

Managing the NPD process

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MoT132
Technology, Strategy & Entrepreneurship

Objectives today

1. Understanding the main elements of new product development process
2. Provide insight into how opportunities come about and the factors influencing the development process
3. Be able to clarify difference between ideas and opportunities
4. Recognize how decisions are made w.r.t. uncertainty and result in entrepreneurial opportunities

https://www.youtube.com/watch?v=9_ZLI3ImBAs

Contents

1. Scientific management
2. Strategy & Entrepreneurship
3. New product development
4. Ideas and opportunities
5. Opportunity recognition
6. Effectuation and Causation

Scientific Management



Frederick Winslow Taylor
(1856 – 1915)

Father of *scientific management*

- ▶ Frederick Taylor was obsessed with numbers
- ▶ There is one best way to do a work
- ▶ *You can't manage something that you can't measure*
- ▶ Split a given job in smaller tasks
- ▶ Focus on productivity by carrot and stick methods
- ▶ Compensate workers on the work done
- ▶ Taylorism was born

Scientific Management

Taylorism marked a shift from intellectual thinking on the worker's part to just blind, unquestioning following of a set rule.

Innovation in the shop floor got stifled; but better productivity resulted.

Resulted in

Fordism- mass production

Fast-low cost production.



Scientific Management

Taylorism allowed for fast growth during WW2

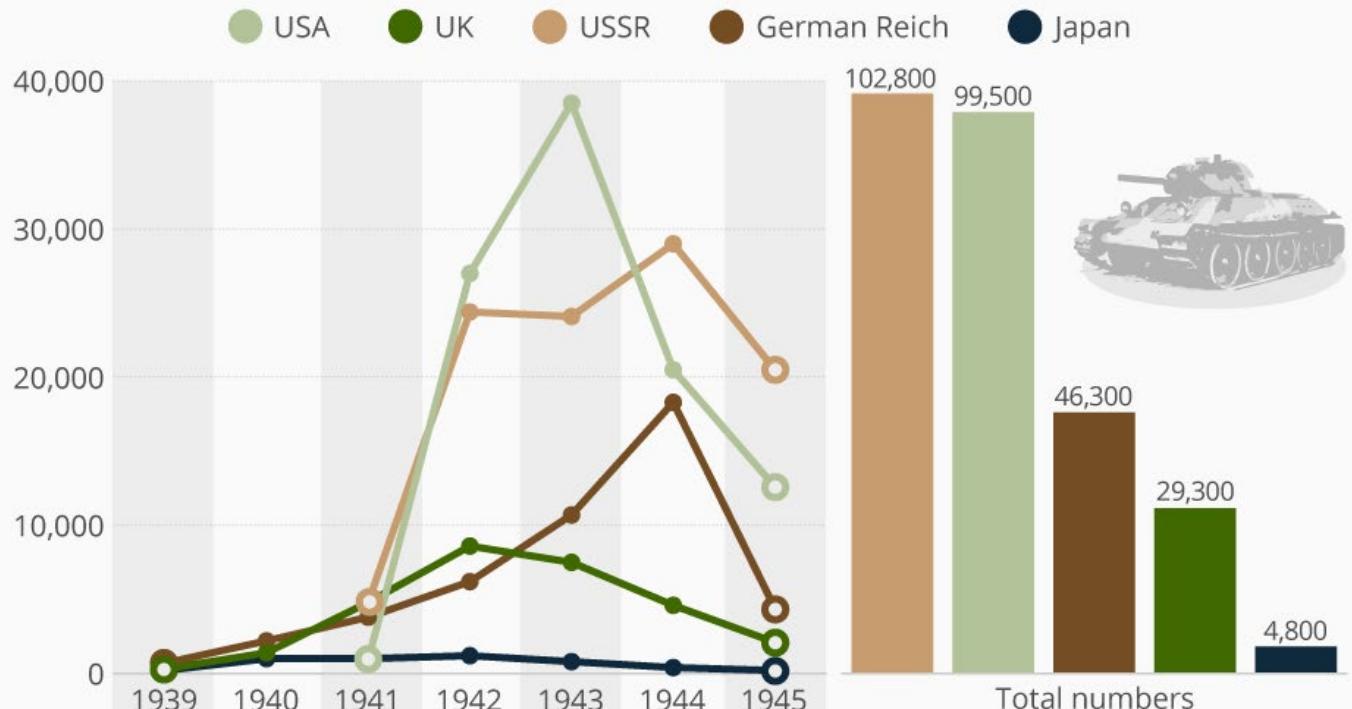
Late 1930s, US was still flying biplanes, and soldiers saying *pang*

