TECHNOLOGY COMMERCIALIZATION

Catarina Maia

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Opportunities

What are (not) customer needs?

- " People don't want a quarter-inch drill. They want a quarter-inch hole."

Theodore Levitt

Jobs to be done

- Christensen and Raynor, in The Innovator's Solution, approach figuring out which products will connect with customers with a "job-to-be-done" framework.
- Predictability requires understanding what causes customers to buy a product:
  - Customers – people and companies – have "jobs" that arise regularly and need to get done
  - Customers look around for a product or service that they can hire to get the job done – effectively, conveniently and inexpensively

How to identify customer needs?

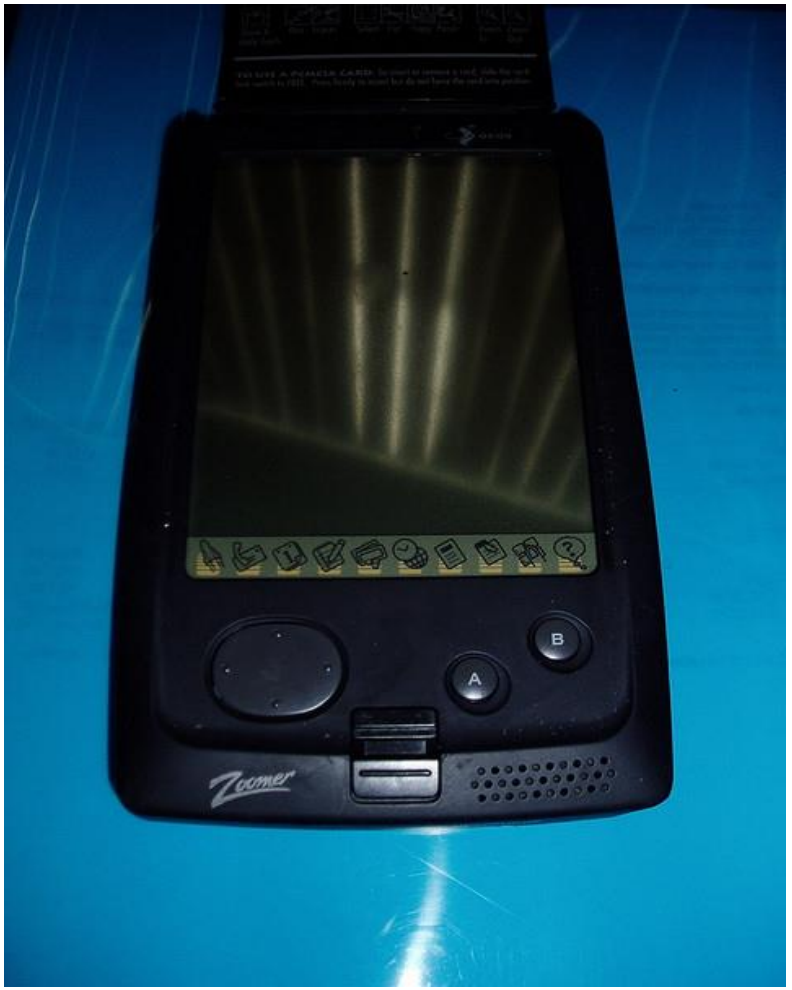
- Unsolved problem or margin to improve in solving a problem
- Customer complaints and unfulfilled wishes are clues to unmet needs
- Companies often have trouble identifying customer needs because:
  - Product developers overestimate their understanding of needs
  - Try to gather information only by asking customers
  - Do not know which target market to ask
  - Incorrectly project beliefs about value of product attributes on customers
  - Have structures and routines that inhibit information gathering
  - Fail to recognize how needs change over time

Implications of not focusing on the problem

- Not using a "job-to-be-done" perspective, which is focused on customers needs and problems, can lead to errors
  - Incorrect customer characterization
  - Incorrect competitor identification

A tale of two (failed) products

"Apple Newton-IMG 0454-cropped" by Photograph by Rama, Wikimedia Commons, Cc-by-sa-2.0-fr. Licensed under CC BY-SA 2.0 fr via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Apple_Newton-IMG_0454-cropped.jpg#mediaviewer/File:Apple_Newton-IMG_0454-cropped.jpg



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Newtons and Zoomers

- Jeff Hawkins, Palm/Handspring

- After the failure of our first PDA we called up the people who bought Newtons and Zoomers and we said:
  - Why did you buy it?
  - What were you hoping it was going to do?
  - Now that you don't like it, what did you think it was going to do?
- We listened to this… our competition is not a computer right now. Our competition is paper.

