Disruptive Digital Printing

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Vince Cahill - VCE Solutions

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- Former CEO of Datametrics Corporation
- Digital printing consultant

VCE Solutions

- Target marketing
- Industrial digital printing solutions and consulting
- Brokering of business relationships

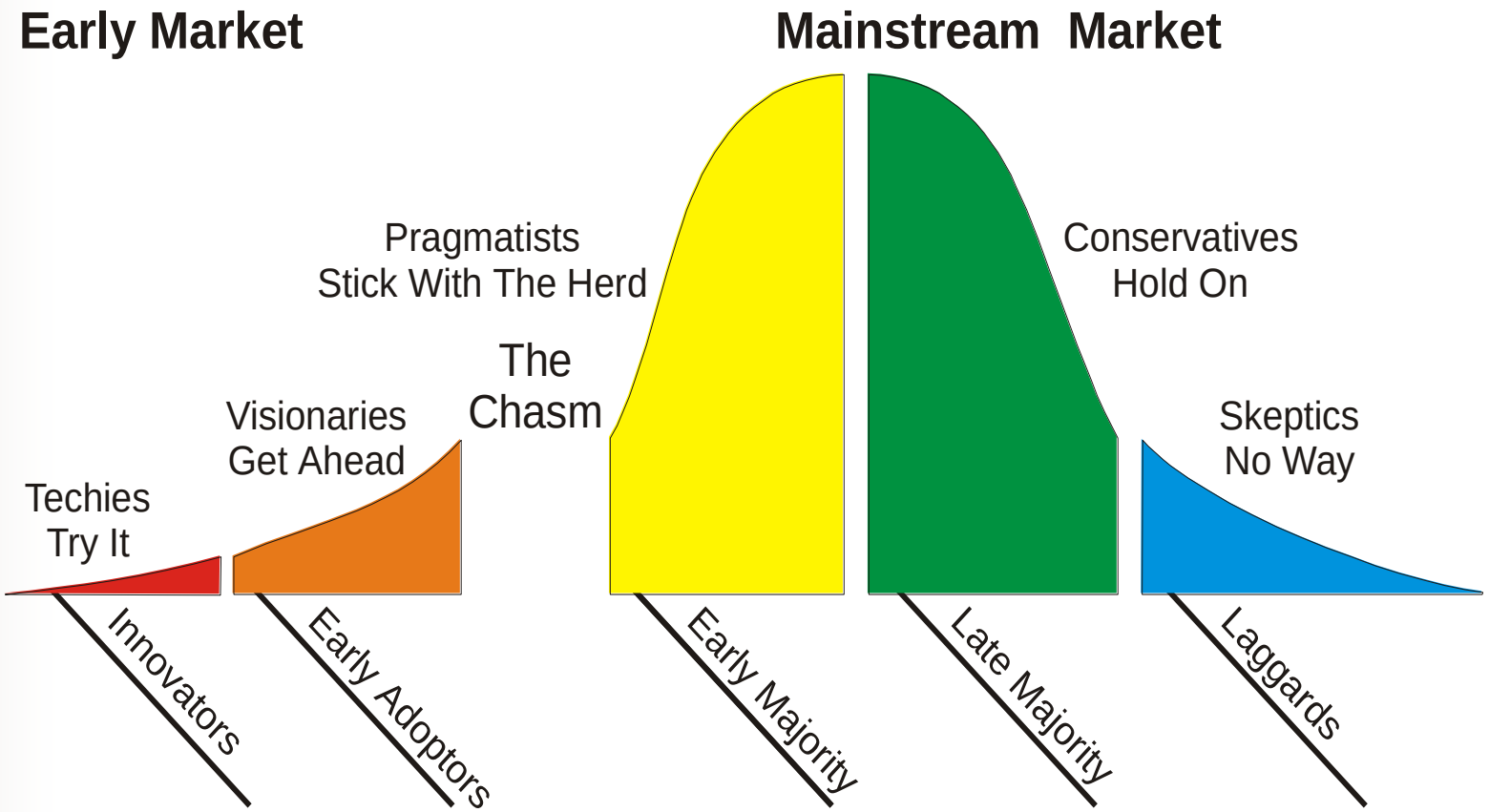
Agenda

- Definitions
- Established digital print technologies
- Disruptive digital print technology examples:
  - Pico jet – low cost industrial ink jet
  - Flat jet – simple solution beyond ink jet
  - Electronic Imaging
  - BMT - Beta Management Team – electrostatic sublimation
- Disruptive pitfalls, opportunities and strategies

