



# The Role of Incremental and Transformative Change in Future Prediction

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Campus Technology  
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Boston, Massachusetts  
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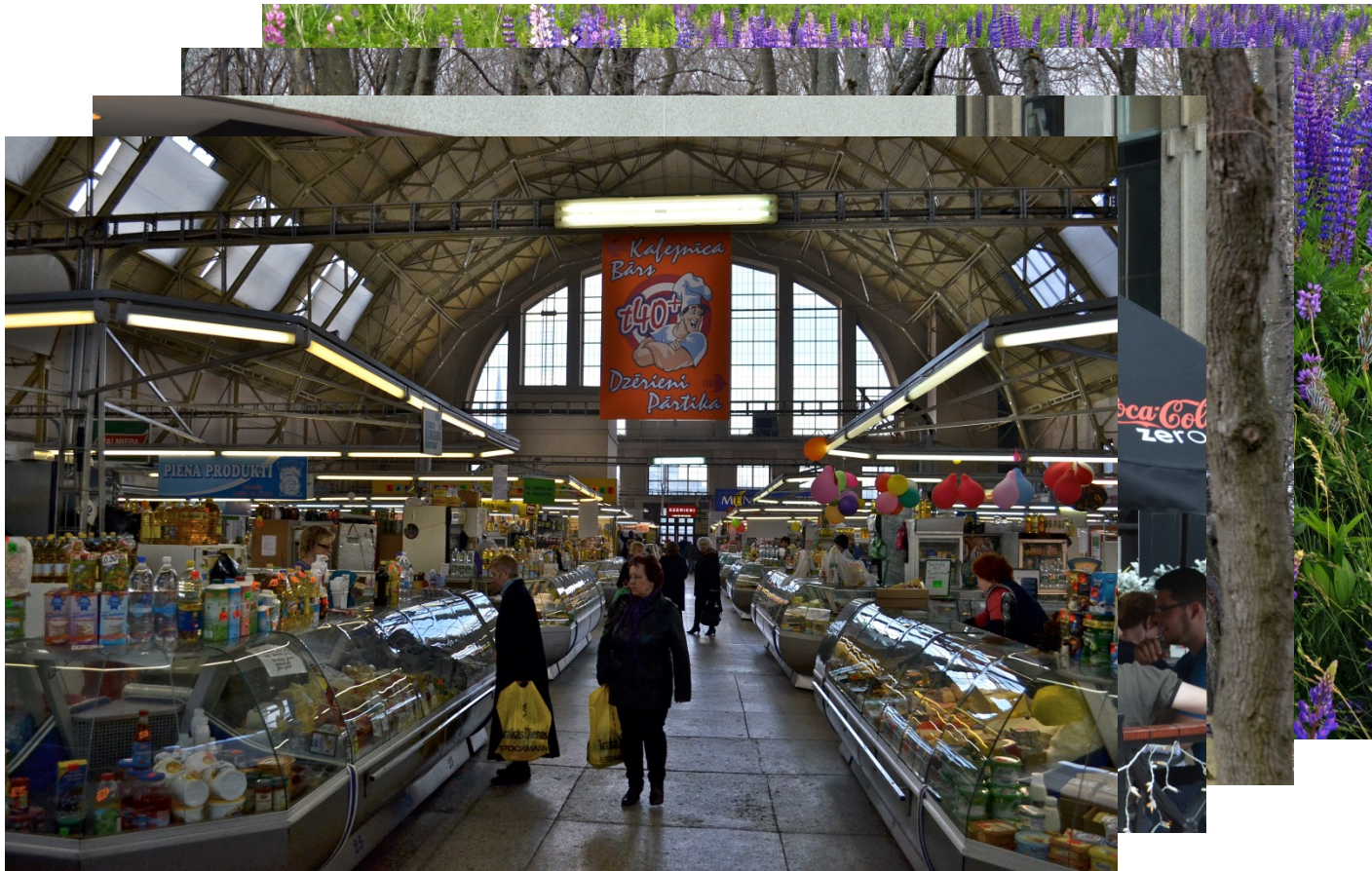
# 1. The Future



Kakadu, Australia, 2004

# Nobody Can Predict the Future?

- Let's make some predictions together...



Riga, Latvia, 2014

# We Predict by Reading the Signs

- Prediction isn't magic, it's a form of reasoning
- Overall, it is an instance of *recognition*



# The Future and the Past

- The future and the past are epistemologically equivalent (so are possibility and necessity)



