



How Digital Technology is Disrupting Everything

Small Business Digitization Initiative (SBDI) - Day 1

By Marc Lijour

January 23, 2017



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Table of Contents

1 Program Overview

- Purpose of the Program
- Organization of the Program & Expectations

2 The 4th Industrial Revolution

- Symptoms
- Industry Positioning

3 What is Technological Innovation?

- Sources of Innovation
- Types & Cycles of Innovation
- From Innovation to Standards



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Welcome!



Small Business Digitization Initiative

A Sense of Purpose

Our Challenge

- › Youth unemployment is 12% vs under 3% in average for the ICT sector
- › SMBs represent 99% of Canada's businesses
- › Canada often gets a D mark on productivity, despite its knowledgeable workforce
- › Adoption of technology is a challenge (e.g. 40% of Ontario businesses do not have a presence on the Internet)
- › Digitization of all industries is happening (World Economic Forum: 4th Industrial Revolution)
- › Big IT, and recently start ups, have been leveraging technology to gain global advantage. Meanwhile, many SMBs are still using paper and basic office software.
- › Is the gap widening in Canada?

Two Main Issues to Address in Ontario



- › Youth unemployment
- › Digitization of Businesses

Small Business Digitization Initiative

A Case Study - part 1: Typical SMB Challenge

- Wholesale Fruits and Vegetable company, about 25 employees



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A Case Study - part 1: Typical SMB Challenge

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- Family-run business, which grew organically over time



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A Case Study - part 1: Typical SMB Challenge

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- Staff did not have any idea at which price to buy and sell to make their margin



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A Case Study - part 1: Typical SMB Challenge

- Wholesale Fruits and Vegetable company, about 25 employees
- Family-run business, which grew organically over time
- Staff did not have any idea at which price to buy and sell to make their margin
- Executives did not know if they were losing or making money on specific lines of product



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A Case Study - part 2: Solution

Savoir-faire Linux digitized key business processes to improve productivity:

- *Analytical Accounting* to allow executives to make more informed decisions



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A Case Study - part 2: Solution

Savoir-faire Linux digitized key business processes to improve productivity:

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- *Real-time Pricing* data made available through mobile apps to buyers and seller



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A Case Study - part 2: Solution

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- *Analytical Accounting* to allow executives to make more informed decisions
- *Real-time Pricing* data made available through mobile apps to buyers and seller
- *Location Tracking* of the shipping crates in the refrigerated trucks, to facilitate partial recalls when necessary



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A Case Study - part 2: Solution

Savoir-faire Linux digitized key business processes to improve productivity:

- *Analytical Accounting* to allow executives to make more informed decisions
- *Real-time Pricing* data made available through mobile apps to buyers and seller
- *Location Tracking* of the shipping crates in the refrigerated trucks, to facilitate partial recalls when necessary
- More *Back-Office Automation* to save staff time (labelling, invoicing, etc)



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A Case Study - part 3: Results

Results

The Company saved 20% of their FTE time (about 5 employees).
Moving these employees to Sales generated a \$15 million/year increase in revenues.



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Governments and Industry alike are Responding



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Dundee Precious Metals
Connects People, Miners, Vehicles and Building Controls

Quadrupled Production Saved US\$2.5M

"We've actually taken the Internet to a place that realistically it never should have gone."

Mark Germerich
Executive Director of IT
Dundee Precious Metals

Tory announces details of plan to modern

Mayor says plan is designed to improve service while saving the city money
By Muriel Draisma, CBC News Posted: Nov 22, 2016 10:28 AM ET | Last Updated: Nov 22, 2016 2:13 PM ET



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http://horizontlife.com/style/toronto-coolest-office-spaces-shopify/

Small Business Digitization Initiative

Challenges & Opportunities

- The pace of change is accelerating (e.g. Technology time to market)



Small Business Digitization Initiative

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Small Business Digitization Initiative

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Small Business Digitization Initiative

Challenges & Opportunities

- The pace of change is accelerating (e.g. Technology time to market)
- Technology enables disruptive innovation
- Businesses don't understand fully the potential & benefits
- There are not enough workers capable of designing & implementing digitized solutions



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Challenges & Opportunities

- The pace of change is accelerating (e.g. Technology time to market)
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- There are not enough workers capable of designing & implementing digitized solutions
- Change is hard. IT Change is especially risky & difficult (Software Crisis).



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Challenges & Opportunities

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- SMBs can't rely on the same resources as a Google, Facebook, Twitter...



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Challenges & Opportunities

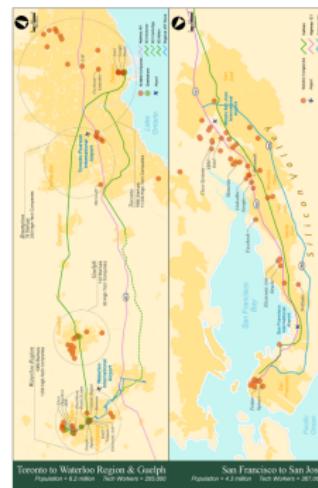
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- SMBs can't rely on the same resources as a Google, Facebook, Twitter...
- other?



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Opportunities for Ontario (and Ontarians)

Can we lead the Digital Revolution?



Course Organization & Expectations

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Small Business Digitization Initiative

Main Components of the Course

Theme	Content	Duration
Digitization Theory (Conceptual Foundation)	The business of Innovation, adoption of technology, entrepreneurship, start ups, business models, key technologies to watch & how to stay current. Sustainable Development: environmental regulations and business operations, compliance, corporate social responsibility, triple bottom-line reporting	5 days
Entrepreneurship Skills (Making Innovation Happen)	Project Leadership – Innovation – Entrepreneurship and Start-Up Students solve a business challenge with an Digital Adoption solution, from ideation to a first implementation (prototype).	14 days (spread out)
Tech Lab (Basic Skills to setup a SOHO)	IT fundamentals for SOHO (for beginners): Internet, Wi-Fi, telephony/VoIP, computers and other devices and software for office productivity and operations; figuring out needs & ROI, how to setup, how to buy. May also cover how to install Odoo on a laptop (depending on audience skill level).	3 days
Communicating Value (Practical approach)	Design and Implement a simple Web front for the course project (or employer) using Odoo builtins and/or industry practice, tools of trade, tips and tricks. How to procure products and services to outsource some of this function.	3 days
ERP / Back-Office (Digitizing Business Processes)	Understand and implement business processes such as accounting, invoicing, billing, hiring, inventory management, project management, CRM, e-commerce into Odoo (the course ERP). Students will also perform business analysis for their employer during coop, followed by a configuration of key business processes in Odoo.	26 days
Data and Intelligence	Business Intelligence and Big data (1 st day) + Business Analytics and Tableau/real cases (2 nd day).	2 days
Open Data and Smart Communities	Smart Government, Open Data, Open Standard, Citizen Engagement, User rights & freedoms, communities working to improve society with technology (e.g. Code for America, OpenNorth, CivicTechTO)	2 days
Project / Specialization (Based on employers' real challenges)	Time dedicated for students to work under supervision on a project to solve an employer challenge. Depending on student skill level, it might include more or less advanced technical competencies. Specific industry verticals can be covered such as advanced manufacturing and intelligent retail.	2 days
ICTC (Employability)	Employability 101, dealing with employers and employees, ICTC digital compass, e-talent... Essential skills, Ontario Skills Passport...	3 days