Credits

- Clayton M. Christensen, The Innovator's Dilemma, Harper Business, New York, NY, 1997, 2000
- Geoffrey A. Moore, Crossing The Chasm, Harper Business, New York, NY, 1991
- Geoffrey A. Moore, Inside The Tornado, Harper Business, New York, NY, 1995

Technology Adoption Life Cycle



Definitions

- Sustaining technologies foster improved established product performance according to mainstream major market customer values.
- Disruptive technologies often emerge that result in lower near-term product performance, but provide customers with different features and value. They are typically cheaper, simpler, smaller, and often more convenient to use.

Digital Becomes Established

- Digital printing technologies have become the dominant and established technologies for many markets
  - Billboard
  - Office
  - Back-lighted signs
  - Marking and coding
  - Proofing
  - Commercial carpeting
  - Addressing and franking

Established Ink Jet Technologies

- Desktop-Graphics TIJ
  - Hewlett-Packard
  - Canon
  - Lexmark
- Desktop-Graphics PIJ
  - Epson
- Industrial PIJ
  - Spectra
  - Xaar
  - Trident
  - Scitex

Sell to OEMs

Spectra

- Largest supplier of PIJ printheads to OEMs
- Leading developer and manufacturer of piezoelectric ink jet printheads
- Founded in 1984 with an exclusive Xerox relationship
- Yearly sales of about $35 million and growth of almost 40%

Spectra Customers

- Vutek
- Polaroid
- Heidelberg
- Brother
- Durst
- Dupont
- Leggett and Platt
- Chromas
- 3-D Systems
- Stork
- Inca
- Luescher
- Mutoh

Spectra Printhead Applications

- Coding & marking
- Proofing
- Outdoor and indoor
- Signage
- Billboards
- Forms & statements
- Addressing and postal
- Textiles
- Wall & floor coverings
- Packaging
- Commercial printing
- Screen masking
- Plate making
- Rapid prototyping
- Display manufacture

Spectra Value Model

- One of highest performing, reliable and robust ink jet printheads available
- High price per printhead
- Ink royalty
- Sustaining product improvement

Principles of Disruptive Innovation

1. Companies depend on customers and investors for resources
2. Small markets don’t solve the growth needs of large corporations
3. Markets that don’t exist can’t be analyzed
4. An organization’s capabilities define its disabilities
5. Technology supply may not equal market demand

