pad. Entrepreneurship today is in a state of flux as the field has recoiled from the prescriptive approach of the last decade in which the business plan, and business plan competitions, defined the science of entrepreneurship. The annoying fact that many, if not most, new businesses simply did not use business plans was viewed as something undesirable and needing to be corrected.

As scholars looked at start-ups in a systematic fashion, they also observed that even those that did have business plans rarely executed those business plans in a linear fashion. In fact, most successful new businesses ended up on a trajectory that was not envisioned in the original plan. The ability of a new venture to change its business model dramatically in mid-course has come to be known as a **pivot**. This has led to many scholars abandoning the idea of the business plan altogether.

The Lean Launchpad

- In this part we will introduce the concept of the lean launchpad, as it is used in the National Science Foundation iCorp Program to encourage scientists and engineers to move their research into the market place through entrepreneurship.
- This is essentially based upon work that Steve Blank did in the development of the lean launchpad.
- Blank is a serial entrepreneur of some success who draws on his personal experiences and is a consumer of research rather than a producer-for the mot part.
- His formidable marketing skills have made the lean launchpad a hot topic around the world.
  - http://www.forbes.com/sites/steveblank/2013/06/18/the-lean-launchpad-educators-course/#df15d0d43a74

Steve Blank

- Steve Blank became the leading apostle of business plan rejection about five years ago. In 2009 he wrote that *"In the real world, most business plans don't survive the first few months of customer contact. And even if they did – customers don't ask to see your business plan*. Steve advocated for the supremacy of business models and he enshrined the concept of the pivot as part of his mantra of the "Customer Development Process" with the concepts of
  - "*minimum viable product (MVP*),"
  - "*iterate and pivot*",
  - "*get out of the building*," and
  - "*no business plan survives first contact with customers*."

- http://www.forbes.com/sites/steveblank/2013/06/18/the-lean-launchpad-educators-c
- http://steveblank.com/about/
- http://steveblank.com/2009/05/07/business-plan-competitions-2/
- http://www.businessinsider.com/the-lean-launchpad--teaching-entrepreneurship-as-a-
- https://www.udacity.com/course/how-to-build-a-startup--ep245
- http://www.entrepreneur.com/article/219772
- http://nciia.org/sites/default/files/u7/Educators%20Guide%20Jan%202014.pdf

Steve Blank says:

- After decades of watching thousands of startups follow this standard regimen, we've now learned at least three things:
  - As business plans are full of untested assumptions, they rarely survive first contact with customers. As the boxer Mike Tyson once said about his opponents' prefight strategies: "Everybody has a plan until they get punched in the mouth."
  - No one, aside from venture capitalists and the former Soviet Union, requires five-year plans to forecast a series of unknowns. These plans are generally fiction, and conceiving them is almost always a waste of time.
  - Startups are not smaller versions of large companies. They do not unfold in accordance with master plans. Those that ultimately succeed go quickly from failure to failure, all the while adapting, testing new iterations, and improving their initial ideas as they continually learn from customers.
- Existing companies execute a business model, startups search for one. This distinction is at the heart of the Lean Startup approach. It shapes the lean definition of a startup:
  - **a temporary organization designed to search for a repeatable and scalable business model**.

    - http://nciia.org/sites/default/files/u7/Educators%20Guide%20Jan%202014.pdf

To be fair to many others in the field, his insights into the shortcomings of the business plan were not entirely new, and were probably more a reaction to the way the business plan had become unexamined enshrined dogma that hampered development rather than helped. The problem was not that doing a business plan was bad, but that too many people actually believed that the business plan was an actual "plan" in the sense that large companies create plans. Most of those who taught entrepreneurship already knew that the business plan was something that required regular testing and revision.

I often told my students that the last step in the development of ANY plan was to step back and ask yourself what you were going to do when the plan did not go as planned.

Blank made the significant contribution of pulling together the alternate approaches, rebranding it, and it marketing it into key constituencies –with one of his students, **Eric Reis**. Their Lean-Launchpad model of entrepreneurship now bills itself as the "evidence based entrepreneurship" model and Blank has even trademarked the latter term.

NSF and the iCore Program

- The **National Science Foundation** embraced Blank's and Reis' formulation of new venture development when they launched their **iCore** program.
- In many ways they viewed it as a more scientific approach to venture creation that used the method of hypothesis formation, quick testing, revision, further testing, and continuous refinement.
- Fields as disparate as science and creative writing would perceive this process as the continuous refinement of drafts while writing. It is indeed the way the world works. We build new models of anything we study as we find out more and more detail through research. And so it is with entrepreneurship.
  - http://www.nsf.gov/news/special_reports/i-corps/
- In the new model, the business model canvas, originally proposed by **Alexander Osterwalder** becomes the starting point. (See an example below)
  - http://businessmodelgeneration.com/canvas

- This transition continues to play out in entrepreneurship education programs across the country –as well as at UMass. The most used textbooks are built under the old paradigm. Business plan competitions continue to be held in spite of Steve Blank's pronouncement that "*I hate business plan competitions*."
- Just as physicists teach Newton's Laws and the Einstein Theory of Relativity –which extends and alters Newton's laws, entrepreneurship education needs to introduce students to the process of business planning as well as the limitations and the alternative formulations, like Blank's, that have emerged.
- We also need to alert students to the danger of allowing any model (including Blank's) to morph into a dogma that could constrain innovation.

Customer Discovery

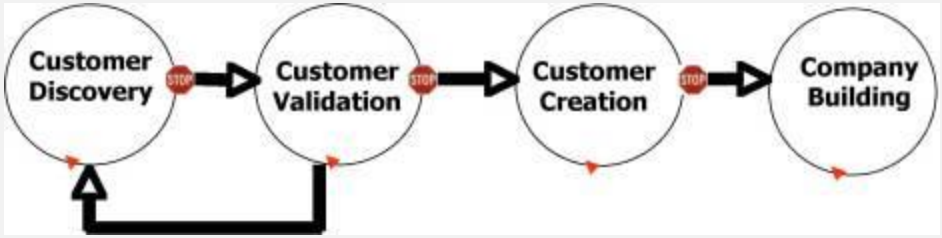
- Customer versus Product Development

Steve Blank:

- Get out of the building (physically or virtually)
  - Talk to customers, ask them questions, and listen.
- Sales calls aren't your IQ test or PhD defense
- Stop talking and listen to the customers problem
- Hire a sales team at the Customer Validation step
- Match the sales team to market type

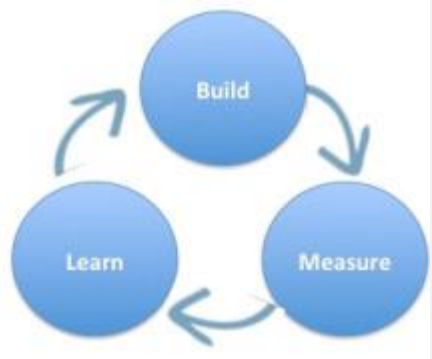
  - http://steveblank.com/tag/customer-discovery/

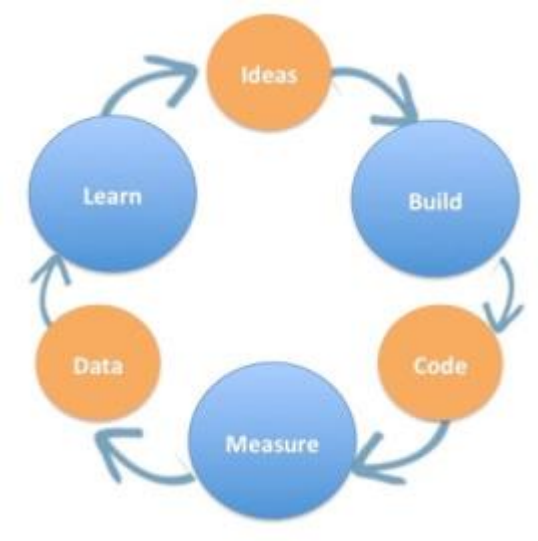
From Customer Discovery to Company Building