## 2. Change



Riga, Latvia, 2012

# Seeing Change

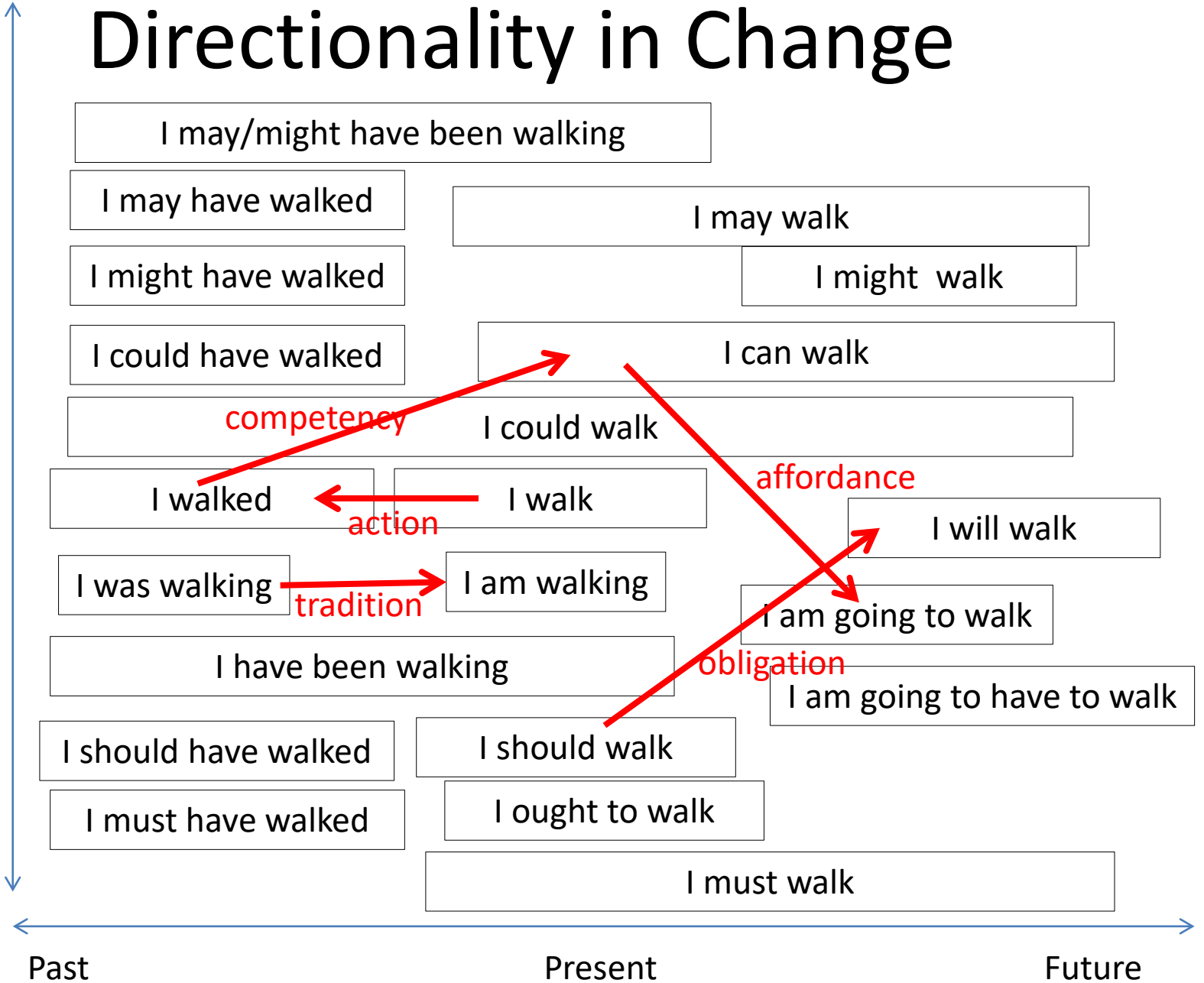
- Nothing changes
- Everything changes
- Change = change to edge conditions
  - What counts as change depends on how you see the world
  - What you see (often) depends on what you're looking for
  - What you're looking for (often) depends on what you (currently) value

