Innovation and Entrepreneurship in the e-Economy

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Department of Management

February 19, 2009
From d-Economy to e-Economy, Can Innovation and Entrepreneurship Help?

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The Role of Basic Research/Scholarship in Innovation and Entrepreneurship

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Outline

- Basic Concepts
  - e-Economy
  - Innovation and entrepreneurship (I&E)
  - I&E as the primary economic driving forces
- Basic Research/Scholarship and I&E
  - Classification of research
  - Examples for discussions
  - Theory and practice
- I&E and Value Creation – Mindset Building
  - What is value?
  - Value related tools and frameworks
  - Value proposition

Exponential Growth

100% every 18 months

Moore’s Law

Our Rapidly Changing World

Why is the extinction rate for companies increasing?

Average Lifetime of S&P 500 Companies

From Creative Destruction by Foster and Kaplan

Manufacturing Engineering Seminar Series, February 19, 2009

Drivers

Many of the most important new opportunities are interdisciplinary

Bio-Tech

Info-Tech

Nano-Tech

Manufacturing Engineering Seminar Series, February 19, 2009
Current Economy

- **WSJ, 01-23-09**
  - “Microsoft reported an 11% decline in net income and said it plans to cut 5,000 jobs, stunning employees and investors.”
  - “AMD posted a $1.42 billion loss.”
  - “New home construction dropped in December to the slowest pace since monthly records began in 1959.”
  - “Chrysler and Fiat showed signs of trouble days after announcing an alliance.”
  - “Google posted a 68% slide in profit on big write-downs.”
  - “Sony plans deeper cost cuts and warned it would report its first annual loss in 14 years.”
  - “Nokia’s profit sank 69%.”
  - “Samsung and LG reported losses amid the wipeout of demand for electronics.”
  - “Capital One wrote off an additional $1 billion for bad loans and posted a worse-than-expected loss.”

- **2-17-2009**
  - President Barack Obama officially signed the American Recovery and Reinvestment Act of 2009 into law ($789 billion), paving the way for the United States economy to get back on track.

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Innovation


- The term innovation means a new way of doing something. It may refer to incremental, radical, and revolutionary changes in thinking, products, processes, or organizations.

- In many fields, something new must be substantially different to be innovative, not an insignificant change. The goal of innovation is positive change, to make someone or something better.

- Innovation leading to increased productivity is the fundamental source of increasing wealth in an economy.
Helpful Definitions

Creativity: Something clever

Invention: Something novel reduced to practice

Innovation: Creation and delivery of sustainable new customer value into the marketplace

The Fundamental Role of Innovation

Growth

Prosperity

Quality of Life

It is needed to address worldwide issues such as the environment, energy, health, and poverty
The Product Life Cycle

The process of innovation needs to dramatically improve

Maturity and obsolescence

The Best Model

Market pull, technology-enabled

Unmet customer and market needs

High-Value Innovation
Entrepreneurship is the practice of starting new organizations or revitalizing mature organizations, particularly new businesses generally in response to identified opportunities. Entrepreneurship is often a difficult undertaking, as a vast majority of new businesses fail.

An entrepreneur is a person who has possession of an enterprise, or venture, and assumes significant accountability for the inherent risks and the outcome. It is an ambitious leader who combines land, labor, and capital to create and market new goods or services.

Entrepreneurs often have strong beliefs about a market opportunity and organize their resources effectively to accomplish an outcome that changes existing interactions.

Entrepreneurs have many of the same character traits as leaders.

The AMR Research - Top 25 Supply Chains in 2007

The AMR Research Supply Chain Top 25 for 2007

1. Nokia
2. Apple
3. Procter & Gamble
4. IBM
5. Toyota Motor
6. Wal-Mart Stores
7. Anheuser-Busch
8. Tesco
9. Best Buy
10. Samsung Electronics
11. Cisco Systems
12. Motorola
13. The Coca-Cola Company
14. Johnson & Johnson
15. PepsiCo
16. Johnson Controls
17. Texas Instruments
18. Nike
19. Lowe's
20. GlaxoSmithKline
21. Hewlett-Packard
22. Lockheed Martin
23. Publix Super Markets
24. Paccar
25. AstraZeneca

Mobile phone industry
Consumer-branded companies
Industrial companies
Technology titans
Life-sciences companies
Retailers

Creative design and innovation matter a lot!
Top 25 Supply Chain Top in 2008 – by AMR