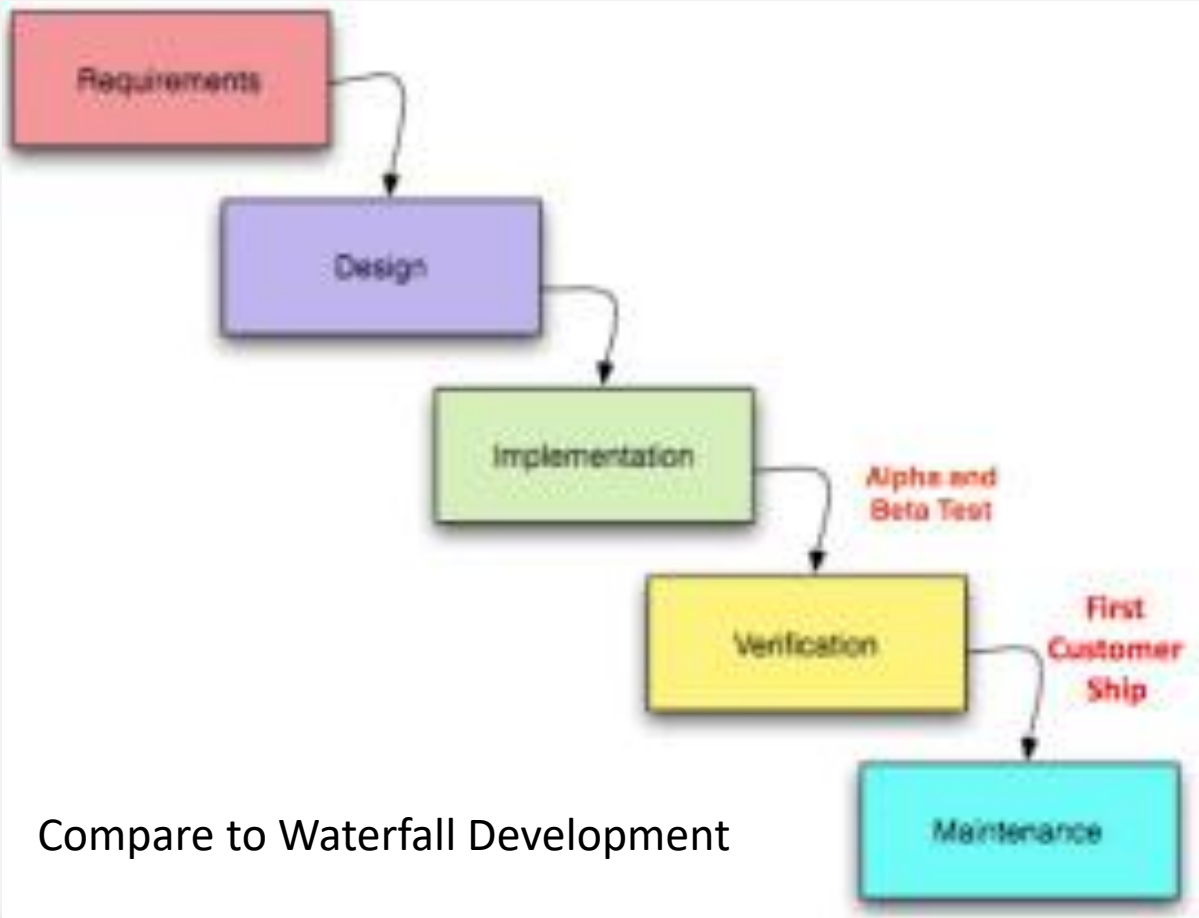
- **Customer Discovery** first captures the founders' vision and turns it into a series of business model hypotheses. Then it develops a plan to test customer reactions to those hypotheses and turn them into facts.
- **Customer Validation** tests whether the resulting business model is repeatable and scalable. If not, the team returns to Customer Discovery.
- **Customer Creation** is the beginning of execution. It builds end-user demand and drives it into the sales channel to scale the business.
- **Company-building** transitions the organization from a startup to a company focused on executing a validated model.

Build, Measure, Learn (repeat)



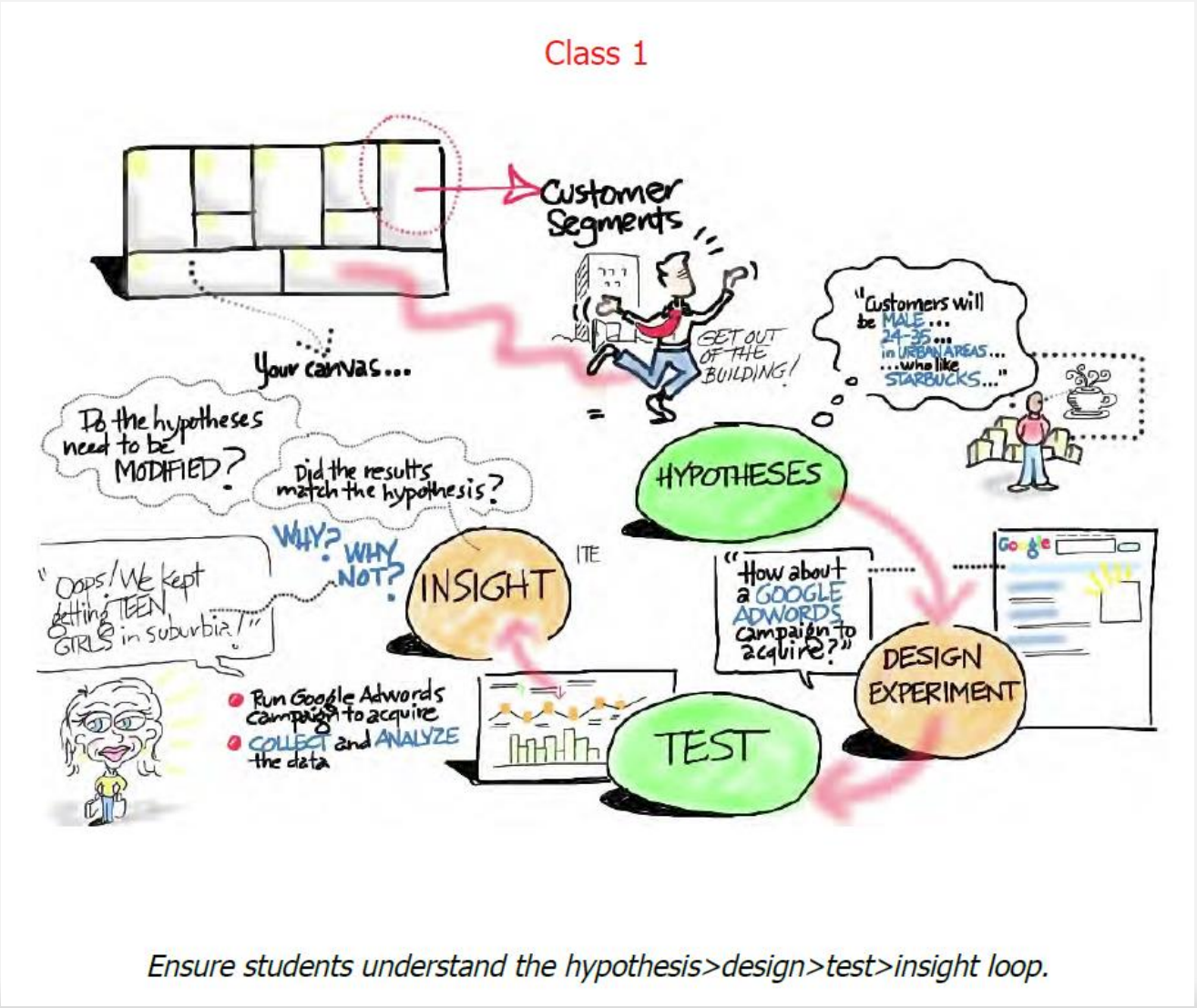


Agile Development



Compare to Waterfall Development

Agile Process



MVP- Minimum Viable Product

- In product development, the minimum viable product (MVP) is the product with the **highest return on investment versus risk**.
  - The term was coined and defined by Frank Robinson, and popularized by Steve Blank, and Eric Ries
- An MVP is not a minimal product, it is a strategy and process directed toward making and selling a product to customers.
- It is an iterative process of idea generation, prototyping, presentation, data collection, analysis and learning.
  - One seeks to minimize the total time spent on an iteration.
  - The process is iterated until a desirable product/market fit is obtained, or until the product is deemed to be non-viable.

  - http://steveblank.com/2013/07/22/an-mvp-is-not-a-cheaper-product-its-about-smart-learning/

Pivot

- What you learn in the customer development process or in the build-measure-learn process will OFTEN cause you to change direction.
- The Pivot
- This is not a sign of failure.
- It is a sign of success.

- Many teams believe “a company is all about my **invention**.”
- Your goal is to teach them “it’s all about the business model.”

- The MVP, pivots, and Customer Development conserve cash,
  - and can accelerate the time it takes to discover a viable product-market fit.