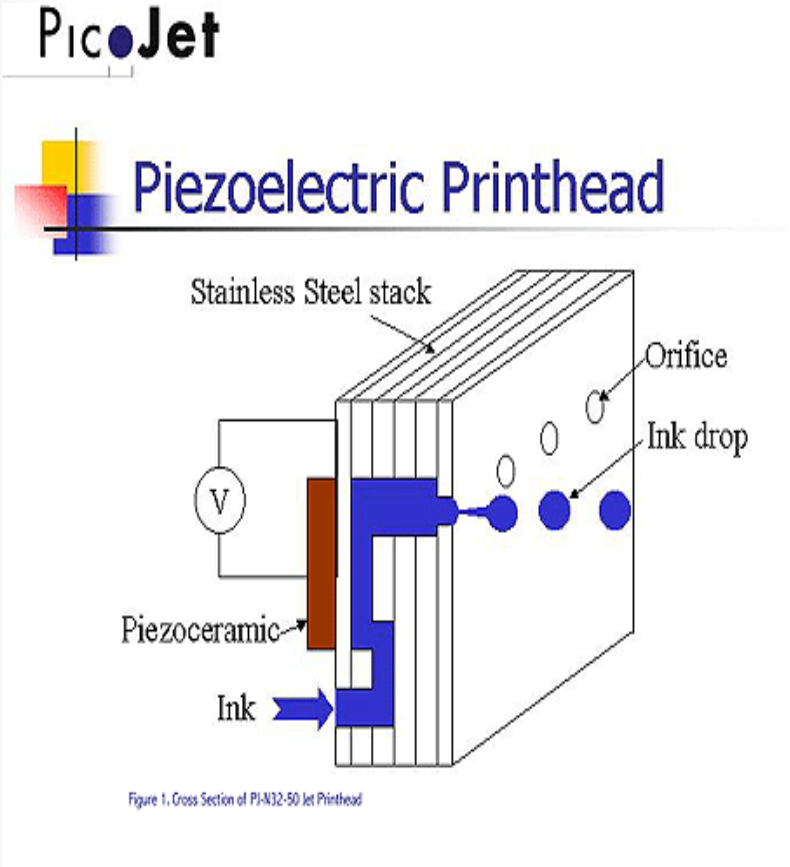
PicoJet

- Founded in 1997
- President, Hue Le, the former Director of Technology Development for Tektronix Printing and Imaging Division
- Located at 3155 SW 234th Avenue, Hillsboro, Oregon
- www.picojet.com

PicoJet PIJ Printhead

- Bend mode piezoelectric ink jet
- Ink flexibility
- Low cost
- Reliable
- 32 nozzle
- 256 nozzle head planned

PicoJet Key Characteristics



- Stainless steel plates joined using a proprietary intermetallic bonding process.
- Operating at up to 18,000 drops per second with <10% drop volume variation.
- Proprietary PZT bonding and patterning for reliability.
- High aspect ratio nozzle design for high velocity.