# Directionality in Change

Possibility

Actuality

Necessity



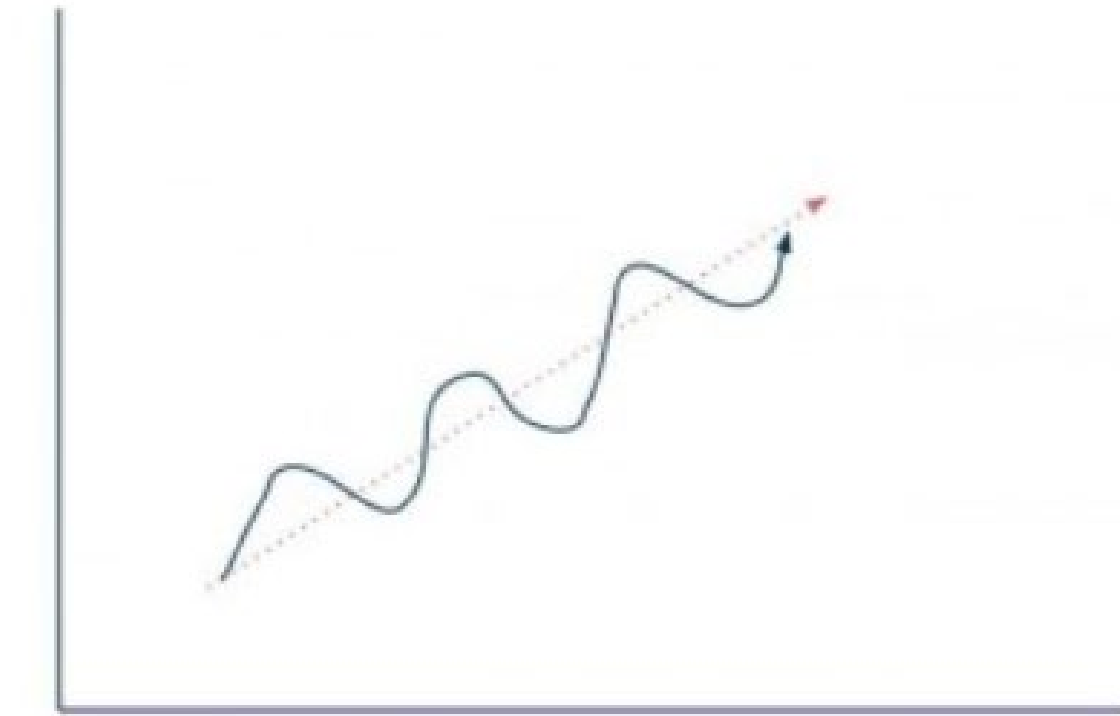
Past

Present

Future

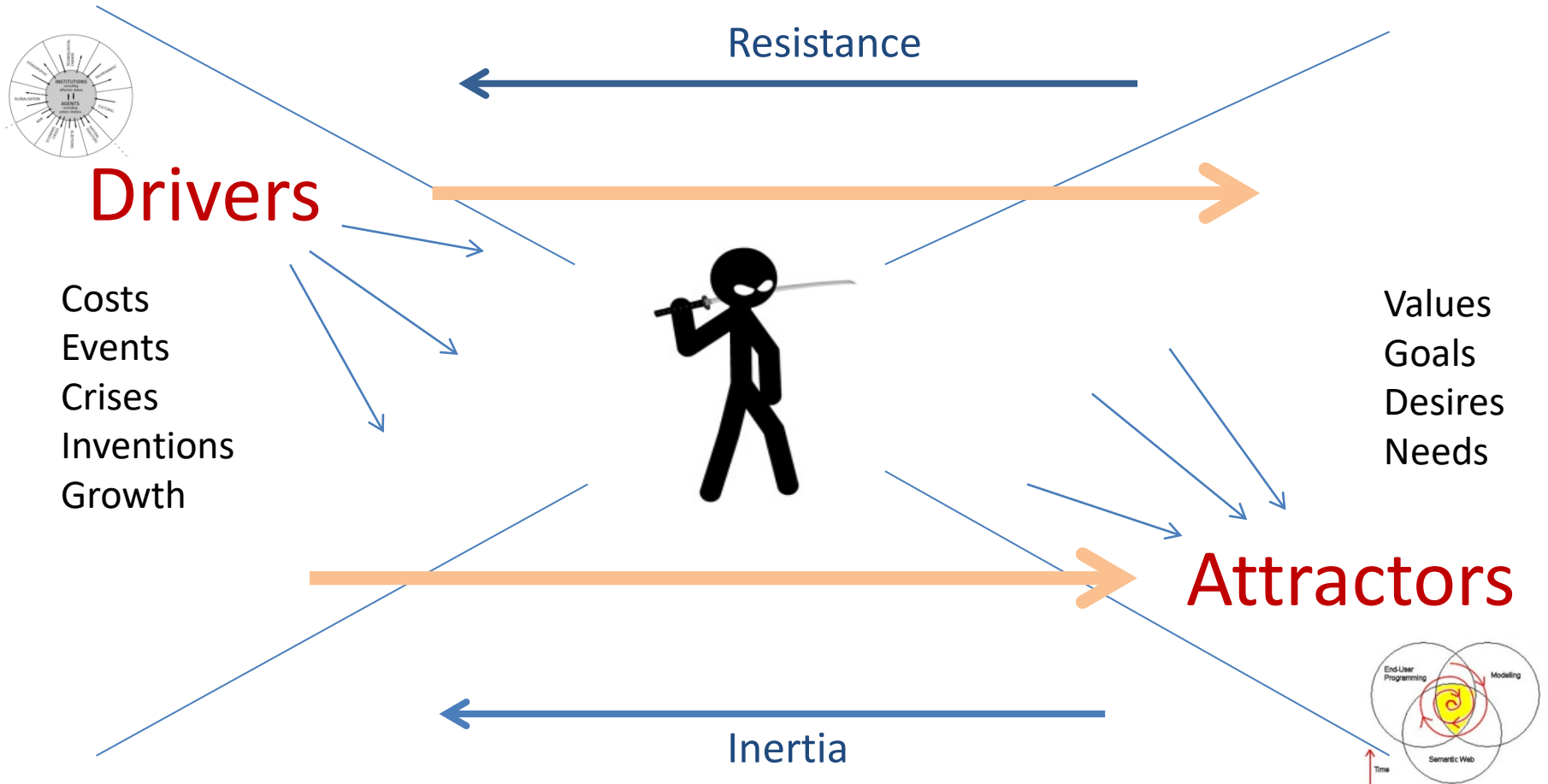


# Patterns of Change



Dialectic Cycles

# Causes of Change



# Change in Education

- Changes in tech that changed learning were the result of *drivers*
  - Writing and publishing – print technology
  - Public education – social forces
  - Networks – electronic technology
- They came from *outside* education
  - They impacted how we manage and deliver education
  - But they also reflected changes in what we *value* in education

# Education Disruption

- Everybody wants to ‘disrupt education’ without having the sense that this means ‘keep it the same, but with more benefits for me’