Business Model Canvas

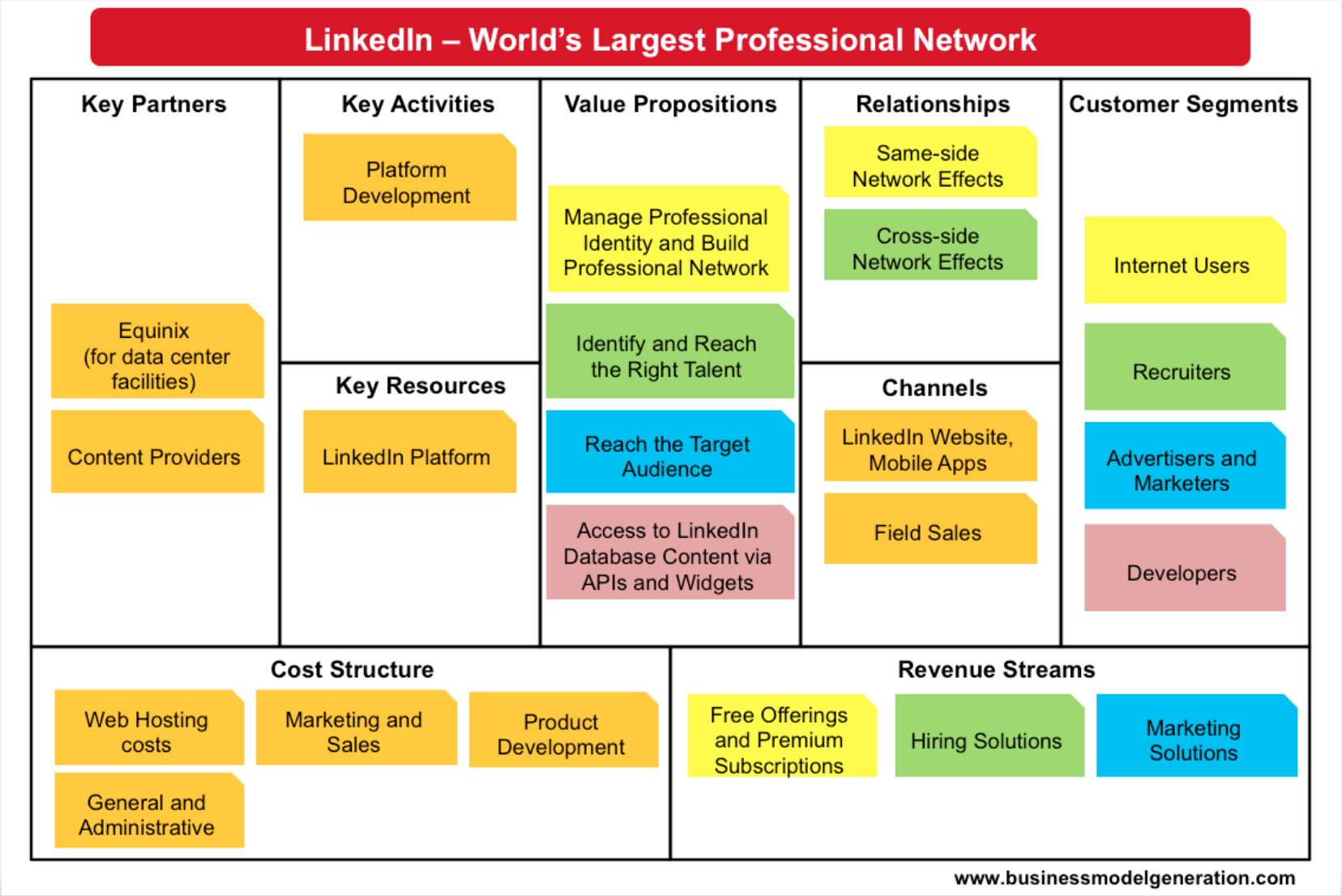
Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
Who are our Key partners? **Who are our key suppliers?** **Which Key Resources are we getting from suppliers?** **What key activities do partners perform?**	**What key activities are required by** **1. our value propositions?** **2. our distribution channels?** **3. our customer relationships?** **4. our revenue streams?**	**What value do we deliver to the customer?** **What problem(s) are we solving for our customers?** **What bundles of products and services are we offering to each customer segment?** **What customer needs are we satisfying?**	**What type of relationships do customers expect?** **Which ones are already established?** **How do those relationships fit with our business model?** **What is the cost of maintaining those relationships?**	**What customers do we create value for?** **Who are our most important customers?**
	Key Resources What key resources do we need for: 1. our value propositions? 2. our distribution channels? 3. our customer relationships? 4. our **revenue streams**?		**Channels** Through which channels do our customers wish to be reached? How do we reach them now? How do those channels fit together? Which work best? Which are most cost efficient? How do we fit them into customer routines	

Cost Structure	Revenue Streams
What are the most important costs in our business model? **What key resources are most expensive?** **What key activities are most expensive?** **Is this business more cost driven or value driven?** **Fixed versus variable expenses?** **Are there economies of scale?**	**What value are our customers ready to pay for?** **For what do they currently pay?** **How are they currently paying?** **How would they prefer to pay?** **How much does each revenue stream contribute to the overall revenue?**

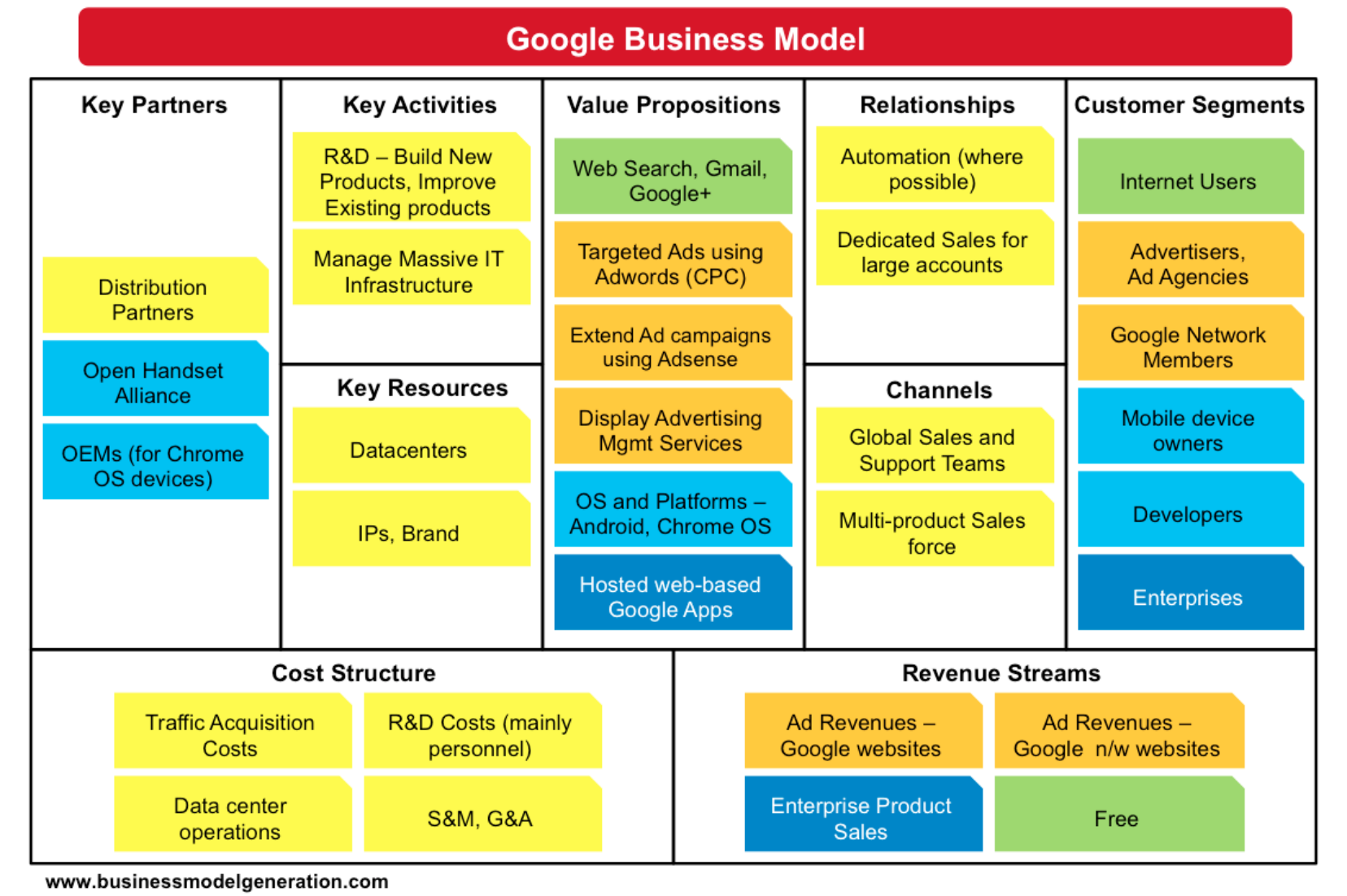
The business model canvas (Nine Sections)

- **Value Proposition** – *What value does the company bring to the customers?*
- **Customer Segments** – *What market segment(s) are being targeted by the company?*
- **Channels** – *How do they reach the customers –go to market (market, deliver, support)?*
- **Customer Relationships** – *How does the business develop and retain the customer relationships?*
- **Key Activities** – *What activities need to occur to make the company successful?*
- **Key Resources** – *How does the company get its resources?*
- **Key Partners** – *Who are the key partners?*
- **Revenue Streams** – *How does the company generate its revenues?*
- **Cost Structure** – *What costs does the business incur?*
  - http://en.wikipedia.org/wiki/Business_Model_Canvas