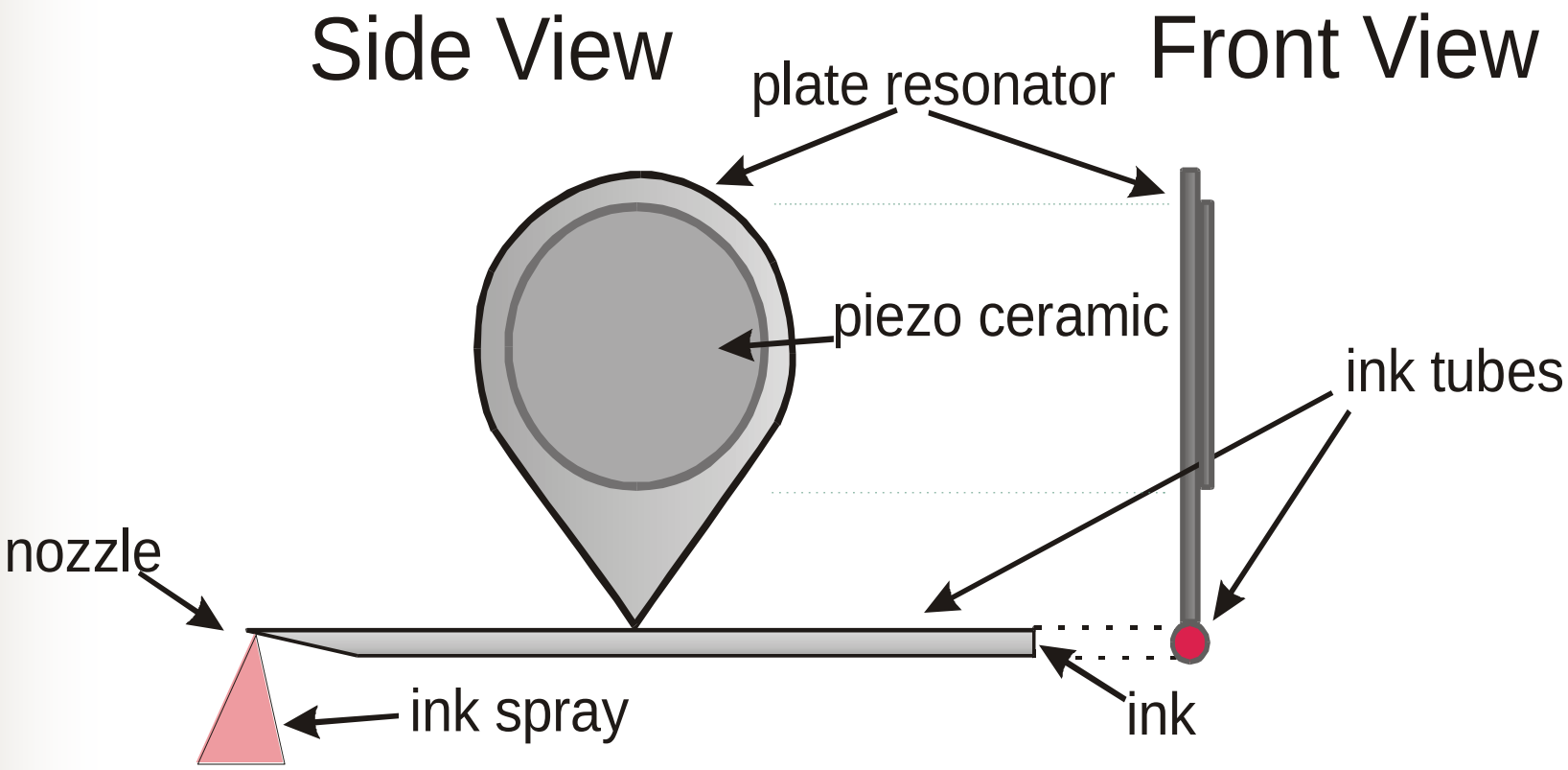
PicoJet Value

- Fast & accurate low-cost printhead production
- Enables cost-effective arrays
- Flexible platform to meet customer needs
- Can tolerate a wide variety of inks and liquids
- Precise liquid dispenser
- US Postal Service

FlatJet

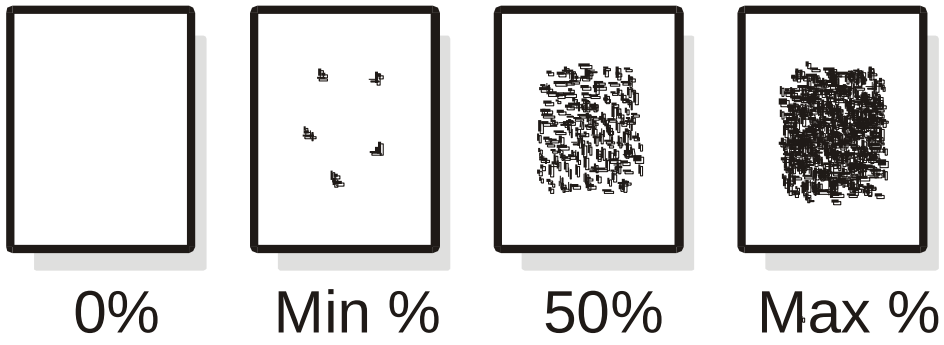
- Patented in Budapest, Hungary 1998
- A number of European companies and a research institute are developing FlatJet for their own applications
- Applications include the printing of fabric, ceramic tile, billboards, signs, and dispensing perfume