<table>
<thead>
<tr>
<th>Rank</th>
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<tr>
<td>1</td>
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<td>2</td>
<td>Nokia</td>
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<td>3</td>
<td>Dell</td>
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<td>Procter &amp; Gamble</td>
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“The old model, relying exclusively on products or services, is increasingly being replaced by a content economy that builds and delivers value with ideas.” - Kevin O'Marah, chief strategist at AMR Research

Apple’s Products

- iPod
- iPhone
- iTunes

**Source:** Apple Inc., Wikipedia

Manufacturing Engineering Seminar Series, February 19, 2009
Apple’s Leader

- For reasons as various as its philosophy of comprehensive aesthetic design to its distinctive advertising campaigns, Apple has established a unique reputation in the consumer electronics industry. In 2008, Fortune magazine named Apple the most admired company in the US.
- CEO, co-founder, Chairman, Steve Jobs, the former CEO of Pixar Animation Studios.
- Jobs’s history in business has contributed greatly to the myths of the quirky, individualistic Silicon Valley entrepreneur, emphasizing the importance of design while understanding the crucial role aesthetics play in public appeal. His work drives forward the development of products that are both functional and elegant.

The World’s 50 Most Innovative Companies

Not so long ago, no conversation about innovation would be complete without the story of IBM inventor Jack Kilby’s encyclopaedic memory; that led to the prototype of today’s computers. Today, that tale, which verges on cliche, has been almost universally replaced by the story of the iPod, Apple’s omnipresent icon of design.

It should come as little surprise, then, that Apple tops the BusinessWeek’s list of the World’s Most Innovative Companies for the third year in a row. That sort of staying power speaks volumes about the sort of innovation that matters today: Post-Note, which provokes the value of time, the Post epiphanies today’s innovation sensibilities. These include the design, the focus on the user’s experiences, and the power of ecosystems. The iPhone is a hit because it works so seamlessly all software. The company’s much anticipated iPhone 5, which launches in June, will likely keep Apple high on our list next year.

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<td>Redmond, WA</td>
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Click column heading once to reorder from highest to lowest. Click twice to reorder from lowest to highest.
2. Basic Research and I&E

Classification of Research

- **Basic research**: fundamental research (sometimes pure research), is research carried out to increase understanding of fundamental principles. Many times the end results have no direct or immediate commercial benefits, which is to say that basic research can be thought of as arising out of pure curiosity. However, in the long term it is the basis for many commercial products and applied research.

- **Empirical research**: research that is based on experimentation or observation, i.e. evidence. Such research is often conducted to answer a specific question or to test a hypothesis (educated guess).

Examples for Discussions

- Operations Research
- Operations Management
- Laser Technology
- RFID
Operations Research

- The beginning can be traced back to WWII;
- Contributions in improving early-warning radar system, aircraft gunnery, antisubmarine warfare, civilian defense, convoy size determination, and bombing aids;
- After WWII, the Army, Air Force, and Navy set up various agencies to continue research of military problems
  - Navy’s Operations Evaluation Group at MIT
  - Project RAND, by Air Force
- Consulting firms were established to apply these techniques to industrial and business problems

Operations Management

- The famous EOQ model
  - The model was developed by F. W. Harris in 1913
  - Applications started in 1940s
Laser Technology

- A laser is a device that emits light (electromagnetic radiation) through a process called stimulated emission.
- In 1917 Albert Einstein, in his paper, *On the Quantum Theory of Radiation*, laid the foundation for the invention of the laser;
- When lasers were invented in 1960, they were called "a solution looking for a problem". Since then, they have become ubiquitous, finding utility in thousands of highly varied applications in every section of modern society.
- The first application of lasers visible in the daily lives of the general population was the supermarket barcode scanner, introduced in 1974. The laserdisc player, introduced in 1978, was the first successful consumer product to include a laser, but the compact disc player was the first laser-equipped device to become truly common in consumers’ homes, beginning in 1982, followed shortly by laser printers.
- In 2004, excluding diode lasers, approximately 131,000 lasers were sold worldwide, with a value of US$2.19 billion. In the same year, approximately 733 million diode lasers, valued at $3.20 billion, were sold.