LinkedIn Business Model Canvas - http://bmimatters.com/



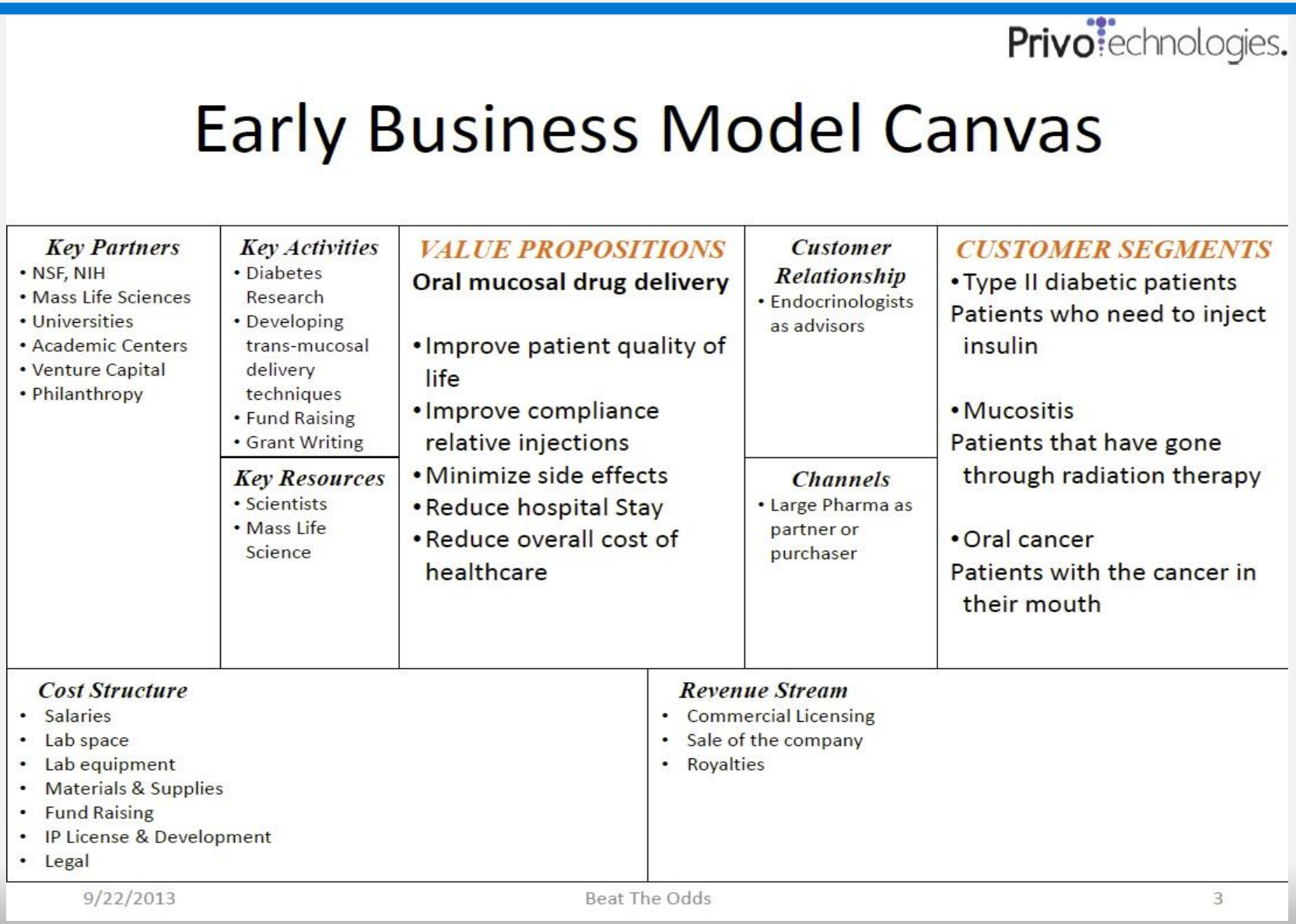
Google Business Model Canvas - http://bmimatters.com/



Privo

- Now let us take a look at a company that was founded and is led by Manijeh Nazari Goldberg, who took two degrees (engineering and computer science) from Umass Lowell and then one each from Harvard and MIT.
- Privo Technologies was formed to commercialize a discovery made in Robert Langer's laboratory at MIT that allowed the delivery of various drugs through encapsulation using nan-technology
  - Privo was a winner of the MIT 100 K Business Plan Competition
    - Their original idea was Nano delivery of insulin by chewing gum
  - Nano Drug Delivery
- In a very tough area of raising money to commercialize. It can take a billion dollars to bring a new drug to market.
- The next page will show their initial business plan canvas.

Privo Business Model Canvas



Privo Business Model Canvas –First version

Key Partners
- **NSF and NIH**
- **Mass Life Sciences**
- **Universities (MIT, Harvard, UML,etc**
- **Academic Centers**
- **Venture Capital**
- **Philanthropy**

Key Activities
- **Diabetes Research**
- **Trans-Mucosal Delivery development**
- **Fund raising**
- **Grant Writing**

Key Resources
Scientists
Mass Life Science Center

Value Proposition
- **Oral Mucosal Drug Delivery**
- **Improve patient quality of life.**
- **Improve compliance relative to injections**
- **Minimize side effects**
- **Reduce Hospital Stay**
- **-Reduce overall cost of healthcare.**

Customer Relationships
- **Endocrinologists as advisors**

Channels
Large Pharma as partners or purchasers

Customer Segments
Type II diabetic patients who need to inject insulin

Cost Structure
- **Salaries**
- **Lab space**
- **Lab equipment**
- **Materials and supplies**
- **Fund raising**
- **IP license and development**
- **Legal**

Revenue Streams
- **Commercial Licensing**
- **Sale of the company**
- **Royalties**

Privo: Learn and Pivot

- As they moved forward they learned both from their successes and their mistakes –and got lots of advice along the way.
- They Interviewed
  - 20 Physicians
  - 40 Scientists
  - 12 Attorneys
  - 6 Multinational Pharmaceutical Co.
- They wrote many Grants (that were peer reviewed) for
  - NCI (National Cancer Institute)
  - NIH (National Institute of Health
  - MLSC (Mass Life Science Center)
  - NSF (National Science Foundation)
  - Next (Rare Disease services)
  - NCL (Nano Characterization)
  - Deshpande –MIT
- They met with the governments of 7 other countries

Pivot

- When an entrepreneurial venture learns from their customers, experience, mistakes, and other sources that they need to take a significantly new direction.
- At that point we say they **Pivot**.
- Research shows that this is very typical of a new venture and is not actually either rare or a fatal flaw.
- You have learned something new about the market -from the market.
- If you are walking down a hall looking for the exit door and you open a door and find that it is a closet, what would you do?
  - Close the closet door and open another door.
- When we compared Effectual Entrepreneurship (EE) to Causal Entrepreneurship (CE) we saw that they (EE) rejected set goals in favor of constant iteration.
- This is also an element of the Lean Launchpad.

Business Model after pivot (as of 2014)

Privo technologies.

Current Business Model Canvas

Key Partners
- NSF, NIH, NCI
- Mass Life Sciences
- Universities
- Academic Centers
- Angel Investors
- Venture Capital
- New England Hospitals
- Global Hospitals
- CRO's for manufacturing, preclinical and

Key Activities
- Fund Raising
- Grant Writing
- Optimize Formulation
- Build Partnerships
- Mfg NP's
- Pre-clinical trials
- Phase 1 Clinical Trials

Key Resources
- Scientists
- Mass Life Science
- NSF, NIH, NCI
- IP Attorneys
- Business Advisors
- Science Advisors
- Medical Advisors
- GMP/GLP CRO's

VALUE PROPOSITIONS
Replacing existing intravenous Oral Cancer chemotherapy
- Much Higher efficacy
- Better quality of life
- Vastly lower toxicity
- Ease of use
- Lower Total Cost

Other applications
- Deliver other drugs through buccal tissue using NP permeation
- Use NP loaded Chemo-Wafer (CW) to deliver drugs to target other cancers

Customer Relationship
- Oncologists as advisors
- Pahrma as advisors/mentors
- Oncology radiologists

Channels
- Large Pharma as partner or purchaser for Global Marketing, Sales, & Distribution

CUSTOMER SEGMENTS
Chemo-Wafer Patients
- Age 62+ at diagnosis
- Early Stage OC patients
- Later Stage OC patients
- HPV Patients (male age 40-59)
- Oncology surgery patients

Head & Neck Oncologists Surgeons
- Maxillofacial and oral surgeons
- General oncology surgeon

Large Phama
- Licensing out

Cost Structure
- Salaries
- Lab space
- Lab equipment
- Materials & Supplies
- Fund Raising
- IP License & Development
- Legal

Revenue Stream
- Commercial Licensing
- Sale of the company
- Royalties

Business Model after pivot (as of 2014)

Key Partners
- **NSF and NIH and NCI**
- **Mass Life Sciences**
- **Universities (MIT, Harvard, UML,etc**
- **Academic Centers**
- **Venture Capital**
- **Philanthropy**
- ***New England Hospitals***
- ***Global Hospitals***

Key Activities
- ~~**Diabetes Research**~~
- ~~**Trans-Mucosal**~~ **Delivery development**
- **Fund raising**
- **Grant Writing**
- ***Optimize Formulation***
- ***Build partnerships***
- ***Manufacturing nanoparticles (NP's)***
- ***Pre-clinical trials***
- ***Phase 1 clinical trials***

Value Proposition
- **Oral Mucosal Drug Delivery for oral cancer chemotherapy**
- **Improve patient quality of life.**
- ~~**Improve compliance relative to injections**~~
- **Minimize side effects**
- **Vastly lower toxicity**
- **Ease of use**
- ~~**Reduce Hospital Stay**~~
- **Reduce overall cost of healthcare.**

Customer Relationships
- ~~**Endocrinologists as advisors**~~
- **Oncologists as advisors**
- **Pharma as advisors/mentors**
- **Oncology radiologists**

Customer Segments
- ~~**Type II diabetic patients who need to inject insulin**~~
- **Chemo-wafer cancer patients**
- **Age 62+ at diagnosis**
- **Early stage oral cancer (OC) patients.**
- **Later stage OC patients.**
- **HPV patients (male 40-59)**
- **Oncology surgery patients**
- **Head and neck oncologists and surgeons**

- *Chief Research Officers (CRO) for manufacturing and pre-clinical*.

Key Resources
- Scientists
- Mass Life Science Center

- *other applications*
- *Deliver other drugs through buccal tissue using NP permeation*
- *Using NP loaded chemo-wafer to deliver drugs to other targets.*

Channels
- Large Pharma as partners or purchasers for **Global Marketing Sales and Distribution**

- **Maxillofacial and oral surgeons**
- **General oncology surgeons**
- **Larger pharma –licensing**

Cost Structure
- **Salaries**
- **Lab space**
- **Lab equipment**
- **Materials and supplies**
- **Fund raising**
- **IP license and development**
- **Legal**

Revenue Streams
- **Commercial Licensing**
- **Sale of the company**
- **Royalties**

Now THAT is quite a pivot!