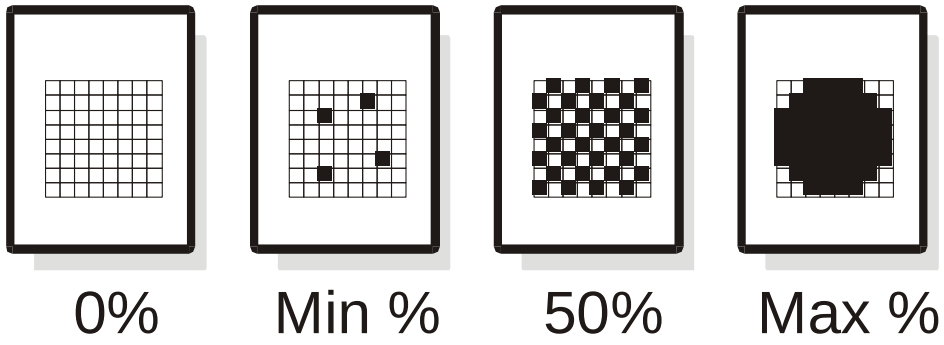
FlatJet Printhead



FlatJet Grays

FlatJet Halftone

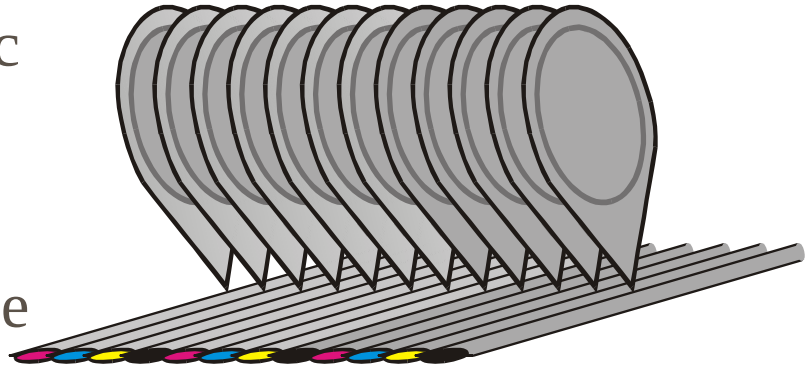




Standard Halftone

FlatJet's Value

- Can print robust higher viscosity inks, frits, metallic & specialty inks
- Low cost inks
- Low cost and highly reliable printheads
- Standard images =150 dpi
- 300 – 600 dpi equivalent possible



Electronic Imaging

- Digital signage systems
- Electronic messaging
- Dynamic signage & displays
- Distributed signage
- Narrow casting

E-Imaging Output Devices

- Gas plasma
- LCD screens
- Projection displays
- Smart paper – Gyricon (Macy's-Federated)
- Printer Micropolymer LED

Beta Management Team

- Demonstration plant location: Ontario, California
- Minimum facility size: 5000 sq.Ft.
- Sustained production speed: 250 sq. meters per hour / per production line
- Fabric marking technology: sublimation
- Fabric requirement: polyester fiber of any construction, nylon 66, other synthetics
- Minimum personnel required: 5 per shift

BMT's Disruptive Claim

- Transition to production
- Business model matches niche market needs
- Recycles older digital technology for new purpose
- Takes advantage of lower recycled equipment costs
- First textile production printing system
- Can provide production line for under $250,000

BMT's Three Production Modes

- Roll to roll (R2R)
- Roll to piece (R2P)
- Piece to piece (P2P)

BMT Roll to Roll (R2R)

- Print run of 3000 yards or less
- Continuing repeat design(s)
- Same fabric per run
- Multiple print designs, colors and color ways without affecting cost or speed

BMT Roll to Piece (R2P)

- For fabric changes
- For garments that do not require exact design match across seams
- Precut white fabric pieces are dropped onto a contiguous stream of repeating print paper which then passes through the transfer roller dropping the now printed and finished cut pieces into the sorting trays

BMT Piece to Piece (P2P) Process

- Prints of cut pieces imposed on the paper and streamed through the transfer unit
- Cut pieces are then placed on the paper and the finished printed fabric is collected and sorted for sewing. Speed and quality are independent of changes in either print design or fabric choice.

P2P Advantages

- For tight tolerances or non-repeating designs
- Can produce mix to replace consumer sales.
- Fabric inventory is kept in white either pre-cut or uncut with digital cutting markers stored in the virtual inventory and cut pieces are printed and sewn on demand.
- Orders are printed on digital presses that can produce about 300 square yards of nested cut pieces per hour.

P2P Advantages (cont.)

- Once the SKU's and count have been fed into the print control computer the press changes styles and sizes on the fly, converting the virtual inventory to a physical inventory containing only the styles and sizes already ordered at that time, avoiding the space for storage and cost of inventory liquidation.
- Digital design and instruction enables remote printing.

BMT Value

- Digital change on the fly
- Mass customization at production speeds
- Low cost product development
- No minimums
- Zero Inventory (ZIP)
- Internet order and design transfer
- Enables cut and sew
- Empowers designers
- Minimizes retail risk
- Less capital and process cost (used equipment)
- Exists and fits targeted customer needs
- “Customer pull” replaces “inventory push”

Common Characteristics of Printing DTs

- Full width array capable and economical
- Production solutions
- Low cost to manufacture and assemble
- Need capital investment to grow

Disruptive Pitfalls

- Lack of capital
- Require market user friendly packages
- Lack of marketing and advertising
- Technological glitches
- Chemistry
- Integration