A product hired to organize a schedule, like on paper…

Asking customers to change jobs

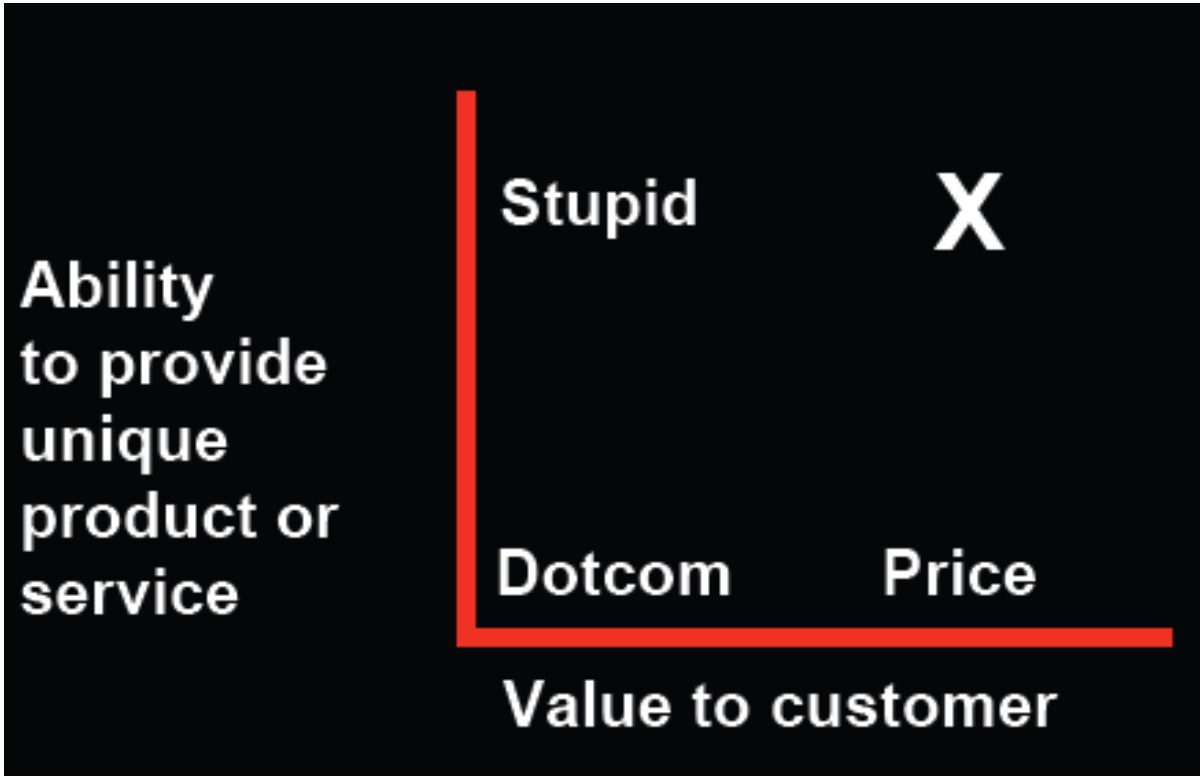
- The things that people want to accomplish in their lives don't change quickly
- An idea stands little chance of success if it requires customers to prioritize jobs they haven't cared about in the past.
- Customers don't just "change jobs" because a new product becomes available.
- A new product will succeed to the extent it helps customers accomplish what they're already trying to do.

Jobs are remarkably stable

- Photograhic Film
  - To get good shots
    - take multiple pictures of the same pose
  - To send a really good picture to a friend or relative: order double prints
- Digital Imaging
  - To get good shots
    - **verify on the spot – if not good, delete and try again**
  - To send a really good picture to a friend or relative: send over the Internet

The art of positioning

- Guy Kawasaki, The Art of the Start



Elevator test

1. For (target customers)
2. Who are dissatisfied with (the current market alternative)
3. Our product is a (new product category)
4. That provides (key problem-solving capability).
5. Unlike (the product alternative),
6. Our product (describe the key product features).