Start of WW2, U.S. Army had 189,000 soldiers, ranking 17th, just behind Romania.

But Taylorism helped to produce effectively and outdo enemies in numbers produced

Tanks Produced During World War Two

Number of tanks and self-propelled guns produced from 1939 to 1945

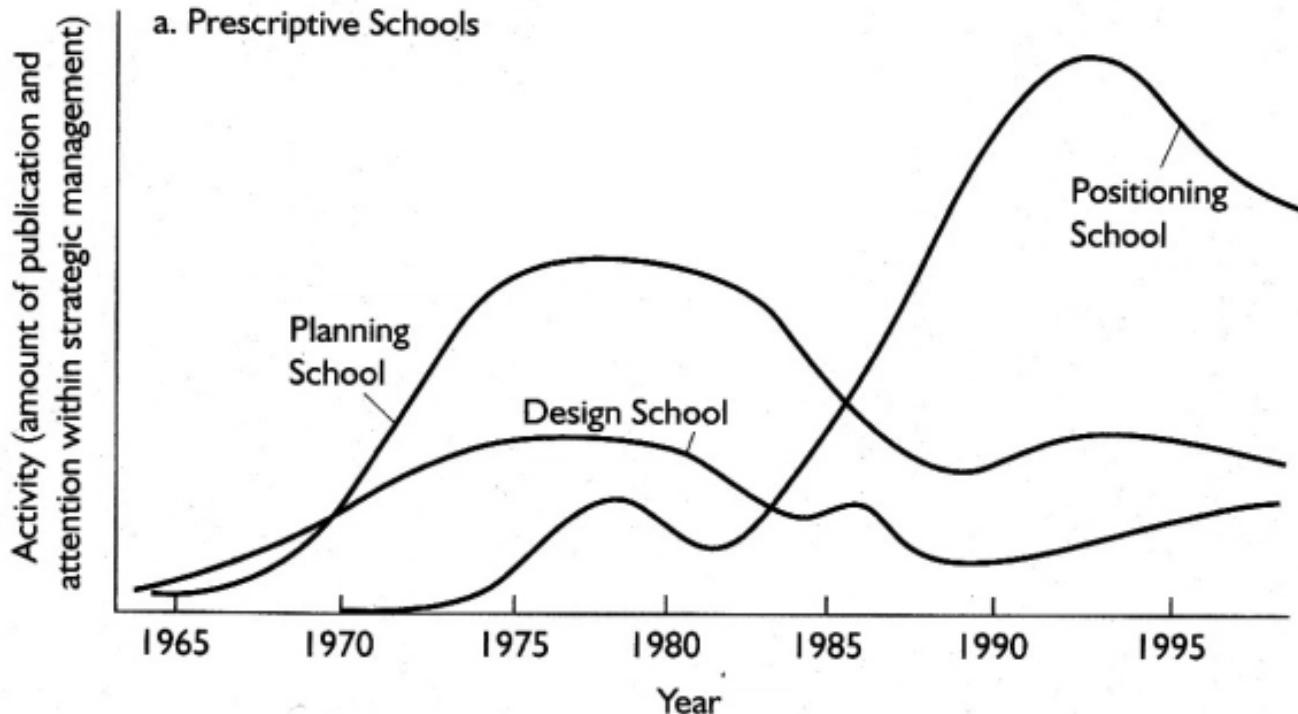


@StatistaCharts

Source: Mark Harrison: "The Economics of World War II"