History of RFID

- A similar technology, the IFF transponder, was invented by the British in 1939, and was routinely used by the allies in WWII;
- An early work exploring RFID is the landmark 1948 paper by Harry Stockman;
- Mario Cadullo’s US Patent in 1973 was the first true ancestor of modern RFID. A demo of today’s reflected power RFID tags was done at the Los Alamos Scientific Lab in 1973;
- The first patent to be associated with the abbreviation RFID was granted to Charles Walton in 1983.
Impact of RFID on SCM

- This emerging technology for identifying and tracking objects which holds many promises for closing the time-lag gaps in information transfer for improving supply chain operation productivity.
  - RFID in inventory systems
    - Reduce inventories $117-$293 billion
    - Increase sales $83-$166 billion
    - Connecting, collaborating and synchronizing with the extended supply chain
  - RFID as a key enabler for improved SCM
  - The use of RFID ranges from asset tracking to cashless payment to homeland security

Basic Research and I&E

- HOW TO FIX THE INNOVATION GAP: A CONVERSATION WITH JUDY ESTRIN

In this video interview, the author of Closing the Innovation Gap: Reigniting the Spark of Creativity in a Global Economy says we are living off the previous generation's research investments and thus failing to make the basic research investments needed to seed innovation in the future.

Estrin taps her years of experience in nurturing Silicon Valley companies to describe what's necessary to help new ideas thrive. She also offers some advice to the incoming administration on how to begin reinvesting in fruitful research.

- [http://e.mckinseyquarterly.com/W0RT0007A1162B60732302E246FE70](http://e.mckinseyquarterly.com/W0RT0007A1162B60732302E246FE70)
Theory and Practice

What is theory building?

“The term, ‘theory’, is a body of understanding that researchers build cumulatively as they work through each of the three steps in the descriptive and normative stages.”

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Theory and Practice

What is practice?

- a "best practice" is a practice that upon rigorous evaluation, demonstrates success, has had an impact, and can be replicated.
- **United Nations Population Fund**: The UNFPA Glossary of Monitoring and Evaluation Terms defines best practices as planning or operational practices that have proven successful in particular circumstances and which are "used to demonstrate what works and what does not and to accumulate and apply knowledge about how and why they work in different situations and contexts"
- **UNESCO**: UNESCO describes best practices as having four common characteristics: *they are innovative; they make a difference; they have a sustainable effect; and they have the potential to be replicated and to serve as a model for generating initiatives elsewhere*

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Sources:
- http://www.infoforhealth.org/practices.shtml
Theory and Practice

The subtle interface (In R&D):

- Stage 1: Basic Research
- Stage 2: Applied Research
- Stage 3: Development

The dilemma
- Why?
- Compliment each other

3. What is Value?

Value = \frac{Usefulness}{Cost}

(by Operations Managers)

Customer Value = \frac{Customer Benefits}{Customer Costs}

(by SRI)
What’s Value?

- Defined by customer and is only meaningful when expressed in terms of a specific product, which meets the customers’ needs at a specific price and at a specific time
- Common mistake – internally defining value

Value Stream

- All the steps and processes required to bring a specific product from raw materials to finished product in the hands of the customer
- Value stream analysis will almost always show three types of actions:
  1. Steps that create value
  2. Steps that create no value but are unavoidable
  3. Steps that create no value and are avoidable
**Value Stream Mapping**

A graphical technique to:

- Map all actions (value added & non-value added) required to bring “product family” from raw material to customer
- Visualize & understand relationship between Material Flow & Information Flow (i.e. the “system”)
- Identify sources of waste
- Target improvement opportunities to leverage the system

"A Conversation Piece"

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**Porter’s Value Chain Model**

The chain of activities gives the products more added value than the sum of added values of all activities; Capturing the value generated along the chain is the new approach taken by many management strategists.

The Development Chain

Value Propositions

A common language for systematic, high-value innovation

N  Customer/Market Needs
A  Compelling Approach
B  Customer Benefits/cost
C  Worldwide Competition

“NABC” captures the essential, defining ingredients of a Value Proposition.
Value Proposition Development

Basic ingredients for exponential improvement

- Identify important customer needs
- Define champions and productive teammates
- Write down the value proposition (NABC)
- Iterate often with others
  - Regularly
  - In a group

“If it’s not written down, it’s not real”

Things to Remember

Tell a story and make it quantitative

- Put yourself in the customer’s shoes
  - Understand what drives the customer’s business
  - Be an expert in the customer’s microhabitat
  - Know the customer’s customers
  - Ask what keeps the customer up at night
  - Ask how much the customer would pay for a solution

- Latest, greatest technology is not enough
  - Combine good technology with great positioning and a great team
  - Have a compelling, quantitative, value-laden, pithy Value Proposition

- You must have a distinctive advantage
  - Even if you cannot solve the entire problem, you may have the critical missing piece!
  - Ask - listen: Listen - ask: Ask - listen ...
Ingredients of Systematic Innovation

In a global exponential economy

- Important Customer Needs
- Champions
- Productive Teams
- Value Improvement Process
- Organizational Alignment