Example: Air monitoring system to detect wildfires

- The problem
  - Between 2000 and 2016, forest fires in Portugal represented a social cost of 6.6 million euros.
  - The main success factor in firefighting is the speed of the first intervention. This makes detection time critical.
  - Rapid detection requires permanent authorization and the opening of large forest areas, or is prohibitively expensive with currently available solutions.

Example: Air monitoring system to detect wildfires

For	the national fire authorities
which	within tight budgetary constraints they need rapid detection of ignition in large forest areas with the potential to cause high economic losses,
	the Rain Dance
is	an aerial surveillance system based on small fully autonomous aircraft
that provides	permanent, high resolution and scalable fire detection with low investment and operating costs.
Unlike	static ground surveillance systems currently installed
Our system	delivers all the performance required for fast, flexible and scalable detection at a affordable cost.

Technology commercialization

Technology

- Technology
  - Devices, artifacts, processes, tools, methods and materials that may be applied for industrial and commercial purposes.

- Commercialization examples
  - Intel was incorporated to apply semiconductor technology to the design and production of semiconductor circuits.
  - Microsoft was incorporated to create and distribute computer software products for industrial and residential applications.

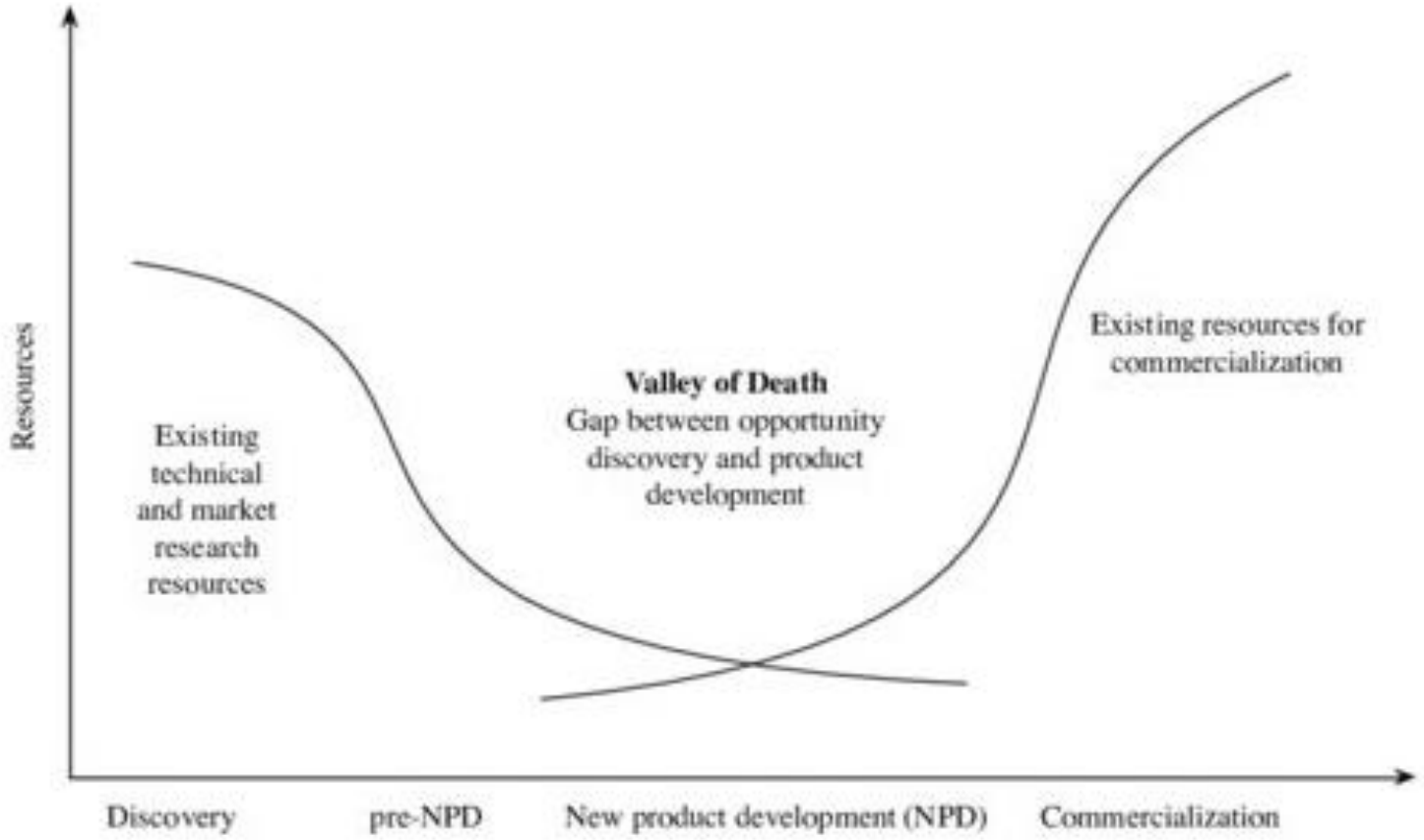
Technology strategy

- Technology strategy is the approach that a firm takes to obtaining and using technology
  - to achieve a new competitive advantage,
  - or to defend an existing competitive advantage against erosion.
- Technology strategy answers three questions:
  1. **How do we create value?**
  2. How do we deliver value?
  3. How do we capture value?

How do we create value?

- We create value through technological innovation…
  - Technology is the application of tools, materials, processes and techniques to human activity
  - Innovation is the process of using knowledge to solve a problem
  - Technological innovation is the use of knowledge to apply tools, materials, processes and techniques to come up with new solutions to problems
- … meaning that we create value by solving problems.

The Valley of Death



Justification

- Incentives
- Education
- Culture
- Comfort zones

Crossing the Valley

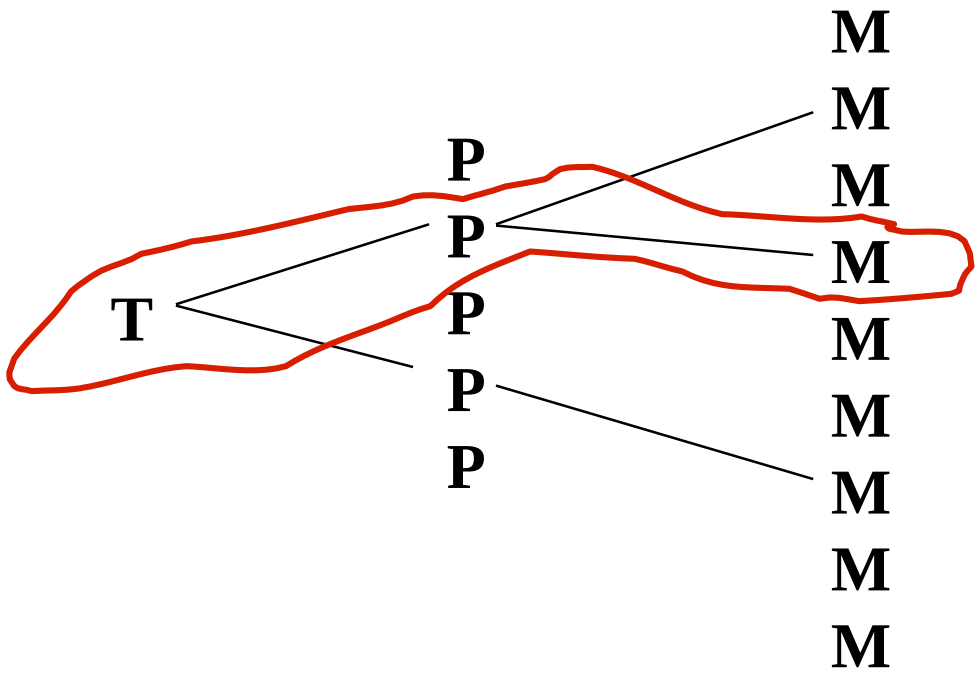
- Technology commercialization is an entrepreneurial process
  - Take technologies developed by researchers and with them create products that meet needs and solve problems.
  - That is, entrepreneurship - identifying and exploiting previously untapped opportunities.