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Course Sequence

Big Challenge – run through Prepr from day 1 to day 60

Welcome + level-set in theory

Tech intro

ERP component (almost half of the course) + the topical modules

+ two days dedicated to work on the employer challenge project in class

ICTC Employability

Blending with coop, to promote a dialogue between employers and students



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Class Time

Time	Activity
9am - 10:30am	Class
10:30am	Break
10:40am - 12:10pm	Class
12:10pm	Lunch
12:50pm - 2:20pm	Class
2:20pm	Break
2:30pm - 4pm	Class



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Work placement

Employer Challenge

Opportunity to leverage *i)* the theory learned in class and *ii)* the intimate understanding of your employer's job functions and business processes, to design new ways to improve their business by leveraging digital technology.

Job Skills

During the work placement, you are expected to behave as a regular employee or consultant. That means *i)* a high standard of professionalism, and *ii)* the performance of work duties that are valuable to the business. You will deliver a report, and if possible a working prototype, to your "customer" at the end of the course.



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ERP Component (26 days)

- Opportunity to study how a business works (complementing the work placement)



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ERP Component (26 days)

- Opportunity to study how a business works (complementing the work placement)
- Focusing on eight business functions:
 - ① Introduction to ERP + Customer Relationship Management (CRM)
 - ② Sales Management
 - ③ Purchasing Management
 - ④ Manufacturing Management
 - ⑤ Inventory Management
 - ⑥ Accounting Management
 - ⑦ Project Management
 - ⑧ Human Resources Management



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 - ⑤ Inventory Management
 - ⑥ Accounting Management
 - ⑦ Project Management
 - ⑧ Human Resources Management
- The study of each module will be broken down in 3 steps:
 - Day 1: Theory, key concepts, best practices
 - Day 2: Introduction to Odoo (the course ERP)
 - Day 3: Analyzing business processes
- See next slides



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Business Module - Day 1 (key concepts)

- Primer on (8) main business functions



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Business Module - Day 1 (key concepts)

- Primer on (8) main business functions
- Best practices in the industry



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Small Business Digitization Initiative

Business Module - Day 1 (key concepts)

- Primer on (8) main business functions
- Best practices in the industry
- Reflection about process variation (e.g. FIFO vs. LIFO)



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Business Module - Day 2 (the tools of the trade)

- Introduction to Odoo -the ERP system used for this course



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Business Module - Day 2 (the tools of the trade)

- Introduction to Odoo -the ERP system used for this course
- Odoo is a fresh and flexible ERP under an Open Source license



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- Your instructors support the community in a number of ways, e.g. with the [Odoo Toronto Meetup](#)



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- Across these 8 days, you'll follow the journey of a fictitious company implementing an ERP
- You will have access to 2 databases (one for class, one for the work placement)
- Start becoming familiar with Odoo today!
([Youtube](#) is a good place to start)



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Business Module - Day 3 (initiating the digitization journey)

- This is where theory meets skills and good understanding of the business at your work placement



Small Business Digitization Initiative

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- You'll work in a workshop format to conceptualize the business processes observed at the work place (your "customer")



Small Business Digitization Initiative

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- Producing diagrams and other documents describing the *as-is* and *to-be* state of the process



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- Discussing potential improvements (based on industry best practices, capabilities of Odoo, etc)



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- You'll work in a workshop format to conceptualize the business processes observed at the work place (your "customer")
- Producing diagrams and other documents describing the *as-is* and *to-be* state of the process
- Discussing potential improvements (based on industry best practices, capabilities of Odoo, etc)
- Working towards implementing some of these processes in Odoo and
- Preparing a report for the business (your "customer")



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Small Business Digitization Initiative

Special Project (2 days)

- Extra days to help you complete the Employer Challenge



Small Business Digitization Initiative

Special Project (2 days)

- Extra days to help you complete the Employer Challenge
- Can be used to
 - refine the business analysis
 - implement some processes in Odoo
 - complete the report for your “customer”



Small Business Digitization Initiative

Special Project (2 days)

- Extra days to help you complete the Employer Challenge
- Can be used to
 - refine the business analysis
 - implement some processes in Odoo
 - complete the report for your “customer”

Attention

Don't underestimate the importance of a thorough business analysis. The main cause of IT project failures is a lack of solid and sound requirements.

Remember:

Project done right ≠ the Right Project is done!



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Business Analysis 101 (2 days)

- Solid foundations



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Business Analysis 101 (2 days)

- Solid foundations
- Before you start the work placement



Small Business Digitization Initiative

Business Analysis 101 (2 days)

- Solid foundations
- Before you start the work placement
- Techniques to explore your “customer” business processes in a thorough & professional way



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Small Business Digitization Initiative

Business Analysis 101 (2 days)

- Solid foundations
- Before you start the work placement
- Techniques to explore your “customer” business processes in a thorough & professional way
- Techniques to conceptualize and to represent a process on paper



Small Business Digitization Initiative

Business Analysis 101 (2 days)

- Solid foundations
- Before you start the work placement
- Techniques to explore your “customer” business processes in a thorough & professional way
- Techniques to conceptualize and to represent a process on paper
- The documentation you produce will be foundational both to your report and to working on a prototype



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Other Modules

- To build awareness on business areas that will be impacted by your work
 - Communications, Sales & Marketing
(e.g. can you enable a new line of revenue?)
 - Big Data & Analytics
(e.g. can you surface intelligence to allow more informed decisions?)
 - Open Data & Smart Communities
(e.g. can you leverage Open Data for your “customer”?)



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Are you ready?



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Let's Start!