- John Battelle. 2016. Want a Deep Dive on How Silicon Valley's Best Will Fix Education? Here's The Full Interview With Max Ventilla, CEO and Founder, AltSchool. <https://www.linkedin.com/pulse/want-deep-dive-how-silicon-valleys-best-fix-education-john-battelle>
- Ilan Mochari. 2015. Inc. 16 Startups Poised to Disrupt the Education Market <http://www.inc.com/ilan-mochari/16-startups-that-will-disrupt-the-education-market.html>
- Image: Larry Downes and Paul F. Nunes. 2013. Dig Bang Disruption. Harvard Business Review. c/o Accenture. [https://www.accenture.com/t20150521T020819\\_w\\_us-en\\_acnmedia/Accenture/Conversion-Assets/Blogs/Documents/1/Accenture-Big-Bang-Disruption.pdf](https://www.accenture.com/t20150521T020819_w_us-en_acnmedia/Accenture/Conversion-Assets/Blogs/Documents/1/Accenture-Big-Bang-Disruption.pdf)

# Change or Innovation?

- What do we want to see in education: change, or innovation?
  - That depends very much on whether you're winning or losing



Malealea, Lesotho, 2006

- Rob Abel. 2013. What is Disruptive Innovation in Education? <https://www.imsglobal.org/article/what-disruptive-innovation-education>

# 3. Innovation



# What is Innovation?

- Idea + Execution + Benefit
  - innovation is defined “as change that creates a new dimension of performance” - Peter Drucker  
<http://en.wikipedia.org/wiki/Innovation>
  - “Innovation is then simply new technology, i.e. the systematic application of (new) knowledge to (new) resources to produce (new) goods or (new) services” - Maciej Soltynski at [Innovation.cc](http://Innovation.cc)

# The Idea

- Product innovation – a new type of product or service
- Process innovation – change in the production function, eg. change in input mix
- Organizational innovation – change in managerial procedures
- Market innovation – eg. developing a new market for an existing product
- Input innovation – new raw material, new energy source, etc



# The Value (Sustaining)

- Different ways of talking about direction
  - Better quality of experience
    - - eg. 4K – bigger pictures
    - ‘student success’
  - Lower cost
  - Increased Efficiency and Productivity
    - Typically, ‘standards’
  - Solving problems
    - Access, engagement, completion

# The Value (Disruptive)

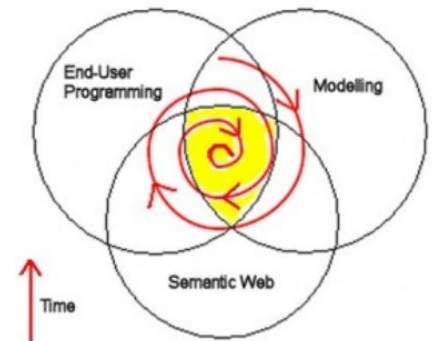
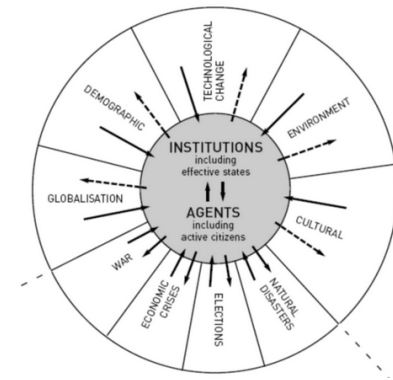
- Incumbents target high end customers
- Disruptors target with product & price advantage:
  - low-end footholds
  - new market footholds
- Not just product innovations;
- Can be business model, etc.



Tbilisi, Georgia, 2014

# Innovation as an Attractor

- We think of change an innovation as working in the same direction, but typically they are working in opposite directions:
- Drivers: out from the centre, toward uncertainty and chaos
- Attractors: toward the centre, toward order
  - And especially preserving what was
  - Sometimes: adaptation to change



# Innovation in Education

- Is education “ripe for disruption”?
- Changes in tech that didn’t change learning
  - TV, Video, overhead projectors
  - Portable classrooms
  - Learning management system
  - Clickers?
  - Second Life

Innovations but not disruptions



Mexico City, Mexico, 2016

- Tony Bates. 2014. A Short History of Educational Technology. <http://www.tonybates.ca/2014/12/10/a-short-history-of-educational-technology/>

# A Candidate for Disruption?

- Online Learning (1995f) & The MOOC (2008f)
  - “Stalled efforts to push MOOCs through the institutional membrane that surrounds higher-education credentialing have cast doubt on whether large-scale free courses will end up disrupting anything.” Steve Kolowich
  - “The reality of online learning... a substantial increase even in years of financial pressures on enrollments.”

# What Counts as Innovation?

- It depends on how the world sees you
  - Is there ‘demand’ for the new thing (eg., a market, buyers, users)
  - Is there a ‘business case’ for it? (Cost/value model)
  - Is there a ‘benefit’ for the customer (greater income, lower cost, amusement)?
- What happens when these change?

# 4. Transformation



# What is Transformation?

- “In an organizational context, a process of profound and radical change that orients an organization in a new direction and takes it to an entirely different level of effectiveness.”
- “Transformation implies a basic change of character and little or no resemblance with the past configuration or structure.”