Creating value from technology

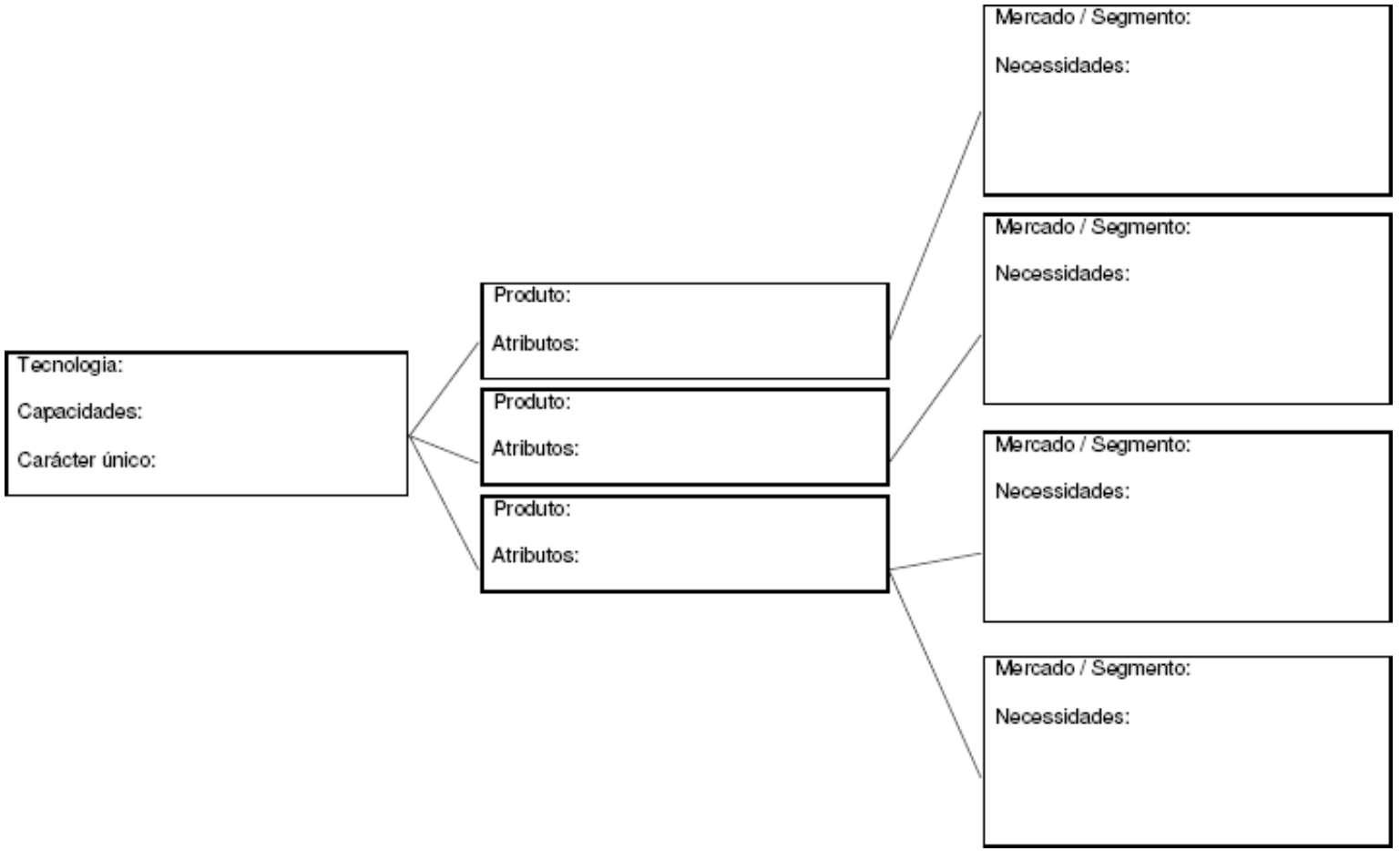
- Three pieces…
  - Technologies / Capabilities
  - Markets / Problems
  - Products / Solutions
- … must be logically connected to explain how we provide a unique solution to a problem
  - Link unique technical performance capabilities with enduring needs, through the specification of product features and benefits

Fundamental linkage

- Technology–Product–Market (T-P-M)