statista

Scientific Management – post war

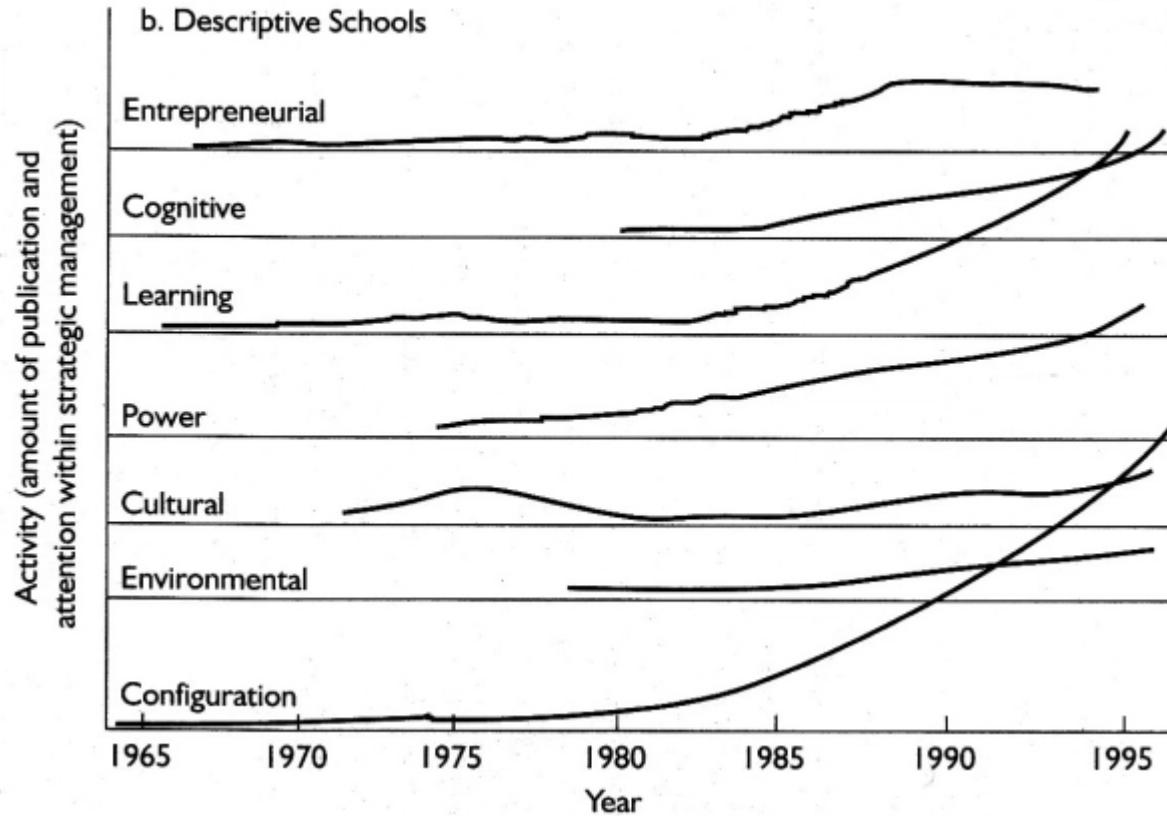


Following Taylorism: Plan and design; design and execute

*Schools of
deliberate
thought*

- Rational
- Predictable
- Data availability
- Strategy follows standard rules and regulation