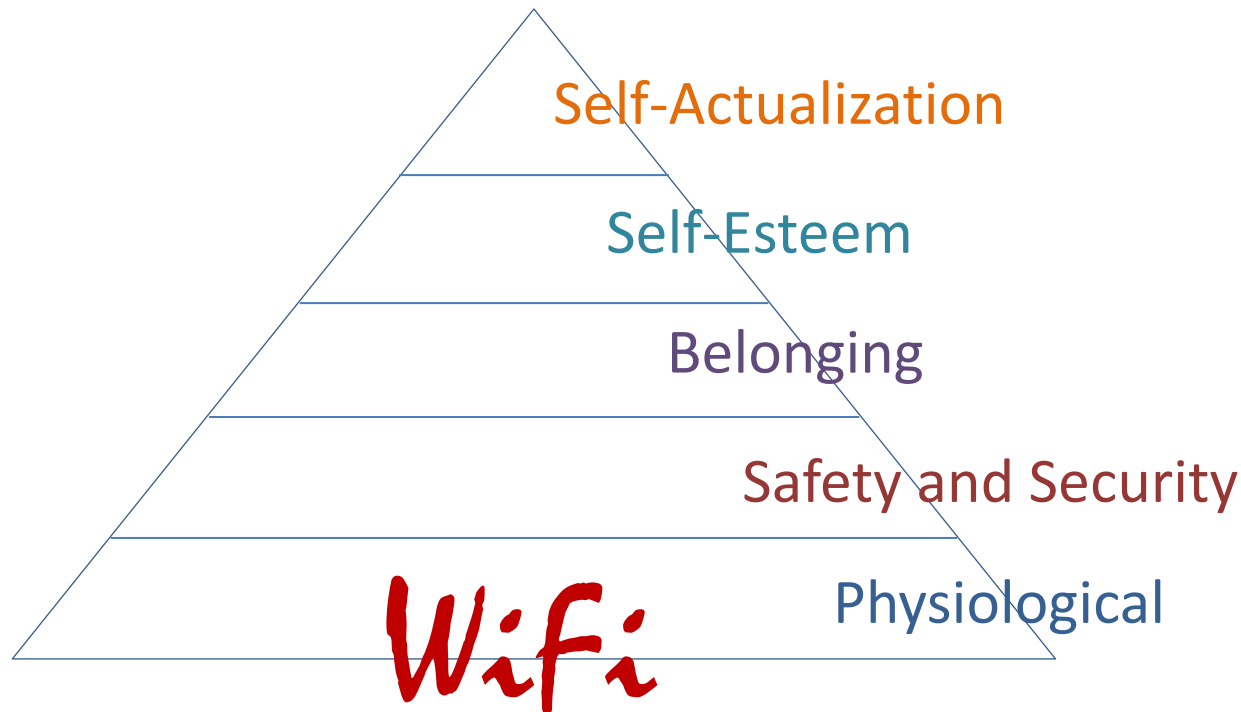
# Microsoft's Vision

- Learning community
- Teacher capacity
- Efficient schools
- Personalization
- Physical learning environments
- Curriculum & assessment
- Is this really transformation?
- Are these things we really want?



# Questions to Ask

- What will new technology enable?
- How will our wants and needs change?



# Transformation of Education

- *Now we're* asking the right kind of question
- Look at how education has been transformed through the years based on changing definitions of need:
  - past needs: storytelling
  - present needs: 'apprenticeship' (aka child labour)
  - future needs: preparing for the factory
  - potential needs: the route to academia

# Who Speaks for Us?

- Who defines innovation?
- Who defines student success?



George Couros. 2016. Who is Defining Student Success? <http://connectedprincipals.com/archives/12581>

Curitiba, Brazil, 2015

# 5. Execution



Panama Canal, Panama, 2012

# Academia is Broken

- Academia has a huge money problem
- Too many studies are poorly designed. Blame bad incentives.
- Replicating results is crucial. But scientists rarely do it.
- Peer review is broken
- Too much science is locked behind paywalls
- Science is poorly communicated to the public
- Life as a young academic is incredibly stressful
  
- <http://www.vox.com/2016/7/14/12016710/science-challenges-research-funding-peer-review-process>