- You can now see why effectual entrepreneurship focuses on the iterative relationship between means, goals, interactions, and commitments.

- EE is far less goal oriented and far more interested in how one can use the resources at hand to create something of value.

Part 3: ILinc –LearnLinc: A case study

Text: http://www.jackmwilson.net/Entrepreneurship/Cases/Case-TheILincStory.pdf

Dr. Jack M. Wilson

Distinguished Professor of
Higher Education, Emerging Technologies, and Innovation

Reprinted from THE WALL STREET JOURNAL.

THURSDAY, AUGUST 6, 1998

TECHNOLOGY JOURNAL / NET INTEREST

Software Seeks to Breathe Life Into Corporate Training Classes

Workers Avoid Long Courses— And Long Trips

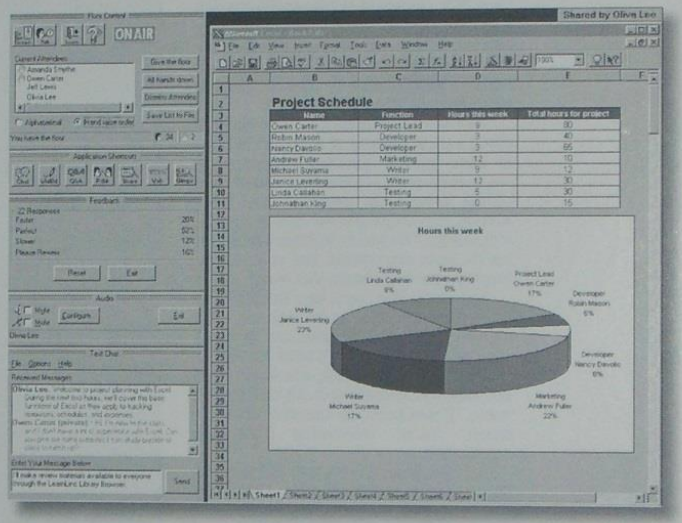
By Rebecca Quick
Staff Reporter of The Wall Street Journal

THE INTERNET promises a lot of miracles, but here's one thing even it can't do: make corporate training classes actually enjoyable.

But maybe it can make them a little less painful.

A handful of Web companies are designing software packages that allow workers, sitting at their own desks, to learn everything from basic computer skills to accounting methods from live instructors. With just a computer and an Internet connection, these software applications allow you to dial in to a virtual classroom—along with colleagues from around the globe. The instructor can call on students, lead them through a presentation or throw out a pop quiz to make sure the class is paying attention.

For businesses, the biggest advantage is that cyberspace training cuts out the ex-



Here is what an instructor using Ilinc software sees. The left side displays a list of students logged on, command buttons for turning the floor over to a student, and a dialog box for typing messages to an individual student. The right side is where the teacher guides the students through presentations via an application like a browser.

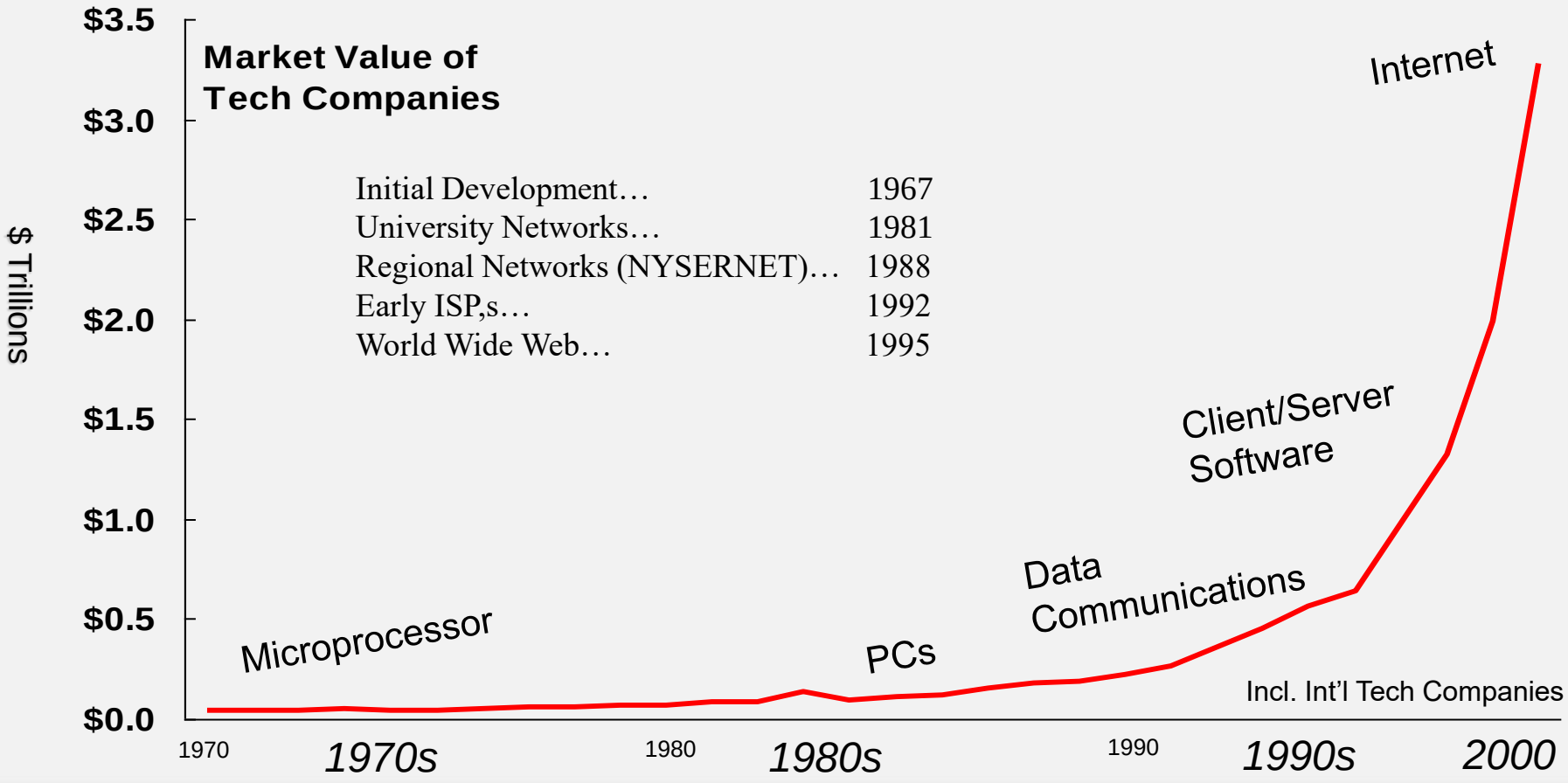
Opportunity Recognition

- Solving a problem
  - Every problem is a brilliantly disguised opportunity –Gardner

- A major problem in the 90's: The Learning Corporation
  - Rapid changes in technology, computers, the internet, globalization, and intense economic competitiveness were forcing companies to adapt. To adapt, their employees had to learn many new things.
  - Employee training is expensive –especially for large geographically distributed firms.
  - How could they provide rapid learning opportunities to employees without breaking the bank at a time when economic competition was ferocious?

The Internet Tsunami

- Do you think the pace of change is accelerating?



Source: Securities Data Company

Introduction

- The founding, growth and eventual acquisition of the ILINC Corporation is a typical small example of technological entrepreneurship.
- ILINC was founded in 1993 by a professor Jack M. Wilson (the author) and two students (Degerhan Usluel and Mark Bernstein) at Rensselaer Polytechnic Institute.
- Later the name was changed to LearnLinc to match the name of its popular product and eventually
- LearnLinc entered a triple merger in early 2000 with Gilat Communications and Allen Communications to form the Mentergy Corporation (NASDAQ).

The Research:

- It all began with an idea, and that idea eventually became a research project.
- In the late 80's and early 90's, my scientific colleagues and I were working on the application of computing and communication technologies to science and engineering education.
  - After producing several multimedia projects, I turned my attention to the management of large quantities of educational materials on networks.
    - The early focus was on the modularization of materials and the ability to store and retrieve those modules in an object oriented fashion.
- In order to fund my research I had obtained research grants from the
    - National Science Foundation (NSF),
    - the Dept. of Ed. Fund for the Improvement of Post-Secondary Education,
    - The Research Corporation for Scientific Advancement,
    - the Annenberg/CPB Foundation,
    - The Sloan Foundation,
    - the AT&T Foundation,
    - Lucent Technologies,
    - The Defense Advanced Research Projects Agency (ARPA), and the IBM Corporation.

The Idea. The Research

- Managing learning on networks
- Consulting with IBM, AT&T, GTE, Boeing, NeXT, Microsoft, Intel, etc
- I had served as an IBM Consulting Scholar and was a frequent speaker at conferences on multimedia on networks.
  - At one point I was invited to present my vision of the future of networked multimedia education to a group of executives that included several key executives from AT&T. That speech led to an invitation to Bell Laboratories to discuss potential cooperation and to present my vision to a broader and more technical audience.
- Apparently the speech was a great hit with the audience, because the AT&T Executives asked me to create a prototype of the vision -in partial collaboration with scientists from Bell Laboratories
- Joint Venture between AT&T Bell Labs and RPI
  - WorldWorx product released

- New technology releases allow a better idea.