Scientific Management – post war



*Schools of
emergent
thought*

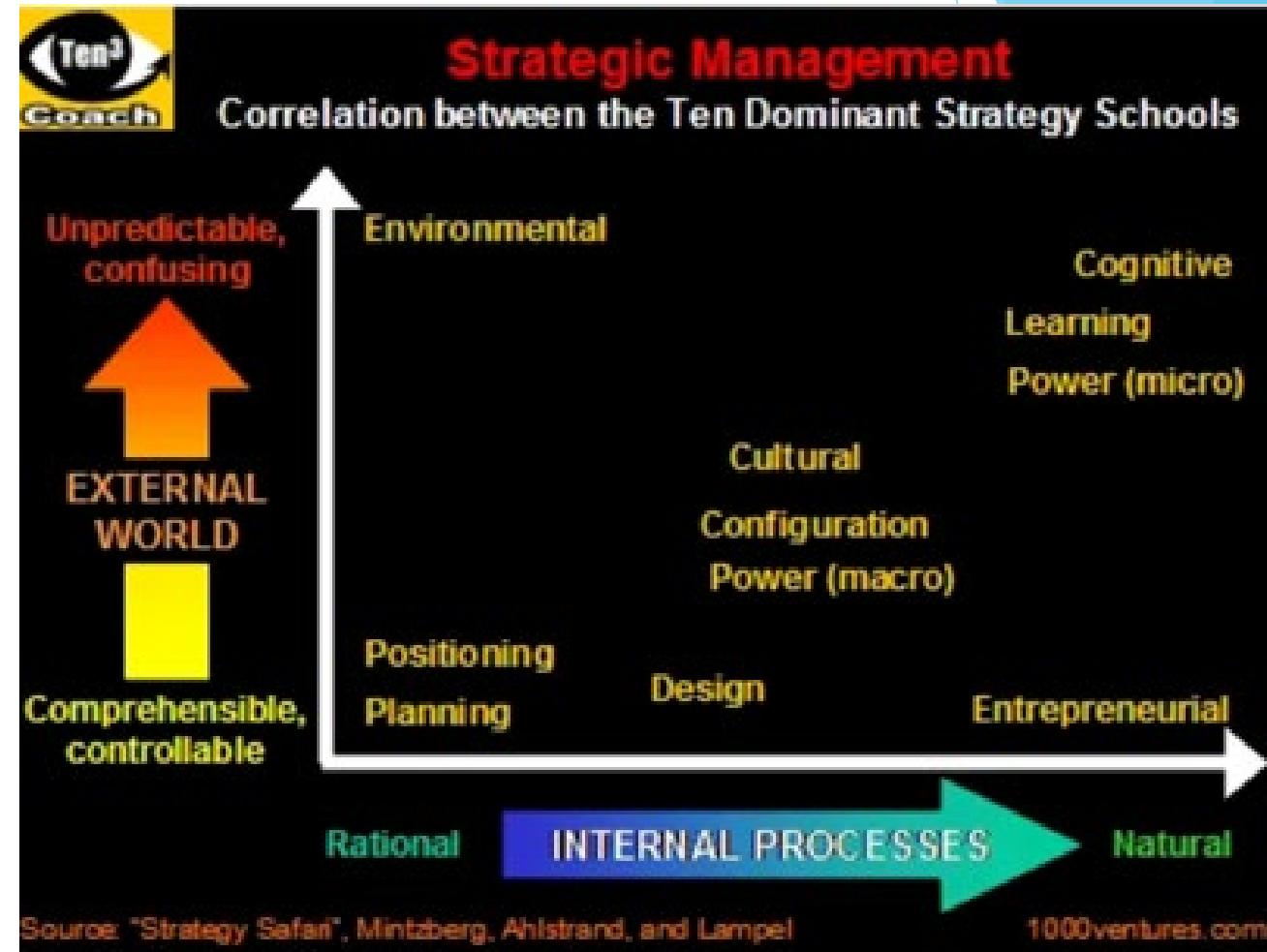
- *Flexible*
- *Change*
- *Opportunities*