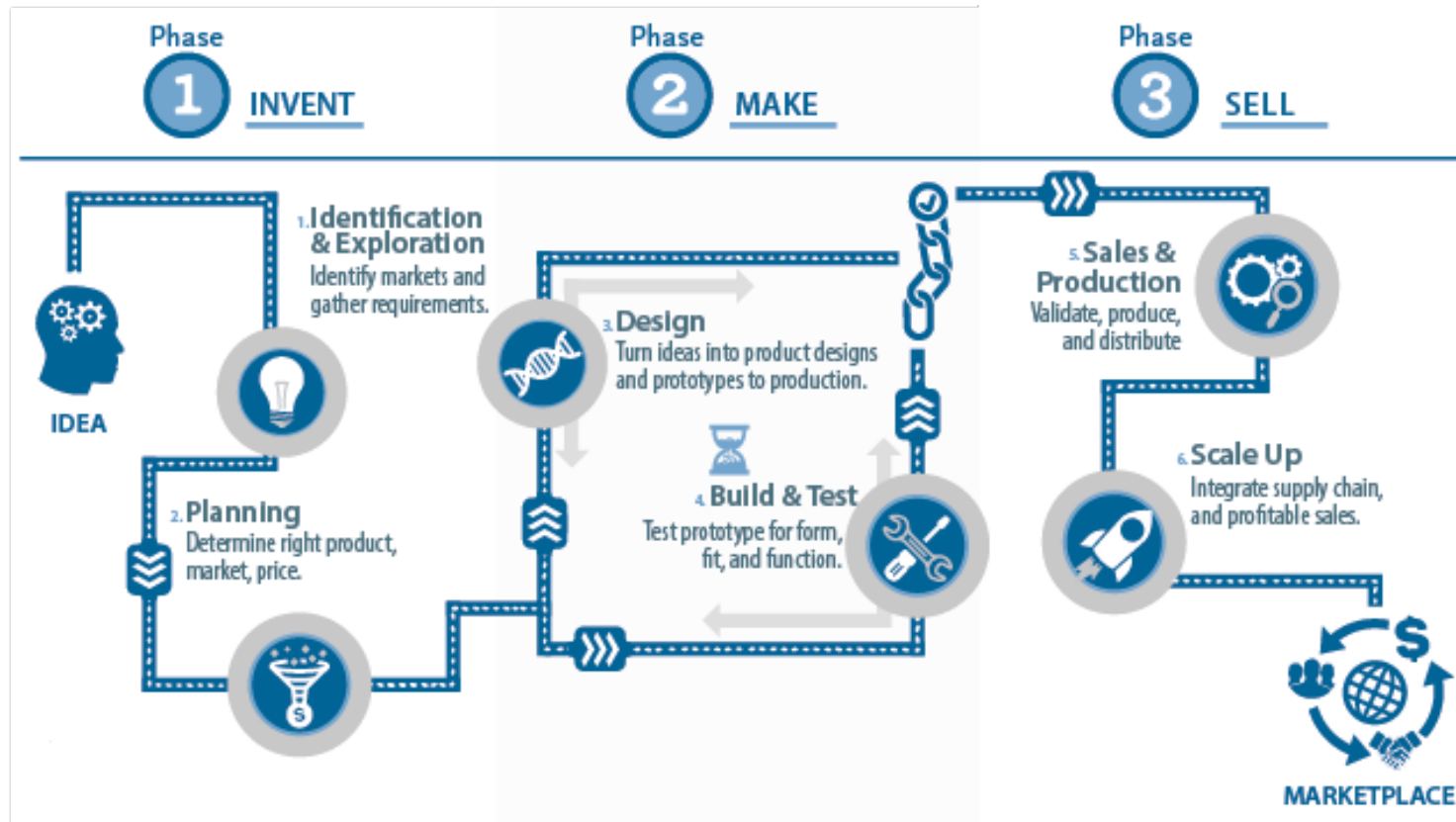
# What are Research & Development?



Riyadh, Saudi Arabia, 2015

Science as a "combination of evaluating evidence, coordinating evidence and models, and arriving at evidence-based judgments that are communicated through argumentation."