Technology-Product-Market Linkage



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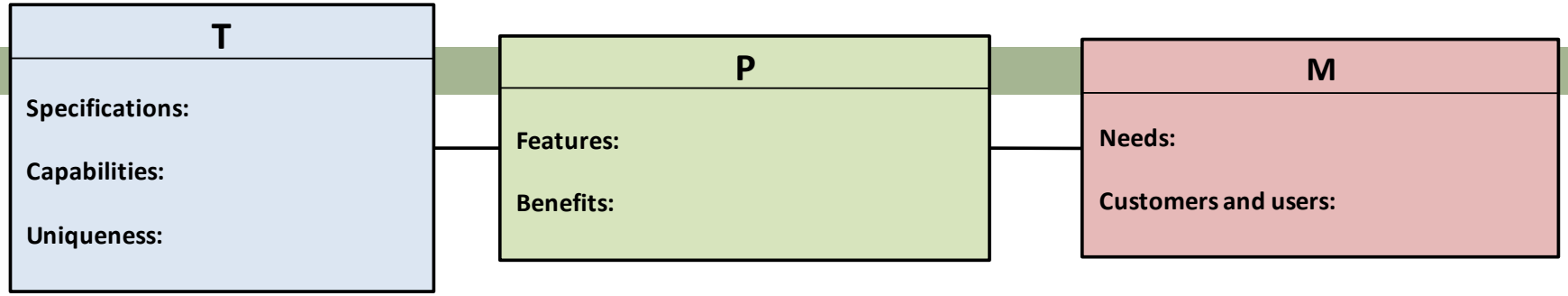


T: Identify technical advantages

- specifications (performance parameters),
- capabilities (what specifications enable)
- and uniqueness (reason why it is impossible or hard to replicate)

M: Identify needs

- not the users but circumstances in which users experience a problem

P: Match needs and capabilities

- translate capabilities to product features, which enable benefits

Technological change

- Regardless of the scientific discipline, there are only three types of technological advantage:
- Better performance
  - Battery life for electronic equipment
- Lowest cost
  - Evolution of memories and hard drives
- New and required capability
  - Personal computers and spreadsheets for accounting

T-P-M Linkage Examples

- Technology
  - Specification: a power semiconductor with operating frequencies above 20 KHz
  - Capability: operate at frequencies above the audible range for humans
- Market and need
  - Electric domestic appliances users are disturbed by excessive noise
- Product idea: chip set for electric motor control
  - Features: silent control device
  - Benefits: appliance operation at reduced noise

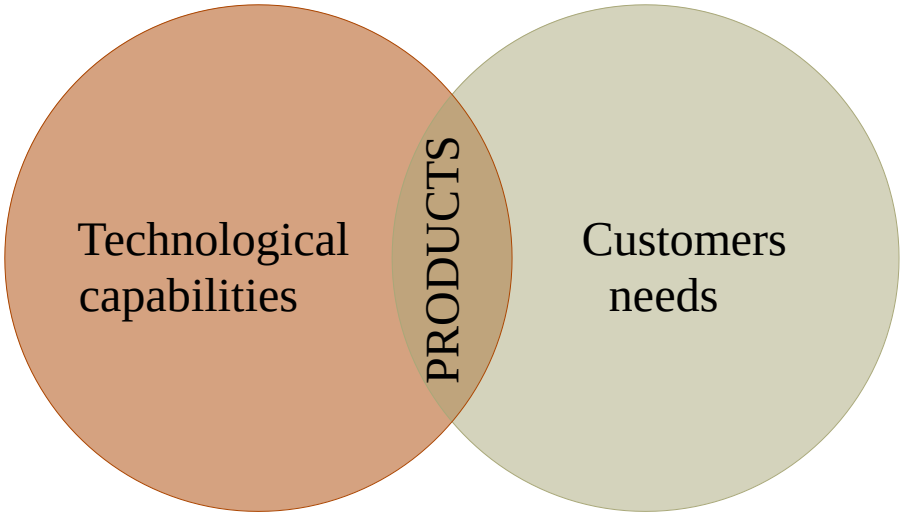
Technologies and Markets

Technology
TMBS Power Seminconductor
Description and Specifications
A Trench Metal-Oxide Barrier allows **lower on-state resistance** for power semiconductors. Putting a trench in the surface of a semiconductor requires different process steps in wafer fabrication. Allows **faster switching time** and **more power** to be handled by the device, **decreases device size** and **increases device yield**.
Capabilities
Longer battery life, lower operating temperature and production costs.
Uniqueness
Patent protection

Market
Customers/Users
Productivity freaks
Need
Use small snippets of time productively, while spending time in waiting lines, public transit, and conference rooms.