Extemporaneous composition; learn, design and build on the fly

Strategy schools of thought

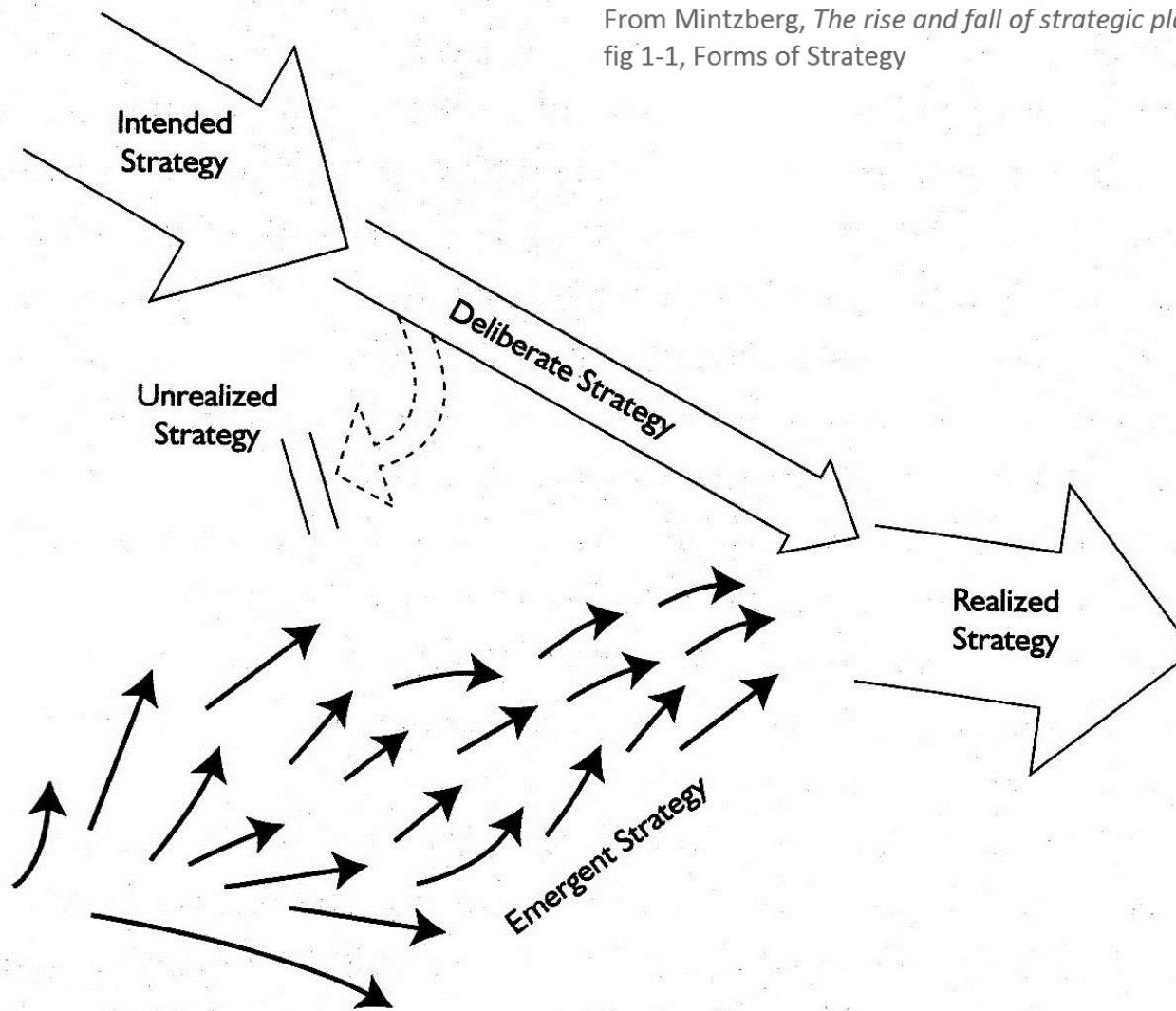
Mintzberg describes different views on how strategic decisions are made.