# Stages of Innovation

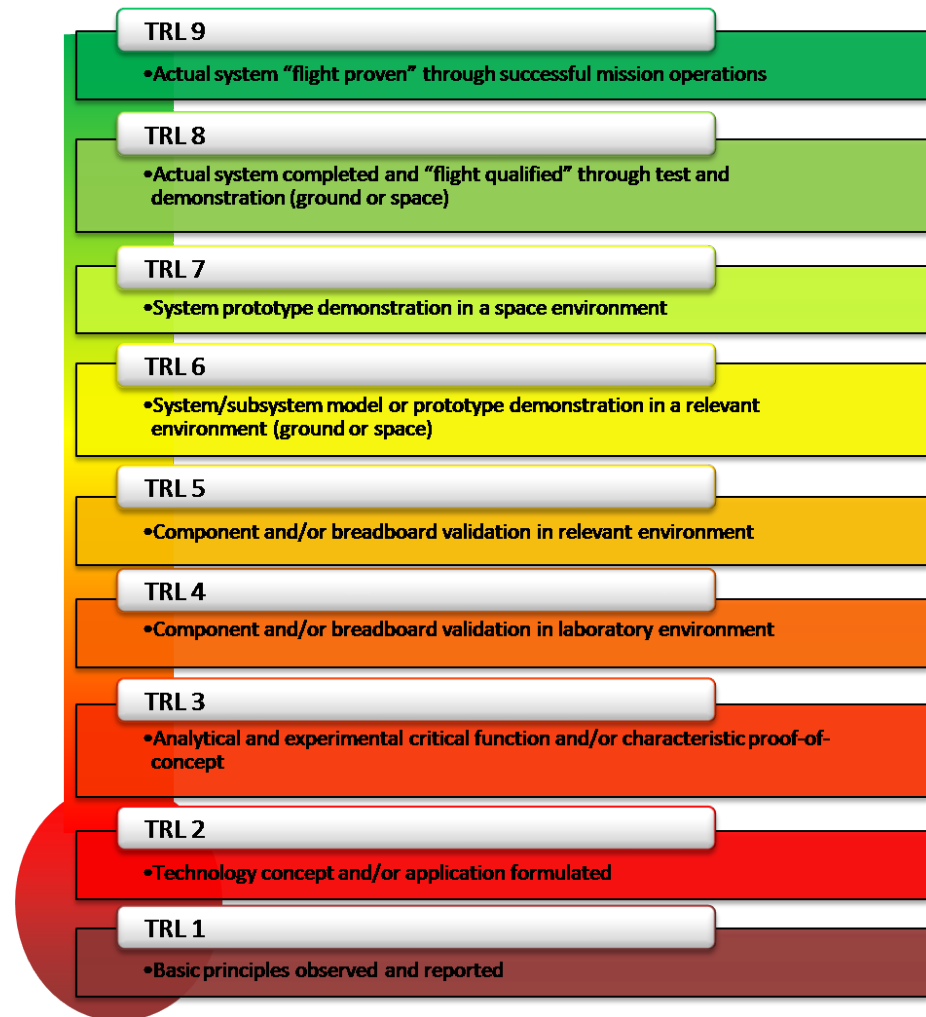


- Does selling really come after making?



# Technology Readiness Levels

- From concept to prototype to qualification to proof...



# New Models of Deployment

## Conventional Wisdom

Focus on one innovation  
(low cost, product, customer)

Target small group first, then mainstream

Low cost feature-poor technologies

Strategic Discipline

New-Product Marketing

Innovation Method

## Big Bang Wisdom

Focus on all three at once

Market to all at once, scale swiftly

Experimentation on popular platforms

- Adapted from Larry Downes and Paul F. Nunes. 2013. Dig Bang Disruption. Harvard Business Review. c/o Accenture.  
[https://www.accenture.com/t20150521T020819\\_w\\_us-en\\_acnmedia/Accenture/Conversion-Assets/Blogs/Documents/1/Accenture-Big-Bang-Disruption.pdf](https://www.accenture.com/t20150521T020819_w_us-en_acnmedia/Accenture/Conversion-Assets/Blogs/Documents/1/Accenture-Big-Bang-Disruption.pdf)

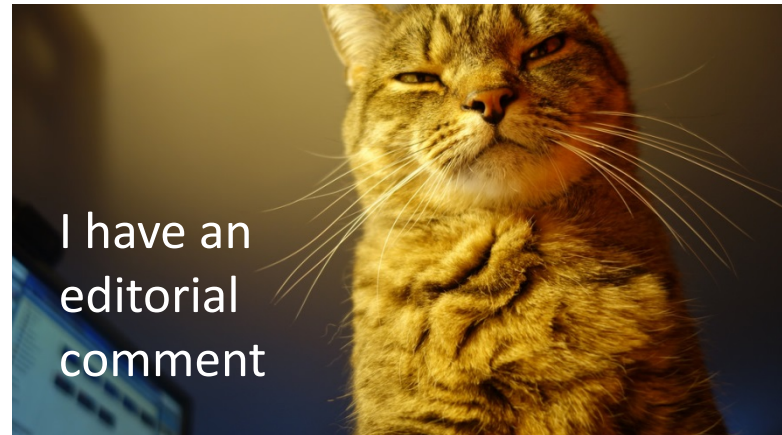
# 6. Strategies



Tallinn, Estonia, 2012

# Find Patterns

- Forms: archetypes? Platonic ideals?
- Rules: grammar = logical syntax
- Operations: procedures, motor skills
- Regularities, substitutions (eggcorns, tropes)
- Feature similarities



# Look for Meaning

- theories of truth / meaning / purpose / goal



- Sense and reference (connotation and denotation)
- Interpretation (Eg. In probability, Carnap; Reichenbach; Ramsey)
- Wagering / strength of belief
- Forms of association: Hebbian, contiguity, back-prop, Boltzmann
- Decisions and decision theory: voting / consensus / emergence

# Observe Practice

- What count as actions? What do they *do*?
  - Speech acts (J.L. Austin, Searle) assertives, directives, commissives, expressives, declarations (but also - harmful acts, harassment, etc)
  - Interrogation (Heidegger) and presupposition
  - Meaning (Wittgenstein - meaning as use)



Los Angeles, California, 2009

# Make Projections

- reasoning, inference and explanation
  - description - X (definite description, allegory, metaphor)
  - definition - X is Y (ostensive, lexical, logical (necess. & suff conds), family resemblance - but also, identity, personal identity, etc)
  - argument - X therefore Y - inductive, deductive, abductive (but also: modal, probability (Bayesian), deontic (obligations), doxastic (belief), etc.)
  - explanation - X because of Y (causal, statistical, chaotic/emergent)