- Download these slides at <http://www.lijour.net/sbdi/day1.pdf>
- Form teams of 4
- Fill the form at <https://goo.gl/forms/moKSrsmIepUaqjFX2> (contact info, background & interests, team)
- Discuss in teams: *What is the biggest challenges for SMBs today?*
- Pick a spokesperson to share with the class



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The 4th Industrial Revolution

Everyone talks about it -Businesses & Government alike



Figure: The topic of conversation since Davos 2016 (Credit: Reuters)

The 4th Industrial Revolution

“The new technology revolution, which entails nothing less than a transformation of mankind.” —Klaus Schwab, founder and executive chairman of the World Economic Forum

Schwab, K. (2016). *The fourth industrial revolution.* Geneva: World Economic Forum



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The 4th Industrial Revolution

Characteristics

According to Klaus Schwab, the “changes are historic” because of their

- **Velocity:** Moving at an exponential pace (vs. linear) as a result of an interconnected world
- **Breadth & Depth:** Touches all industries, not only technology (the *what*) but also *who* we are
- **Systems Impact:** Everything is intertwined, and systems changes: countries, organizations, societies



The 4th Industrial Revolution

Technology-driven revolutions

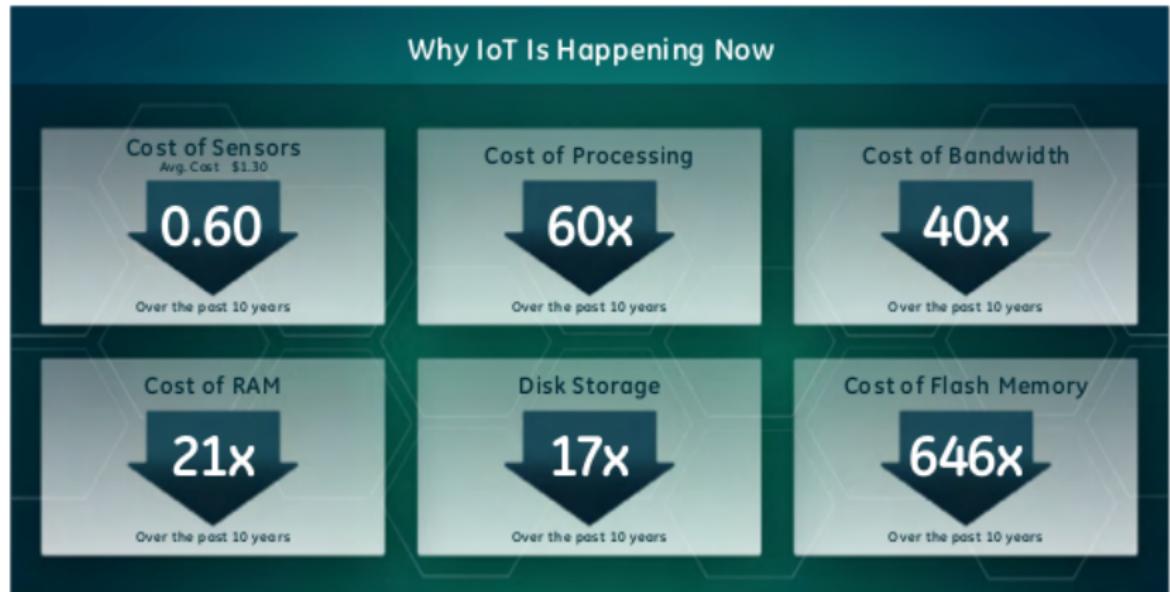
- **Farming** led to better food supply and the rise of urbanization
- The **Steam Engine** led to the 1st Industrial Revolution (rails roads, mechanized factories)
- **Electricity** led to the 2nd Industrial Revolution (assembly lines, mass production)
- **Semiconductors and Computing** led to the 3rd Industrial Revolution (software, the Internet)
- Ubiquitous Computing (cheap sensors, chips, etc), AI, and IoT are leading us through the 4th Industrial Revolution



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The 4th Industrial Revolution

The cost drivers



Source: Goldman Sachs Global Investment Research, John C. McCallum Research, TCG Advisors

Figure: Credit: GE White Paper “Unlocking Business Value through Industrial Data Management”



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The 4th Industrial Revolution

The pace of change

- The iPhone is only 10 years old (2007)
- There were 2 billion smartphones at the end of 2015



The 4th Industrial Revolution

Exercise

Group Work

What are the new technologies that can disrupt the way we live and work?



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The 4th Industrial Revolution

Technology Drivers (Networking)

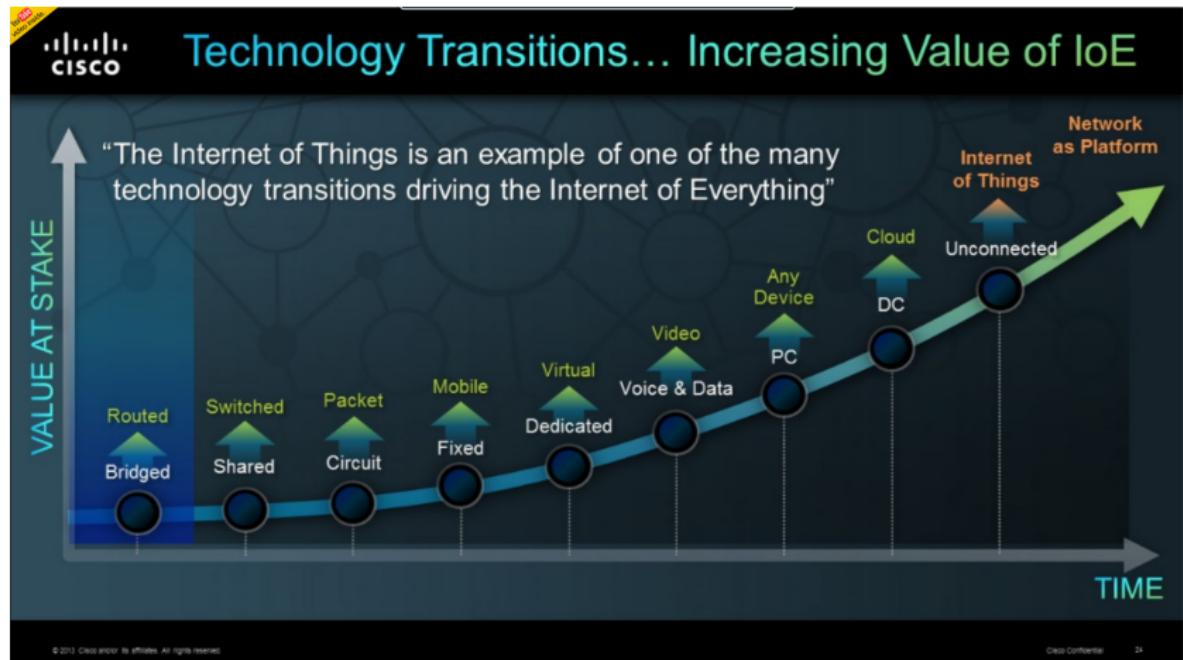


Figure: Credit: John Chambers Keynote (Cisco, 2013)