The Ten Schools of Thought model from Mintzberg is a framework that can be used to categorize the field of Strategic Management



Strategy schools of thought

From Mintzberg, *The rise and fall of strategic planning*,
fig 1-1, Forms of Strategy



Strategy

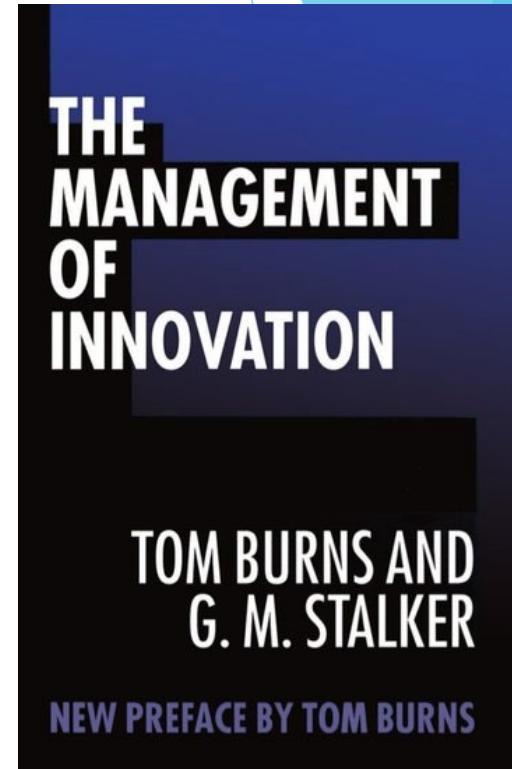
Burns and Stalker

Studied the relationship between environmental conditions, management practices and organizational design

Study in Scottish electronic firms in the 1950s

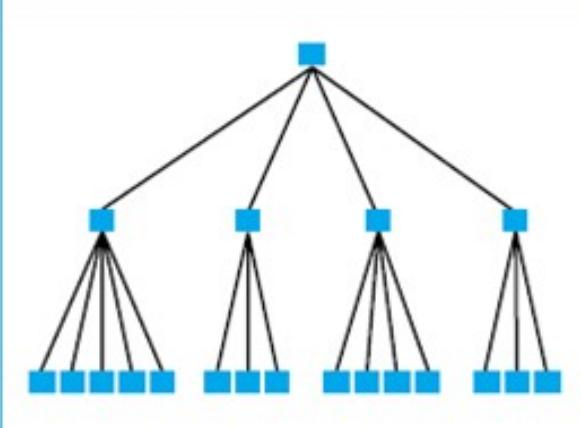
They found that some firms can adapt more easily to changing environmental conditions

How come?



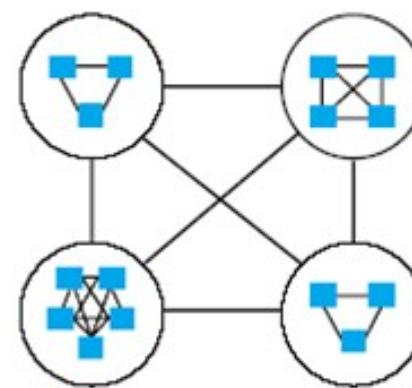
Strategy

Mechanistic structure



- High horizontal differentiation
- Rigid hierarchical relationships
- Fixed duties
- High formalization
- Formalized communication channels
- Centralized decision authority

Organic structure



- Low horizontal differentiation
- Collaboration (both vertical and horizontal)
- Adaptable duties
- Low formalization
- Informal communication
- Decentralized decision authority

THE
MANAGEMENT
OF
INNOVATION

TOM BURNS AND
G. M. STALKER

NEW PREFACE BY TOM BURNS

Strategy

Burns and Stalker (1961)

FEATURE	MECHANISTIC	ORGANIC
Task definition	Rigid & highly specialized	Flexible; less specialized
Coordination & control	Rules & directives imposed from the top	Mutual adjustment. Cultural control
Communication	Mainly vertical	Horizontal & vertical
Commitment & loyalty	To immediate superior	To the organization & its goals & values
Environmental context	Stable with low technological uncertainty	Dynamic, ambiguous, high technological uncertainty