# Consider Context

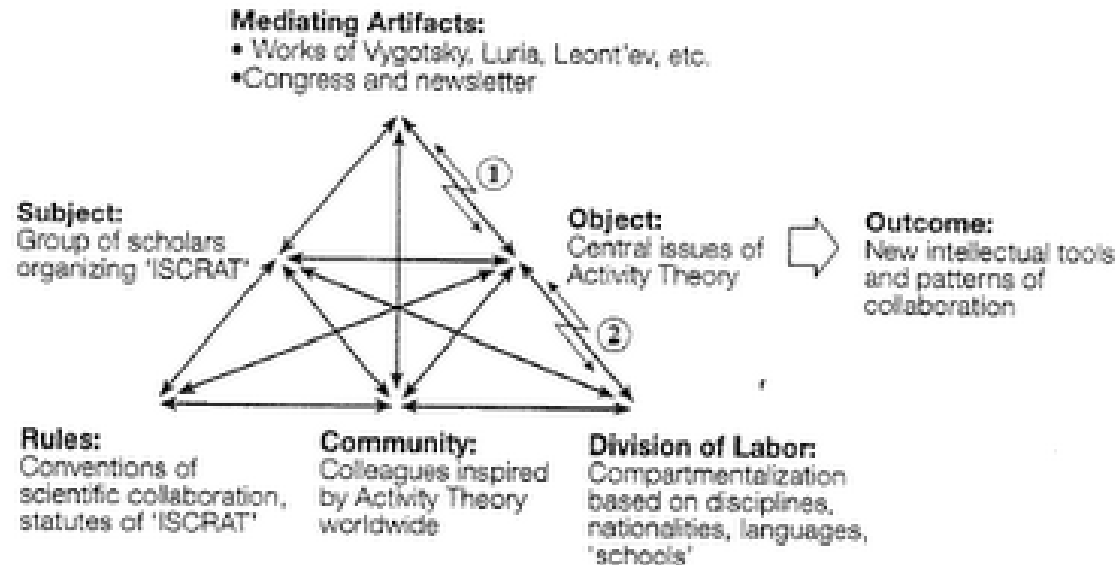
- explanation (why versus why not?)
  - Hanson, van Fraassen, Heidegger)
- meanings (culture, range of possibilities)
  - ('Analytic hypotheses', Quine)
- vocabulary (ontologies, logical space)
  - (Carnap, Derrida);
- Frames and worldviews
  - (Lakoff)

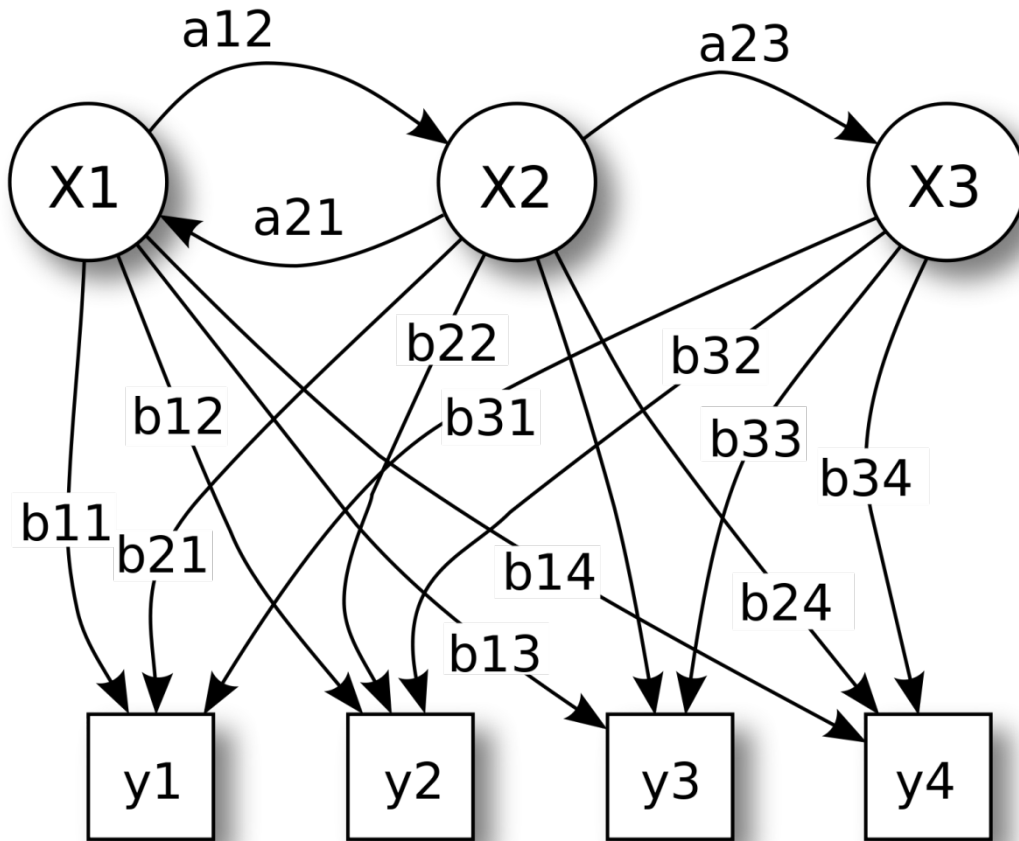




# Manage Change

- relation and connection: I Ching, logical relation
- flow: Hegel - historicity, directionality; McLuhan - 4 things
- progression / logic -- games, for example: quiz&points, branch-and-tree, database
- scheduling - timetabling - events; activity theory / LaaN





Our conception of knowledge itself is insufficient to account for these various dimensions of literacy.

# Knowledge as Recognition

# Stephen Downes



Moncton, Canada, 2005

<http://www.downes.ca>