Market
Customers/Users
Corporate travelers
Need
While traveling, need to be always on, but spend long time away from power supply

Product



- There is no product outside the intersection between customer needs and technology capabilities.
  - A set of technological capabilities are not a product.

Product

- Atributes
  - Product characteristics that manifest technological capabilities.
  - An efficient power rectification chip set could be incorporated into batteries
    - compatible with existing mobile phone designs
    - and that allowed about three times the conversation time.

Incorporating technologies into products

- **Technical and scientific description**

  Underlying science, what the technology does, what it does not do

- **Identification of technical advantages**

  Type of advantage (lower cost, higher performance, new needed capability), potential uses and users

- **Level of development**

  How far from commercial use

From specifications to capabilities

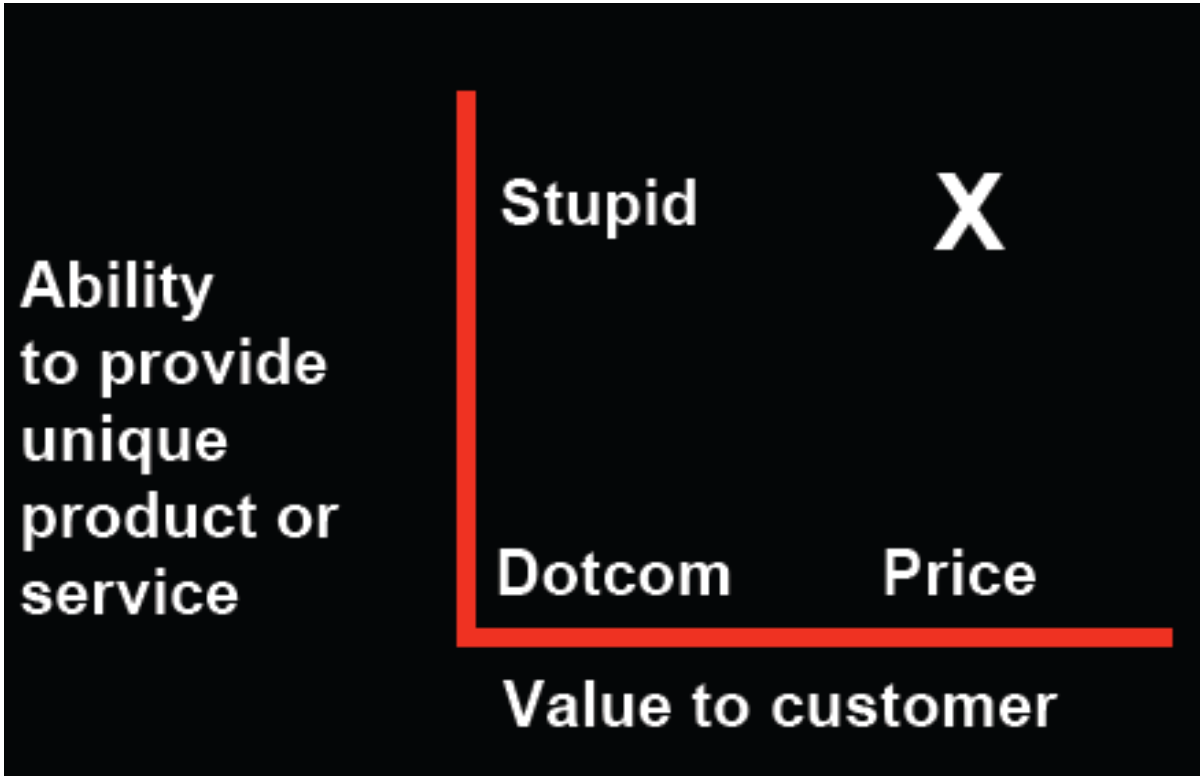
- Specifications

  Measurable performance parameters of a technology
- Capabilities

  What specifications enable products to do – the jobs they will perform
- Examples with new technologies
  - Digital signal processor with higher compression
    - Specifications: higher communication speed
    - Capabilities: deploy more channels, web use in wireless communication
  - Power semiconductor
    - Specifications: operation at frequencies as high as 20 KHz
    - Capabilities: operation above human hearing range, allowing quiet electric motors