The 4th Industrial Revolution

Emerging Technologies (Gartner's Hype Cycle, 2015)



The 4th Industrial Revolution

It's also the way we work, e.g. OT vs. IT

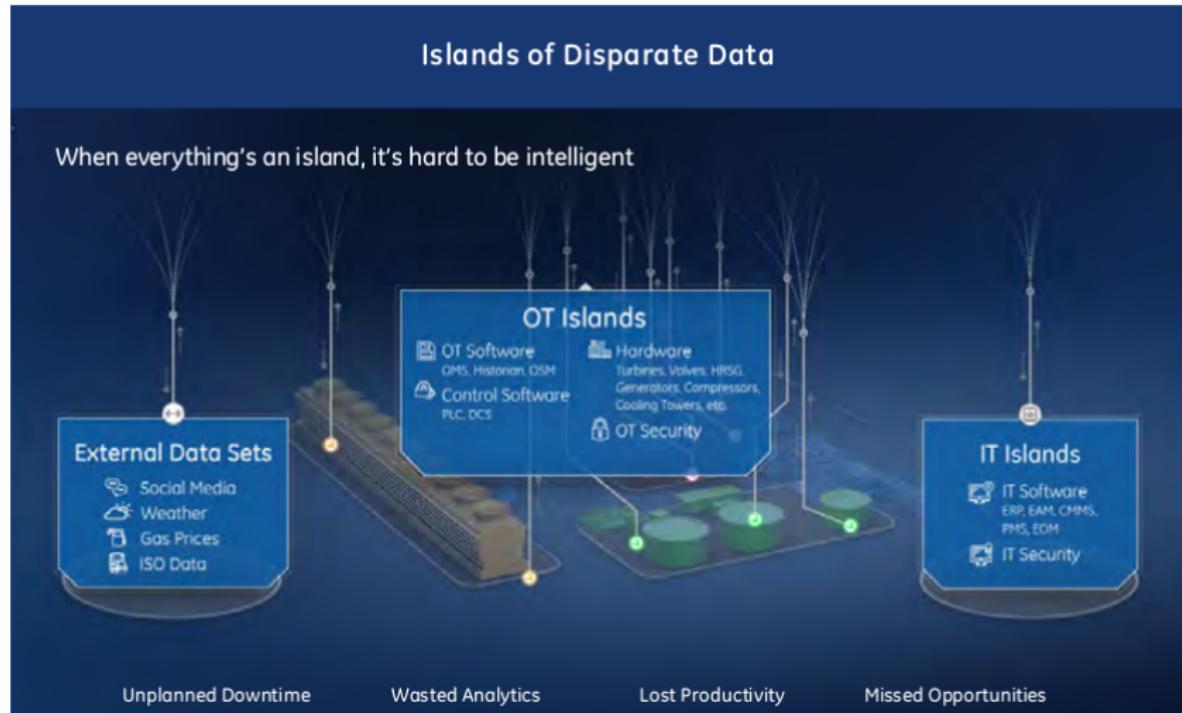
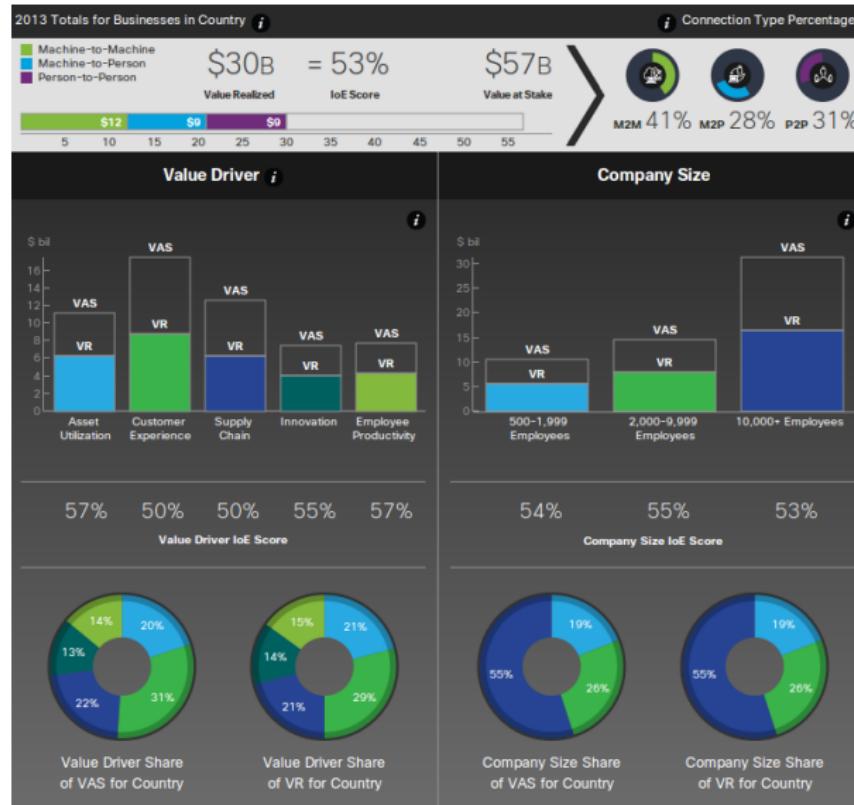


Figure: Credit: GE White Paper "Unlocking Business Value through Industrial Data Management"



The 4th Industrial Revolution

Estimation of the Value at Stake for Canada (Cisco, 2013)



The 4th Industrial Revolution

The market value (to be captured): \$19T over 10 years according to Cisco



Figure: Verticals with highest \$ potential Credit: John Chambers Keynote (Cisco, 2014)



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The 4th Industrial Revolution

A sense of urgency & the race for survival



Figure: Credit: John Chambers Keynote (Cisco, 2014)



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The 4th Industrial Revolution

SWOT Analysis (Credit: Diagram by Xhienne [CC BY-SA 2.5], via Wikimedia Commons)

SWOT ANALYSIS



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Exercise

Group Work

Assess the situation for an Industry (or pick a particular company, e.g. your coop).



The 4th Industrial Revolution

References

- Cisco. (2013). Internet of Everything Value at Stake for Canada. Retrieved from <http://ioeassessment.cisco.com/explore/full#/country/can>
- Schwab, K. (2016). *The fourth industrial revolution*. Geneva: World Economic Forum.