The Opportunity

- Propose a significantly enhanced and advanced version to AT&T
  - AT&T declines
  - But Bell Labs excited!
- Research continues in Wilson's Lab
- Design and Manufacturing Learning Environment
- Degerhan Usluel, MBA student, BSEE, former entrepreneur
- Degerhan recruits Mark Bernstein, former CA "TopGun."
- They want to start company and want Wilson to lead it.
- Distributed learning environment with multicast video, application sharing, agents to control bandwidth.
  - None of these had been done reliably and internet was not ready.

The Team: ILinc LearnLinc Founders

- Degerhan Usluel, Mark Bernstein, Jack Wilson

Exit Strategy

- Need to decide ahead of time how we wanted this to end.
  - Private Company
  - Public Company
    - IPO or acquisition
  - Life Style Company

- We all wanted to create a public company and either IPO or Sell.

ILinc Business Model Canvas

Key Partners

Microsoft – Early OS
Intel – ProShare Video and Capital
AT&T – Early OEM Customer
CISCO – Router software

Key Activities

Create multi-cast video and audio conferencing to large #s
Screen sharing
Training Development tools
Market to Fortune 500

Key Resources

Early access to new hardware and software tech.
Solving the video multicast problem.
Deployment of networks with sufficient bandwidth.
Customers who buy and test and fund early products.

Value Proposition

Allow customer to provide "just in time training to large numbers of employees at a very low cost.
Reduce employee down time (cost) for training.
Improve quality and quantity of training.
Reduce cost of training programs by eliminating travel and ending large corporate training centers.

Customer Relationships

Close partnerships with companies that want our software and are willing to help development.
Early relationships with AT&T, IBM, Intel, News Corp.
Business model is sales and customization of software for Fortune 500

Channels: Direct sales to Fortune 500. First addressed the Corporate training dept.
Pivot: Sell to CEO/COO/CFO
Use Wilson's extensive corporate contacts to gain an audience.
Presentations at large conferences like ComDex, Educom, etc.

Customer Segments

Our most important customers are Fortune 500 companies with large training needs, large training expenses, and a recognition that success required the deployment of new technologies.

Cost Structure: Costs are primarily personnel costs for a development team, a quality assurance team, and a sales/marketing team. Smaller expenses for leased office space, tech. acquisition (some provided by partners for free)
Business is primarily value driven. Costs small in comparison to the saving of corporate expense.
Because we have very low variable expenses, the ability to achieve scale will quickly lead to profits. Building ten thousand units of software is only marginally more expensive than building ten.

Revenue Streams: Sales of software in the form of corporate licenses to Fortune 500 firms.
Software costs are small in comparison to training costs.
Want revenue now in return for software later.
A challenge in selling to trainers since this sidelined them and reduced their budget.
Qui Bono? Executives with bottom line responsibility.

Intellectual Property

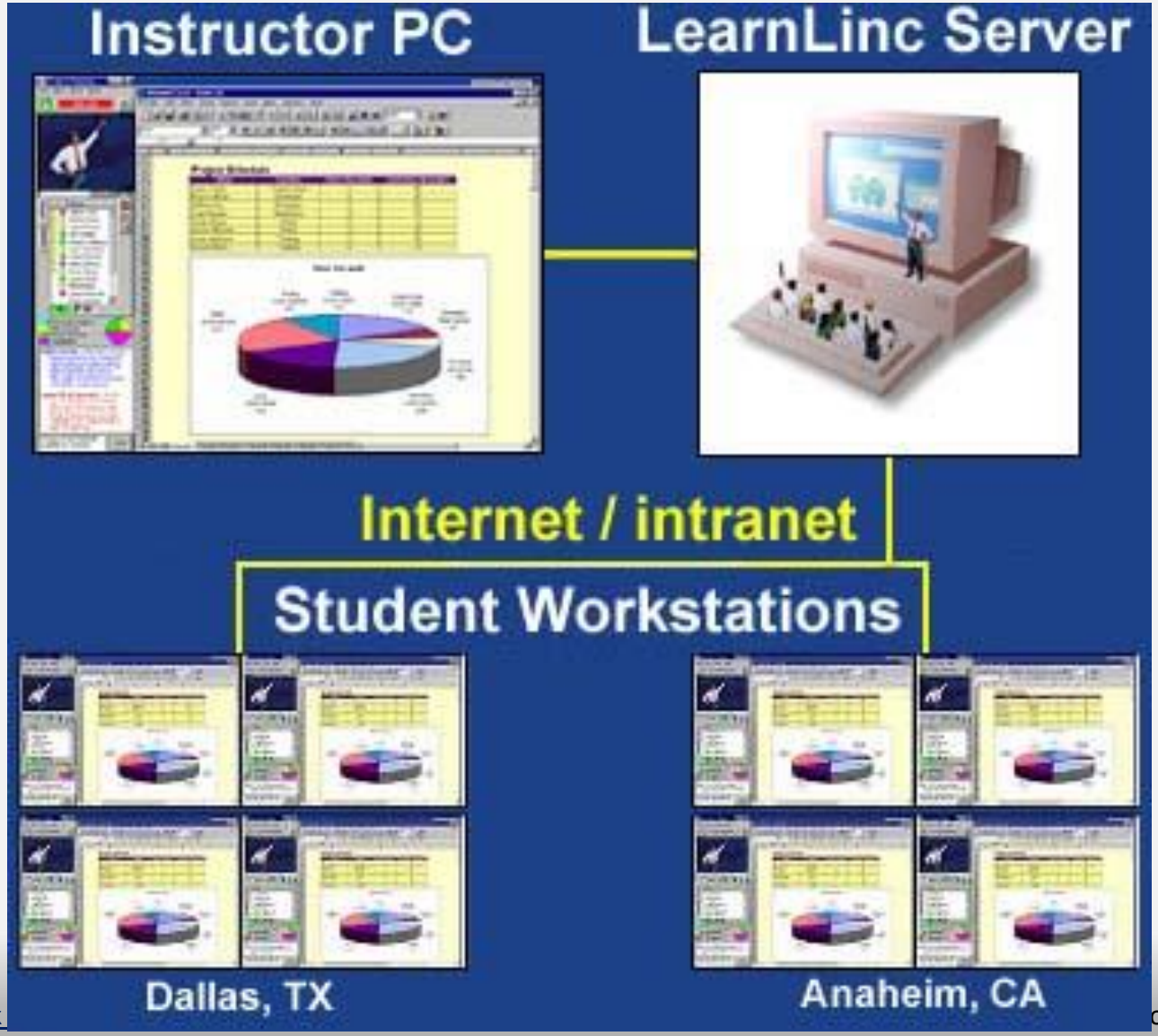
- The Team considered whether to patent the software or proceed while trying to make it a trade secret.

- Advantage of patenting
  - Protect our intellectual property from being copied.
  - Dissuade competitors.
- Disadvantages:
  - Could get to market faster,
  - patenting (and defending) is a long and expensive process.
  - Potential dispute with AT&T who had funded earlier project.