Strategies and Opportunities

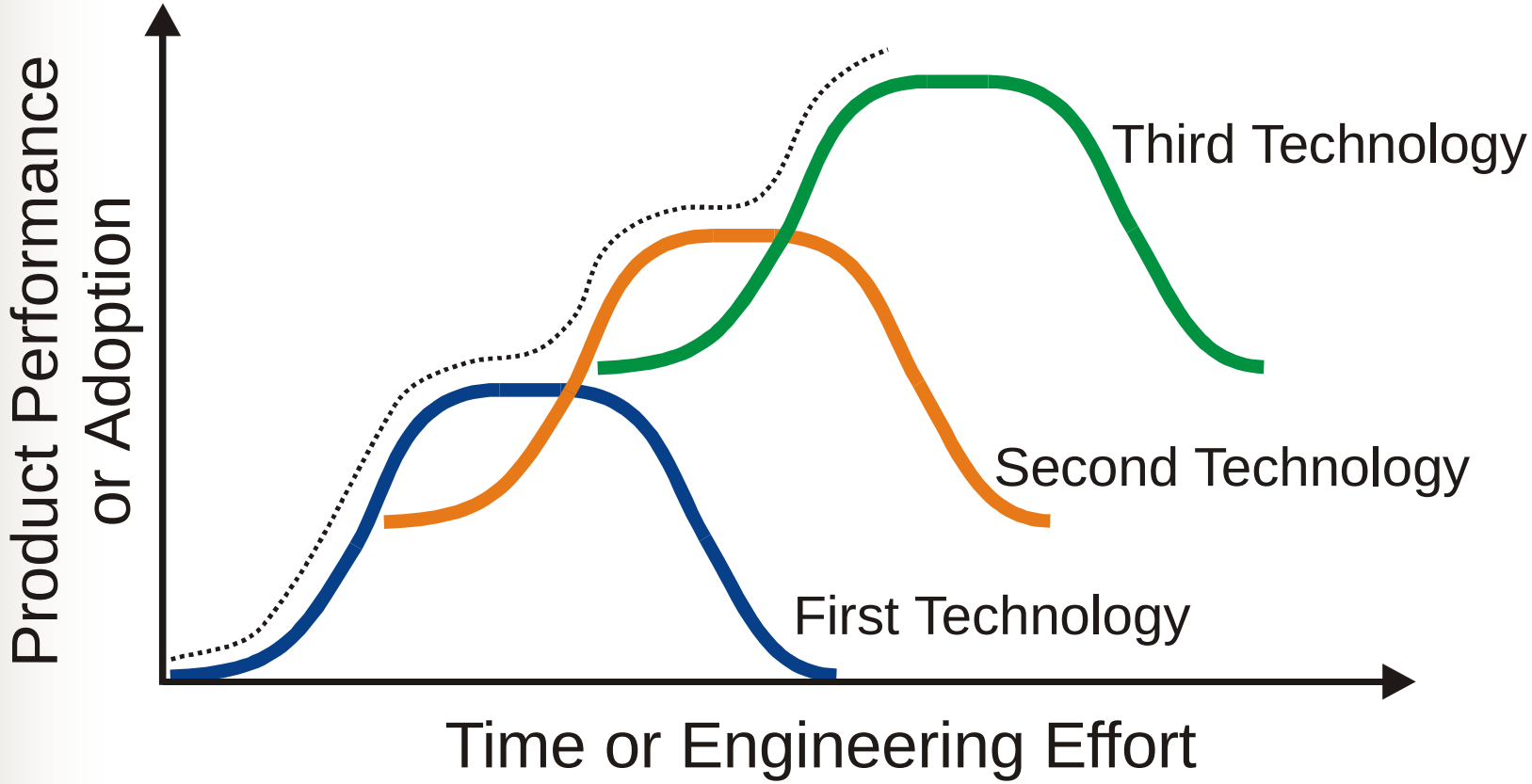
Strategies

- Attract capital
- Select and target market niches
- Remain autonomous

Opportunities

- Production printing
- Improved packaging
- Coating & dyeing
- Medical applications
- The rest of print

S-curve Corporate Immortality



Conclusions

- Technologies have various life cycle patterns
- Digital technologies have become established
- Disruptive technologies go beyond limits
- Established and disruptive technologies have conflicting value models that are best realized under separate management structures
- Established corporations can continue to grow with established and disruptive divisions

Thank you. Questions?

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