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Sources of Innovation

Technological Innovation fuels Economic Growth (the Solow Residual)

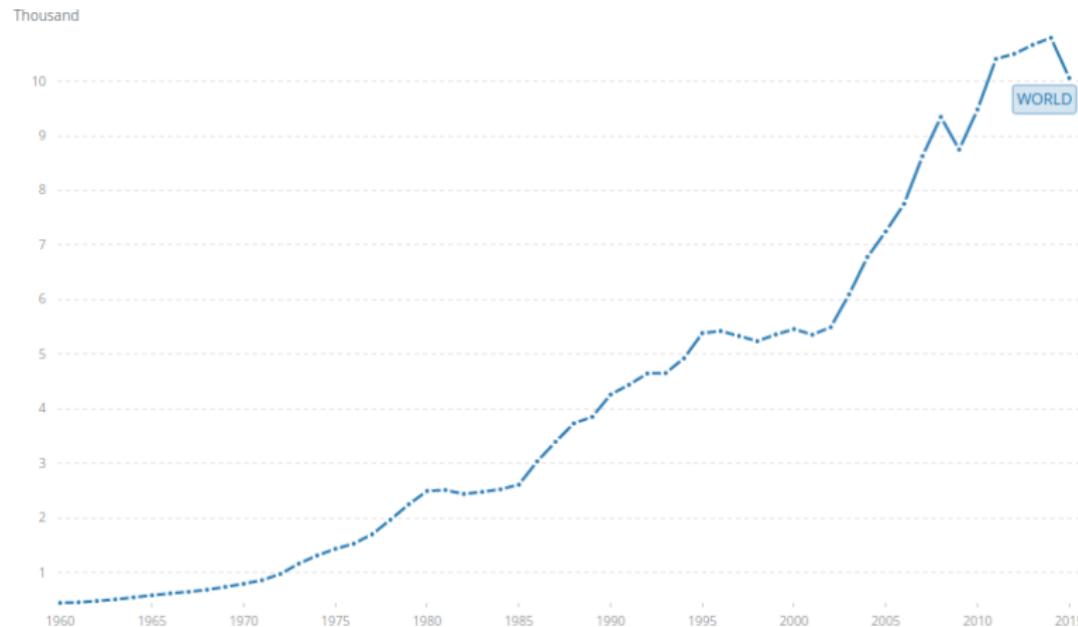


Figure: World GDP per capita, Credit: World Bank, 2017

Where does Innovation come from?



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Sources of Innovation

Inventors' Main Traits (Root-Bernstein, 1989)

- Have mastered basic tools & operations in their field/business



Sources of Innovation

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- Have mastered basic tools & operations in their field/business
- Understand several fields with diverse perspectives



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- Curious & more interested in problems than solutions
- Question status quo



Sources of Innovation

Inventors' Main Traits (Root-Bernstein, 1989)

- Have mastered basic tools & operations in their field/business
- Understand several fields with diverse perspectives
- Curious & more interested in problems than solutions
- Question status quo
- Have a sense that all knowledge is unified (system thinking)



Theory of Innovation

Thinking outside the box

Sir MacFarlane Burnet, Nobel Prize:

"I think there are dangers for a research man being too well trained in the field he is going to study"



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Theory of Innovation

Other Sources of Innovation

- Innovation by users (e.g. Loctite case, startup entrepreneurs)



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Theory of Innovation

Other Sources of Innovation

- Innovation by users (e.g. Loctite case, startup entrepreneurs)
- Internal R&D



Theory of Innovation

Other Sources of Innovation

- Innovation by users (e.g. Loctite case, startup entrepreneurs)
- Internal R&D
- Universities & Colleges



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Theory of Innovation

Other Sources of Innovation

- Innovation by users (e.g. Loctite case, startup entrepreneurs)
- Internal R&D
- Universities & Colleges
- Government-funded R&D (e.g. Internet)



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Theory of Innovation

Other Sources of Innovation

- Innovation by users (e.g. Loctite case, startup entrepreneurs)
- Internal R&D
- Universities & Colleges
- Government-funded R&D (e.g. Internet)
- Collaboration with industry peers (e.g. R3 CEV leads a consortium of 75 of the world leading financial institutions)



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- Open Source projects (e.g. Hyperledger, Linux, Tensor Flow, Eclipse, Odoo)



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- Tech Clusters



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- Tech Clusters
- Other?



Theory of Innovation

Types of Innovation

- Product Innovation vs. Process Innovation



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- Product Innovation vs. Process Innovation
- Disruptive Innovation vs. Incremental Innovation



Theory of Innovation

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- Product Innovation vs. Process Innovation
- Disruptive Innovation vs. Incremental Innovation
- Competence-Enhancing Innovation vs. Competence-Destroying Innovation



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Theory of Innovation

Types of Innovation

- Product Innovation vs. Process Innovation
- Disruptive Innovation vs. Incremental Innovation
- Competence-Enhancing Innovation vs. Competence-Destroying Innovation
- Architectural Innovation vs. Component Innovation



Theory of Innovation

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- Product Innovation vs. Process Innovation
- Disruptive Innovation vs. Incremental Innovation
- Competence-Enhancing Innovation vs. Competence-Destroying Innovation
- Architectural Innovation vs. Component Innovation
- Other?

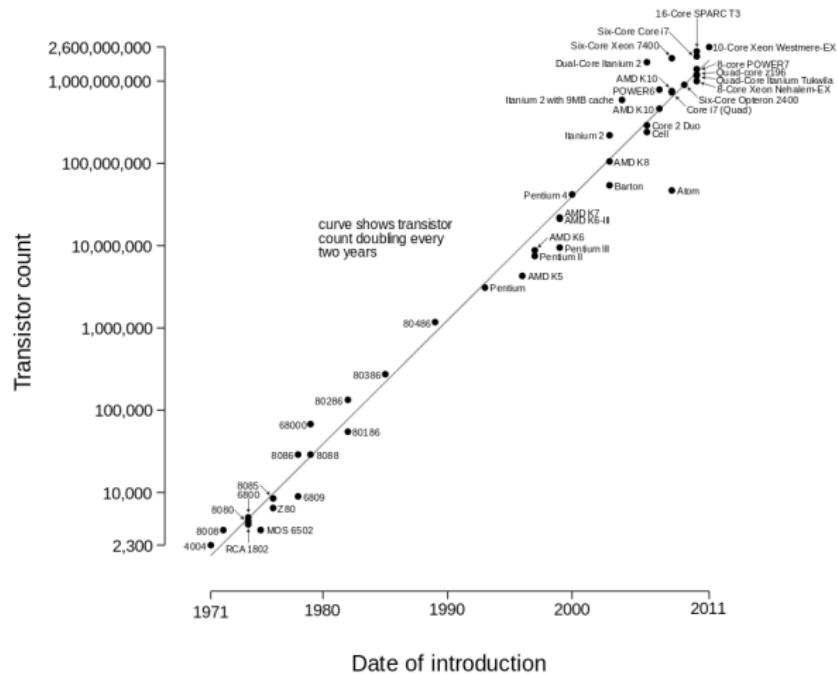


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Theory of Innovation

Technological Improvement (Credit: Wgsimon [CC BY-SA 3.0], via Wikimedia Commons)