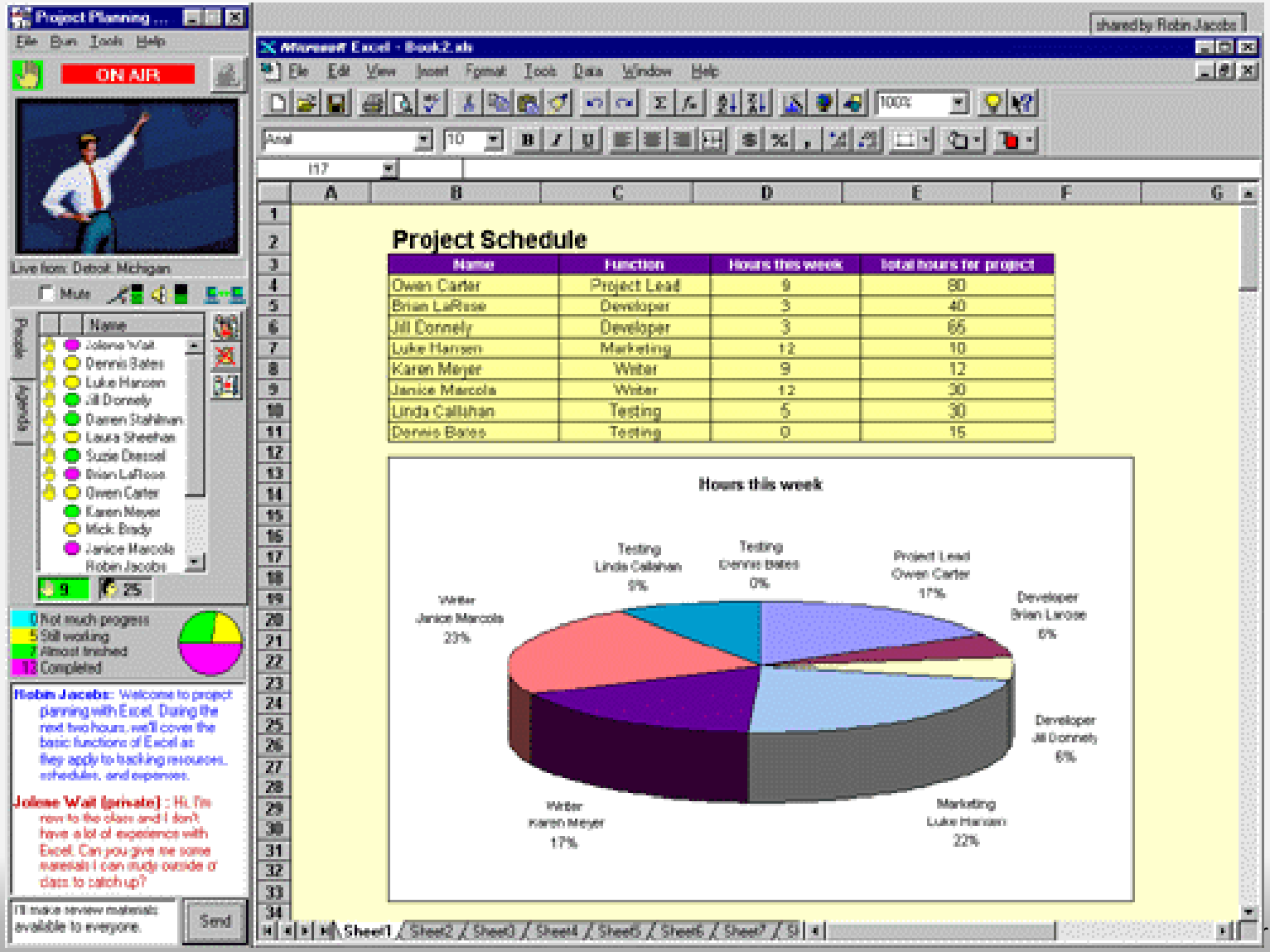
Creating a Prototype

- Need a prototype to raise money.
- Need a prototype to acquire early customers.
  - In order to create the prototype, we had to solve the problem of excess bandwidth on the network due to so many interacting individuals on computers. The primary problem was the video and graphics.
  - The problem was solved by creating agents to shut off video that was not being used and by making reliable IP multi-casting work.
- Need a polished pitch

LearnLinc


Instructor PC
LearnLinc Server
Internet / intranet
Student Workstations
Dallas, TX
Anaheim, CA

LearnLinc Instructor

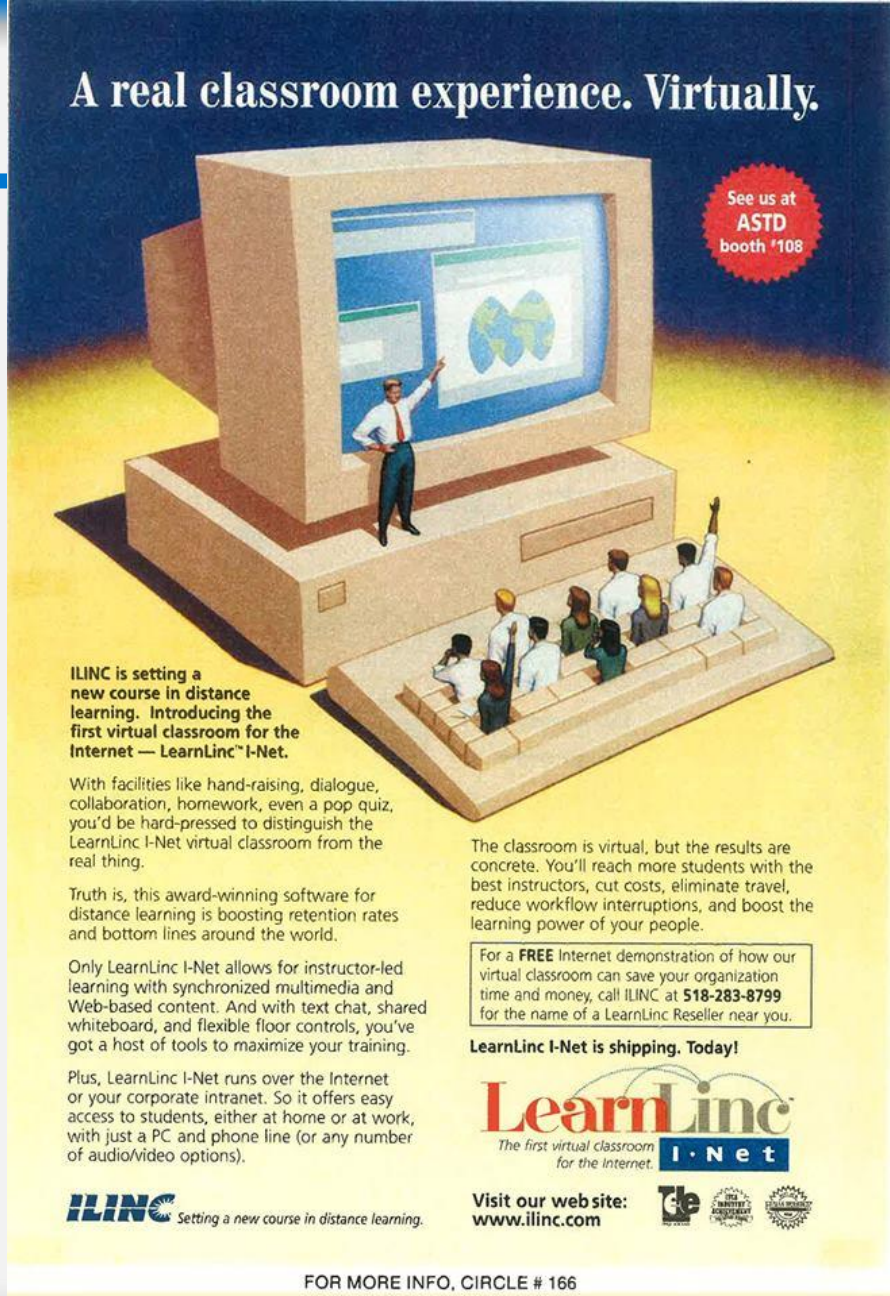


Funding the Enterprise

- Met with many successful entrepreneurs
  - Bugle Boy, Wellfleet, Interlan, Bay Networks, Nortel, MapInfo, etc
- Went against advice
- Decided to sell vaporware.
- Success magazine called it the “Wimpy method”
  - Wimpy: “I’ll gladly pay you Tuesday for a hamburger today!”
  - ILinc: “I’ll gladly give you software next year for $300,000 today.”
- Against all odds (and reason): It worked!
- First Customers: IBM, AT&T, GTE, Sprint, Office Depot, and News Corp.
- We also had received funding from the Air Force SBIR program.

Building the Product

- Degerhan actually conquered the reliable multicasting challenge and made the product work!
- Bernstein sold lots of vaporware.
- Every customer, except for one, was very satisfied.



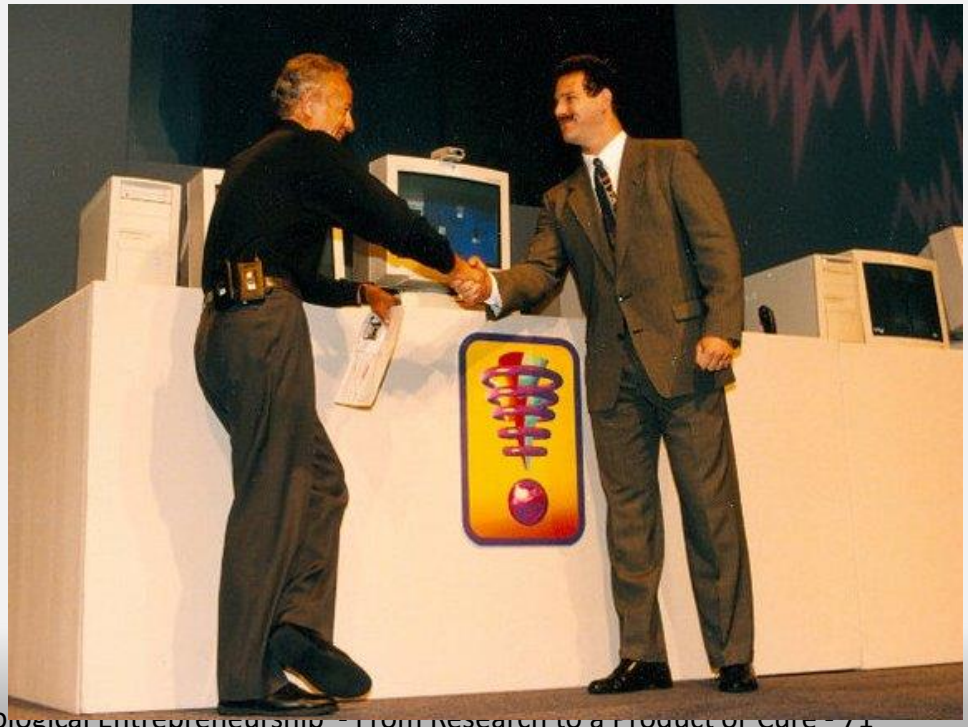
Winning Many Awards

Venture Capital

- Once company was up and running, we were short of working capital and tired of co-signing bridge loans!
- First Round of Venture Capital:
  - Exponential Investors and New York state development fund.
- Board asks Wilson to leave RPI permanently to continue as CEO of ILinc.
- Instead Wilson hires a new CEO who would bring advanced start-up experience.
- Second and Third Rounds of Venture Capital:
  - GeoCapital Investors, Intel, and original investors.
- Total outside investment was less than 50% of the company.
  - Very rare, but left the company short of cash compared to new arrivals.
  - We were using the old model. They used the TechBoom model.