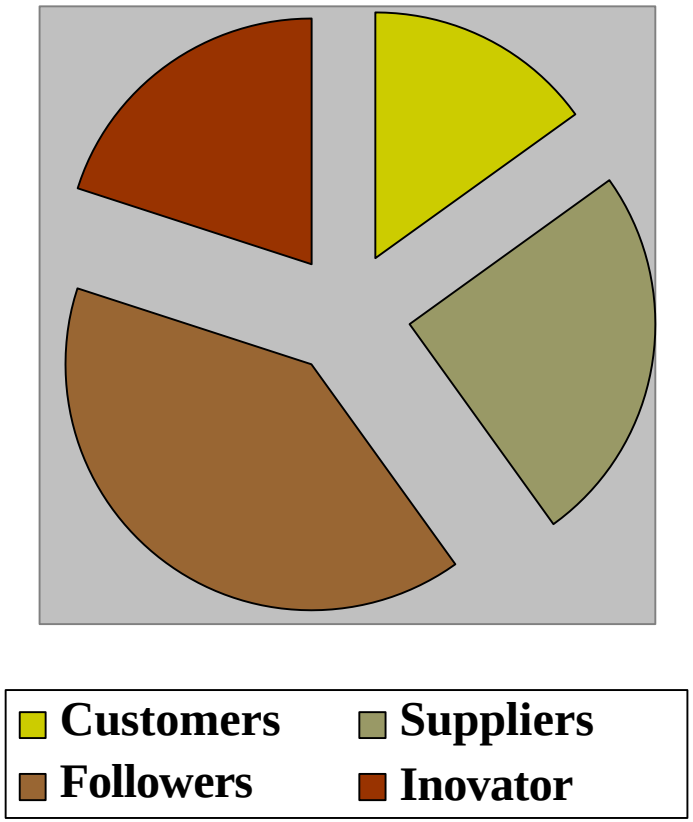
Strong T-P-M links

- Guy Kawasaki, The Art of the Start



Innovation returns appropriation

Return appropriation



- Innovators (pioneering companies in marketing a product or service) often deplore the fact that competitors / imitators profit most from innovation.

- Determining factors:
  - Appropriabilityregime
  - Dominant Design
  - Access to complementary assets

Appropriability regime

- What is my ability to protect technology?

- Dimensions
  - Nature of technology: Ability to keep the product or process secret, codified (easily communicable) or tacit (in the minds of its holders) knowledge
  - Effectiveness of legal protection mechanisms: patent, industrial secrecy, copyright

- Examples
  - Pharmaceutical Industry - Extremely Effective Patents - Innovators are highly capable of appropriating returns on innovation.
  - Consumer electronics - legal protection is ineffective and the ability to keep technology secret is low - innovators will have to find other ways to ensure ownership

Dominant design

- Is the industry committed to a paradigm?

- Early stage of industry development
  - Competition focuses on the designs.
  - Fluid designs, production processes with detached and adaptive organization, use of generic production resources.

- Through trial and error in the market, design emerges as dominant
  - Competition shifts to the price.
  - Scale and learning are more important and resources become specialized.

- Example
  - Video cassette players and recorders - Betamax system pioneered but VHS prevailedA indústria está comprometida com um paradigma?

Access to complementary assets

- Who controls the critical resources for commercialization?

- Supplementary Assets
  - Services: Marketing, Production, Distribution, After Sales
  - Complementary technologies: other parts of the system

- Degree of specialization
  - Generics - manufacturing facilities to produce sneakers
  - Co-specialized - containerization - port facilities
  - Specialized - Containerisation - Trucks (easily converted)

- Examples
- Early days of personal computers - distribution channels were few, strong, and indispensable for reaching customers - channels had a strong capacity for appropriating the returns created by personal computer innovations

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