Microprocessor Transistor Counts 1971-2011 & Moore's Law



Theory of Innovation

Technological Improvement

Pace of Change

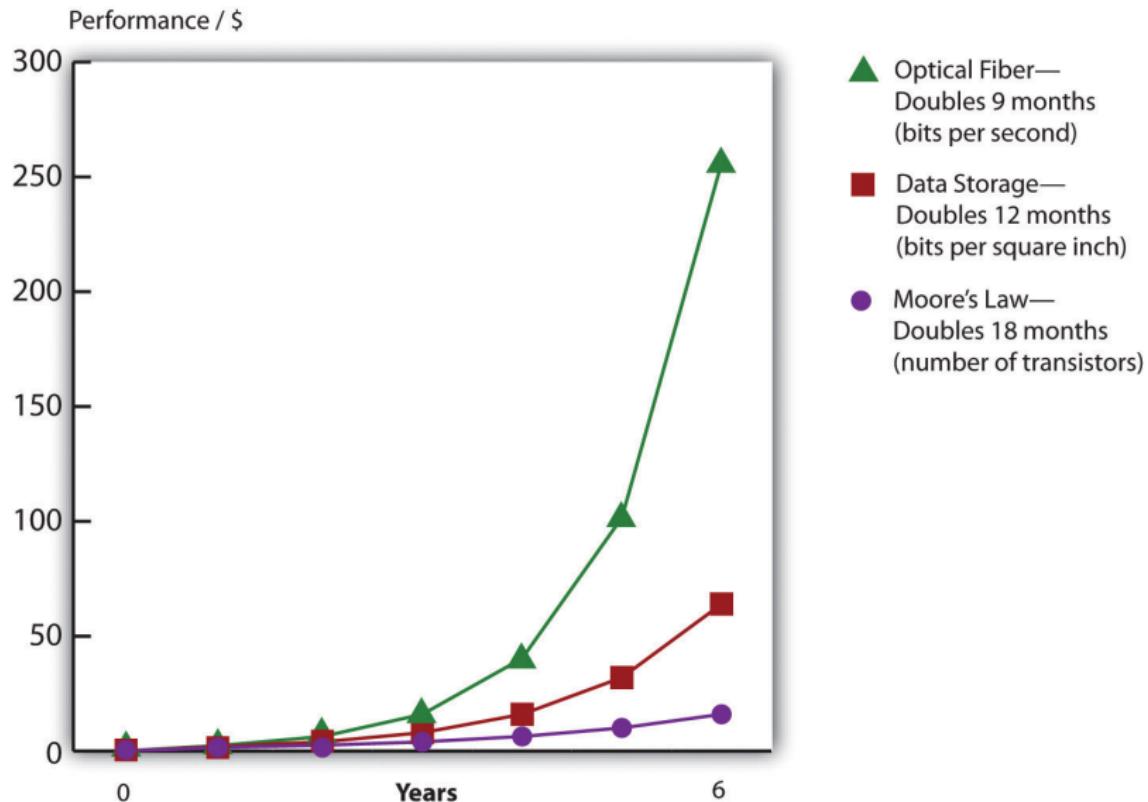
How fast does technology improve according to Moore's Law?



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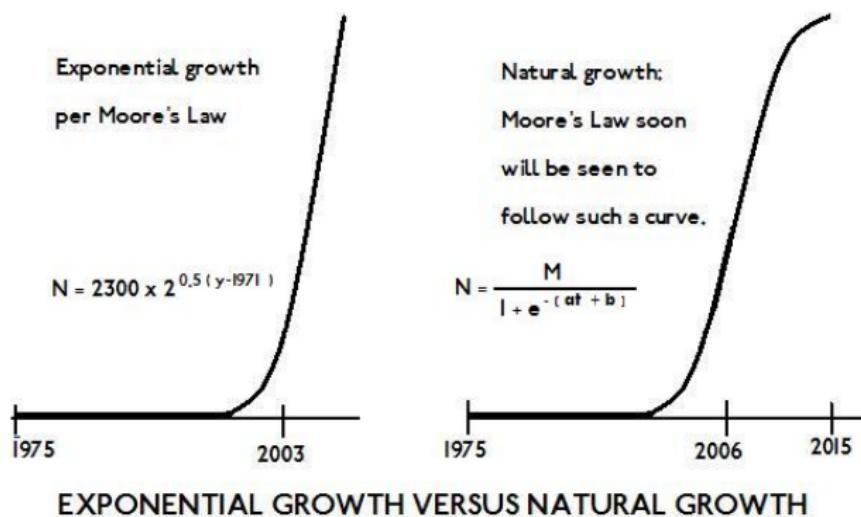
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Technological Improvement grows Exponentially (Heiman, 2013)



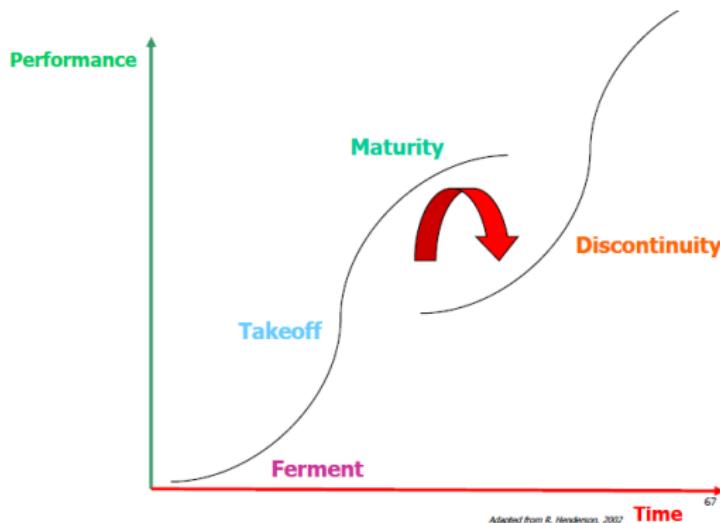
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Technological Improvement follows an S-Curve (Tom Ryun, 2006)



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Technological Improvement & Discontinuous Innovations (Gill, 2012)



How do innovations spread out and get adopted?