Intel Invests millions

- I made a presentation to Andy Grove, CEO of Intel, at their headquarters. They told me that I would only have ten minutes to present and answer questions and then he had to run to another appointment. He ended up sitting down and spending a fascinated hour with me exploring the software.
- They then made their investment.
- Here is Andy Grove with Mark Bernstein when he presented the ILinc software at a major conference before thousands.



Top: Jack Wilson Founder 1st CEO, Chair –Mark Bernstein, Founder, VP of Marketing and Business Development – John Waiveris, Web Design

Bottom: Mike Marvin, 3rd CEO –Degerhan Usluel, Founder, VP of Technology, & 4th CEO – James; Tolga Lazare, Adam Stewart, Software Engineers

Fortune on ILinc:

- “Interactive Learning International Corp. (ILINC), a two-year-old company in Troy, New York, has shown what's possible in today's world of limited telecommunications bandwidth. ILINC's interactive training programs can be transmitted to users' PCs over local- and wide-area networks, as well as high-speed communications links such as ISDN (integrated services digital networks). A live instructor can appear in a window on the screen and address students in dozens of locations. He can launch video and audio clips for all the "class" to see and hear. And at discussion time, a student can click on a "raise hand" icon to get the floor. “
  - REPORTER ASSOCIATE Alicia Hills Moore
  -

Wall Street Journal on ILinc -1998

- "It's great -- by using it, we've cut our travel expenses substantially," says Gary Schweikhart, a spokesman for Office Depot, an office-supply company in Delray Beach, Fla. Office Depot first took its corporate training sessions on-line in May 1996. It was one of the first customers of Interactive Learning International Inc., or ILINC, a Troy, N.Y., maker of distance-learning software. Since then, about 1,500 Office Depot employees have completed on-line training, on everything from how to write a business letter to how to use the company's proprietary order-taking system.
- "We were in a situation where we were doing a lot of training of trainers" in order to have enough qualified instructors to teach employees at 629 stores and 68 sales offices across the country, says Doug Kendig, the company's manager of training technology. "We had to deputize a lot of people [to train employees], and you don't always get the best results that way."
- But now Office Depot uses the ILINC software for about 20% of its training, with classes in Florida, California and Texas using just six instructors. "I think it's fantastic," says Jeannette Perez, who works in Office Depot's commercial credit-card department. "It just holds my attention more, because you're interacting with the computer."
  - Wall Street Journal –Thursday August 6, 1998

WSJ

Reprinted from THE WALL STREET JOURNAL.
THURSDAY, AUGUST 6, 1998

Software Seeks to Breathe Life Into Corporate Training Classes

Workers Avoid Long Courses — And Long Trips

By Rebecca Quick
Staff Reporter of The Wall Street Journal

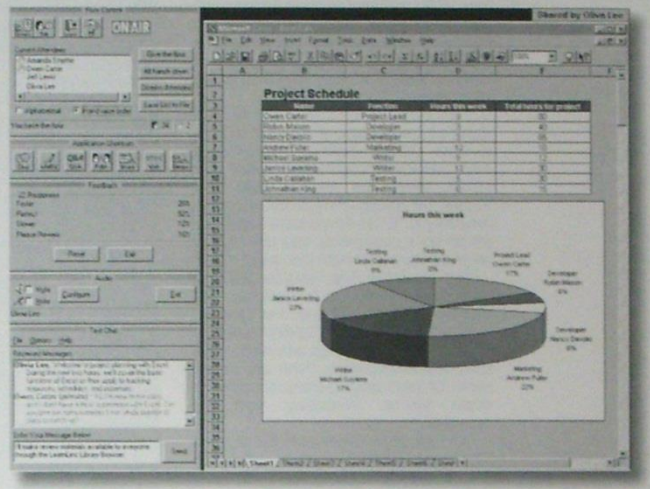
THE INTERNET promises a lot of miracles, but here's one thing even it can't do: make corporate training classes actually enjoyable.

But maybe it can make them a little less painful.

A handful of Web companies are designing software packages that allow workers, sitting at their own desks, to learn everything from basic computer skills to accounting methods from live instructors. With just a computer and an Internet connection, these software applications allow you to dial in to a virtual classroom—along with colleagues from around the globe. The instructor can call on students, lead them through a presentation or throw out a pop quiz to make sure the class is paying attention.

For businesses, the biggest advantage is that cyberspace training cuts out the expense of getting the instructor and students in the same place. It also means that training classes can be pared into shorter sessions and spread out over a number of days or weeks—meaning you don't lose an employee for entire days at a time. Even better, instructors can train employees in multiple locations at one time, allowing for rapid deployments of, say, new software being rolled out to a corporate empire.

The no-travel-required aspect may also be the biggest benefit for the folks who actually have to endure corporate training classes. That means more time at home and less on the road—no more trips to headquarters to learn how to make a spreadsheet. Shorter training sessions are also a plus for students: Studies show that retention levels drop (and doodling, no doubt, rises) significantly after two hours.



Here is what an instructor using Ilinc software sees. The left side displays a list of students logged on, command buttons for turning the floor over to a student, and a dialog box for typing messages to an individual student. The right side is where the teacher guides the students through presentations via an application like a browser.

Of course, some things can't readily be learned over the Internet. Teaching presentation skills, for example, is largely about eye contact, voice projection and body language, skills that don't translate well in the digital realm. And some critics argue that on-line training will never replace the good old-fashioned way of learning.

Still, demand is clearly growing. One interactive-software supplier, **Centra Software** Inc. of Lexington, Mass., says its revenue has doubled each quarter for the past year. And earlier this year, **International Business Machines** Corp. acquired DataBeam Corp., a Lexington, Ky., firm that sells distance-learning software.

Here's how the software packages work: Students go to a special Web site, on either the Internet or a corporate intranet, and sign in. Once on-line, their screens split in two: On the left side are a set of controls for communicating with the instructor and other students, while the right side shows an application such as a browser, whiteboard or word processor.

Anything the instructor does on the right side of the screen automatically appears on the right side of the students' screens. So, if the instructor, say, moves to a Web site, the entire class is automatically dragged along. Speakers and microphones on the computers

(over please)

Going Public

- Rapid Growth meant much more capital needed.
- Arrival of several “fast-followers” meant that we had competitors nipping at our heels.
- Potential IPO was about $100 million.
- Acquisition was only about $50 million but could create some beneficial alliances.
- Investment Banker hired.

Mentergy formed

- With help of Investment Banker and VC advisors:
- A triple reverse merger.
- Sold control of LearnLinc to GILAT Communication of Israel and at the same time used LearnLinc to acquire Allen Communications, John Bryce Training, and GILAT itself.
- Closed deal on February 29, 2000 for $52 million.
- Combination called Mentergy
  - Value was $500 million in March
  - New York, Salt Lake City, Europe, and Israel.
  - Created headquarters in Atlanta
  - As tech bust came they entered bankruptcy in 2002.
  - Text: http://www.jackmwilson.net/ILincLearnLincStory-text.htm

Research Commercialization: Questions for the student

1. How did ILinc use research funding to develop potential technologies for commercialization?
2. What were some of the key technologies that ILinc had to develop to give themselves a competitive advantage?
3. What are the key differences in the funding given by the National Science Foundation and the SBIR program?
4. What advantages does a large business have in investing in new technology start-ups?

Opportunity Recognition -Questions for the Student:

- 1. A new venture is expected to be attractive, timely, durable, and anchored in a product or service that creates or adds value for the buyer. How did ILINC fit with this description?

- 2. What was the "opportunity gap" that ILINC addressed.

- 3. Was ILINC a disruptive innovation? What did it disrupt?

- 4. How did ILINC fit with trends in economic forces, social forces, technological advances, and political and regulatory changes?

- 5. How did the personal characteristics of the entrepreneurs help and hurt?

Text: http://www.jackmwilson.net/ILincLearnLincStory-text.htm

Positioning and Type of Innovation –Questions

- Where would you place LearnLinc on the spectrum of types of innovations?
  - Product or process; radical or incremental; architectural or component, competence enhancing or destroying?
- How would you place LearnLinc on the S curve of technology?
  - What does this imply for its adoption?
- LearnLinc offered a low cost universal way to bring learning to learners in a corporate training environment.
  - Were they operating in segment zero? If so, what was the market they were disrupting?
- If you were advising ILINC as to how to manage its LearnLinc product just prior to its acquisition, what would you identify as major challenges they would need to face quickly?

Text: http://www.jackmwilson.net/ILincLearnLincStory-text.htm

Intellectual Property –Questions for the Students

- Why is it that the founders decided not to patent the product?
- What were the obstacles to patenting the software?
- What other forms of intellectual property protection might have been available to the founders, and what do you see as the advantages and disadvantages of each?
- What was the consequence of not doing the patent?
- If you were one of the founders, would you have pursued a patent?
- Do you see any other strategies that they might have used?

Text: http://www.jackmwilson.net/ILincLearnLincStory-text.htm

Growth, IPO, or Being Acquired- Questions

- 1. What were the apparent advantages to doing an IPO?
- 2. What were the advantages to being acquired instead.
- 3. What drove the founders to consider these two alternatives instead of continuing organic growth?
- 4. If you were the founder, what strategy would you have selected and why?

Text: http://www.jackmwilson.net/ILincLearnLincStory-text.htm

Thank you for your kind attention

Jack M. Wilson, PhD
President-Emeritus
Distinguished Professor
The University of Massachusetts
Lowell, MA 01581
http://www.jackmwilson.net/index.html