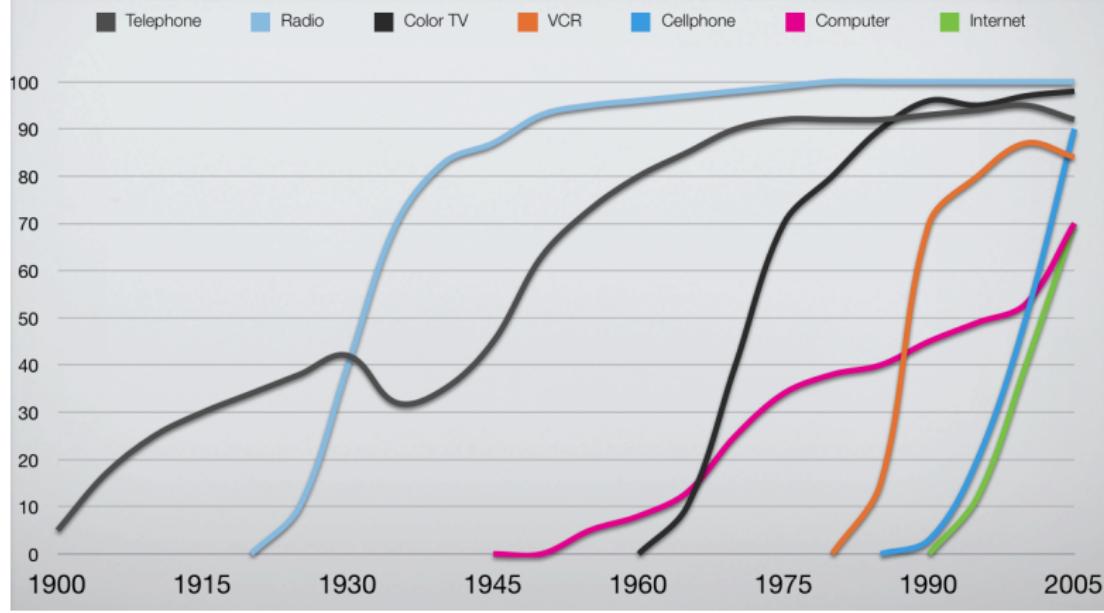
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Diffusion of Innovations (Leyden)

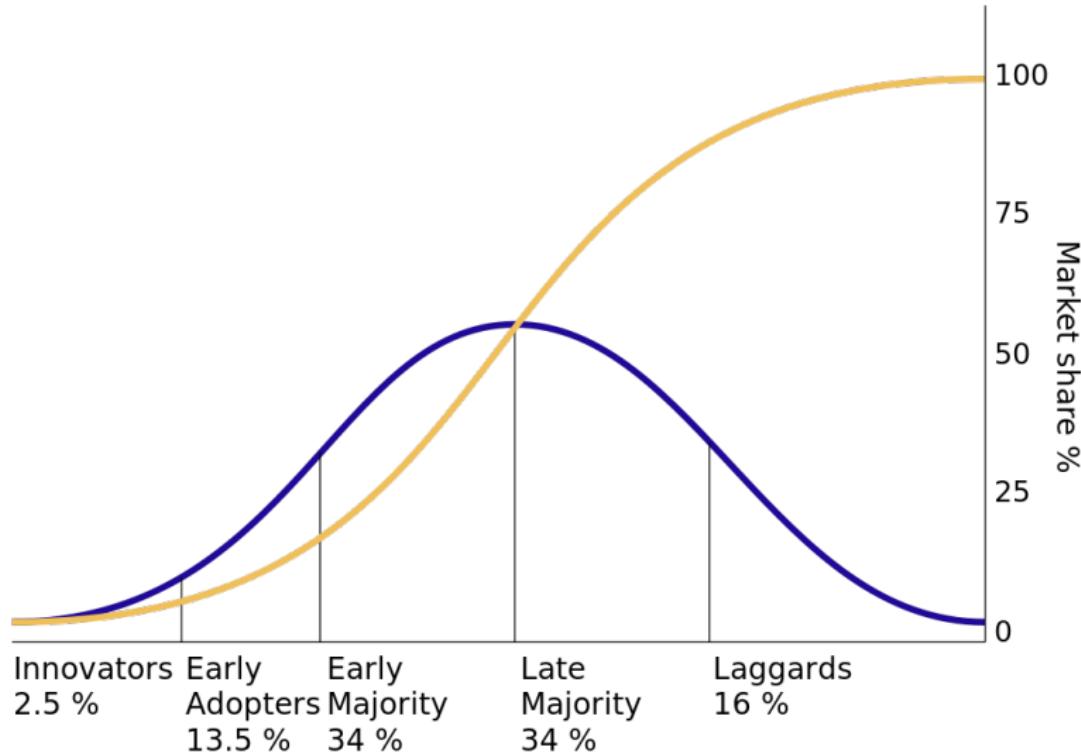
Tech Adoption

Historical adoption rates of communication technologies



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Diffusion of Innovations (Rogers, 2003)



Theory of Innovation

Uses & Limitations of S-Curves

- Commercialization of Innovations (e.g. improved products, start ups disrupting a market)



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Theory of Innovation

Uses & Limitations of S-Curves

- Commercialization of Innovations (e.g. improved products, start ups disrupting a market)
- Forecasting for strategic ventures



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Theory of Innovation

Uses & Limitations of S-Curves

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- Other?



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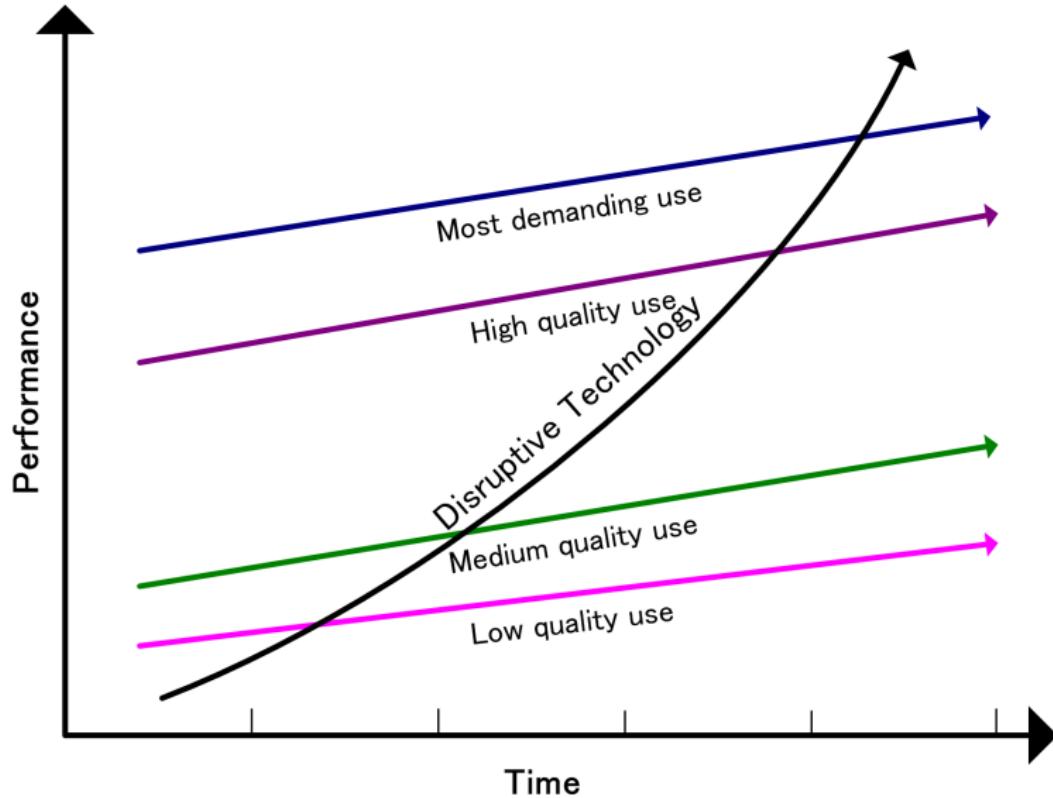
When to market a disruptive innovation? How good an innovation needs to be to gain adoption?



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Theory of Innovation

Disruptive Innovations (Christensen, 1997)



Theory of Innovation

The Innovator's Dilemma (Christensen, 1997)

The Innovator's Dilemma

Should a firm disrupt itself?



Theory of Innovation

Creative Destruction (Schumpeter, 2008)

- Joseph Schumpeter, born in Austria (1883-1950), then Harvard Professor (1932)



Theory of Innovation

Creative Destruction (Schumpeter, 2008)

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- Theory of Economic Innovation (firms die and better ones are created)



Theory of Innovation

Creative Destruction (Schumpeter, 2008)

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- Derived from Karl Marx (re. accumulation and annihilation of wealth)



Theory of Innovation

Creative Destruction (Schumpeter, 2008)

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- Theory of Economic Innovation (firms die and better ones are created)
- Derived from Karl Marx (re. accumulation and annihilation of wealth)
- Example: disappearance of Nortel spreads out top engineers in new local firms



Theory of Innovation

Technology Cycles (Anderson & Thushman, building on Utterback & Abernathy)

- Era of Ferment



Theory of Innovation

Technology Cycles (Anderson & Thushman, building on Utterback & Abernathy)

- Era of Ferment
 - ▶ Design Competition
 - ▶ Substitution



Theory of Innovation

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- Era of Incremental Change



Theory of Innovation

Technology Cycles (Anderson & Thushman, building on Utterback & Abernathy)

- Era of Ferment
 - ▶ Design Competition
 - ▶ Substitution
- Selection of a Dominant Design
- Era of Incremental Change
- Disruptive Innovation



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Theory of Innovation

The Drivers behind the convergence towards a Dominant Design

- Learning Effects



Theory of Innovation

The Drivers behind the convergence towards a Dominant Design

- Learning Effects

- ▶ Learning Curve: after a while costs of production drop



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Theory of Innovation

The Drivers behind the convergence towards a Dominant Design

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- ▶ Learning Curve: after a while costs of production drop
- ▶ Technology Spillover



Theory of Innovation

The Drivers behind the convergence towards a Dominant Design

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- ▶ Learning Curve: after a while costs of production drop
- ▶ Technology Spillover
- ▶ Appearance of mature production tools



Theory of Innovation

The Drivers behind the convergence towards a Dominant Design

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- ▶ Learning Curve: after a while costs of production drop
- ▶ Technology Spillover
- ▶ Appearance of mature production tools
- ▶ Competitors may be better off adopting the same standard



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Theory of Innovation

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- Network Externalities



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- ▶ Installed Base (e.g. telephone)



Theory of Innovation

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- ▶ Installed Base (e.g. telephone)
- ▶ Availability of Complementary Goods (e.g. video games for consoles)



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Theory of Innovation

The Drivers behind the convergence towards a Dominant Design

- Learning Effects
 - Learning Curve: after a while costs of production drop
 - Technology Spillover
 - Appearance of mature production tools
 - Competitors may be better off adopting the same standard
- Network Externalities
 - Installed Base (e.g. telephone)
 - Availability of Complementary Goods (e.g. video games for consoles)
- Government Regulation (e.g. 4G)



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Theory of Innovation

Winner-Take-All Markets

- Pros



Theory of Innovation

Winner-Take-All Markets

- Pros

- ▶ Learning Effects will lower costs for consumers
- ▶ Network Externalities will increase value/utility



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Theory of Innovation

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Theory of Innovation

Winner-Take-All Markets

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- Cons

- ▶ Providers can be in a monopoly position (high prices)
- ▶ Can slow further innovations
- ▶ Can kill some businesses (established ones depending on the design, new ones like start ups)



Theory of Innovation

Assessing an Innovation's Value (Kim and Mauborgne, 2000)

- The “Buyer Utility Map” is a scorecard to assess value/utility
- 6 stages of the buyer experience cycle:
 - ① Purchase
 - ② Delivery
 - ③ Use
 - ④ Supplements
 - ⑤ Maintenance
 - ⑥ Disposal
- 6 utility levers:
 - ① Customer Productivity
 - ② Simplicity
 - ③ Convenience
 - ④ Risk
 - ⑤ Fun & Image
 - ⑥ Environmental Friendliness



Theory of Innovation

Assessing an Innovation's Value (Kim and Mauborgne, 2000)

		The Six Stages of the Buyer Experience Cycle					
		Purchase	Delivery	Use	Supplements	Maintenance	Disposal
The Six Utility Levers	Customer productivity						
	Simplicity						
	Convenience						
	Risk						
	Fun and image						
	Environmental friendliness						

The 4th Industrial Revolution

Exercise

Group Work

Pick an innovative technology-based product or service and estimate its value for customers.



Theory of Innovation

References (see more in Schilling, 2016)

- Christensen, C. (1997). *The innovator's dilemma: when new technologies cause great firms to fail.* Management of innovation and change series. Harvard Business School Press.
- Kim, W. C. & Mauborgne, R. (2000, September). Knowing a winning business idea when you see one. *Harvard Business Review*. Retrieved from <https://hbr.org/2000/09/knowing-a-winning-business-idea-when-you-see-one>
- Rogers, E. (2003). *Diffusion of innovations* (5th ed.). Free Press.
- Root-Bernstein, R. (1989). Who discovers and who invents. *Research Technology Management*, 32(1), 43–51.
- Schilling, M. (2016, January). *Strategic management of technological innovation* (5th ed.). New York: McGraw-Hill Education.
- Schumpeter, J. (2008). *Capitalism, socialism, and democracy* (3rd ed.). Harper Perennial modern thought. HarperCollins.



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