Heart of Entrepreneurship

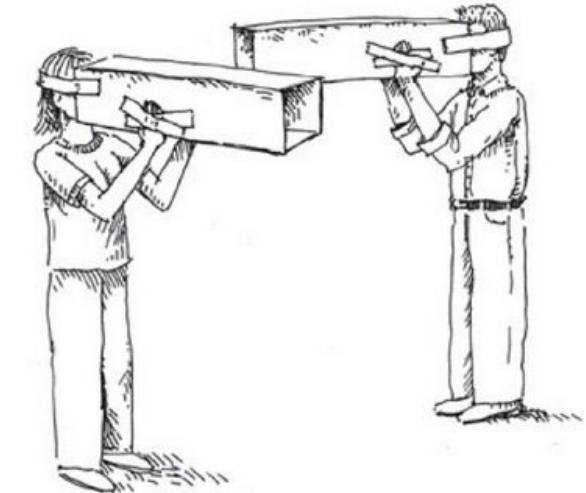
Strategy paradigm

Strategy is mainly concerned with effective implementation

Analyse - Design - Execute

Firm can exist because they are heterogeneous, they are different because they have different resources: differentials among firms

- ▶ Focus is then on the resources of the firm that distinguishes the firm from others: Resources should comply to 'VRIN' conditions
- ▶ VRIN: Resources that are Valuable, Rare, In-imitable and Non-substitutable (difficult to imitate or patent them to do so)
- ▶ The existence of the firm is a result of exploiting the differentials
- ▶ **Deliberate strategy:** positioning-, design and planning school of strategy (see Mintzberg)



Heart of Entrepreneurship

Entrepreneurship paradigm

Entrepreneurship is mainly concerned with opportunities and locus of individual action

Firms can exist because people have a different perception of the environment, some spot opportunities sooner and exploit them before others do:
entrepreneurial behavior

- ▶ External environments, and being alert and receptive to changes may bring about more newness and uniqueness of a business idea
- ▶ Entrepreneurial actions such as discovery and exploitation, and entrepreneurial opportunities that exist/ occur in the environment
- ▶ The attitude towards change is important: **Emergent strategy: Learning-**, entrepreneurial school of strategy (see Mintzberg)



Heart of Entrepreneurship

Stevensson and Gumpert (1985)

Asked themselves, how do people respond to change?

- ▶ Defensive and try to keep things as they are: keep the Status Quo
- ▶ Proactive and embrace change or even invoke change

Defensive/ reactive

1. What resources do I control
2. What structure determines our organisations relationship with the market
3. How can I minimize the impact of others
4. On my ability to perform?
5. What opportunity is appropriate

Offensive/ proactive

1. Where is the opportunity
2. How do I capitalize on it
3. What resources do I need
4. How do I gain control over them
5. What structure is best

*Entrepreneurship: the pursuit of opportunity
regardless of resources controlled*

Heart of Entrepreneurship

Stevenson and Gumpert (1985)

Example how difficult Entrepreneurship is: the pursuit of opportunity regardless of resources controlled

60 million engines! That enormous number of engines is what the employees at the Volkswagen plant in Salzgitter have produced since 1970. The anniversary engine – a 1.5 TSI engine (EA 211EVO) – will start rolling off the production line in early February.

In addition to this large figure, there is a somewhat smaller but currently just as significant one: 7,000. Right now the Salzgitter workforce produces 7,000 various types of engines daily: diesel, gasoline, three-, four-, and six-cylinder engines, and even a 16-cylinder one for Bugatti. In addition, there are also numerous engine components. This all takes place on 86 assembly lines. The level of productivity in Salzgitter has never been higher – 50 years after the plant was first built.



The latest generation of the EA211 TSI evo is being built on this line for gasoline engines. Thanks to innovations like the new Miller combustion process, this 1.5-liter TSI is both fuel-efficient and powerful



Heart of Entrepreneurship

- ▶ Strategic focus
 - ▶ Administrator
 - ▶ Top-down
 - ▶ Learn and apply
 - ▶ Transaction
 - ▶ Resource view
 - ▶ Stability, continuity
- ▶ Entrepreneur focus
 - ▶ Promotor
 - ▶ Bottom up
 - ▶ Learn and unlearn
 - ▶ Transformation
 - ▶ Knowledge view
 - ▶ Change, adapt

GOAL SETTING

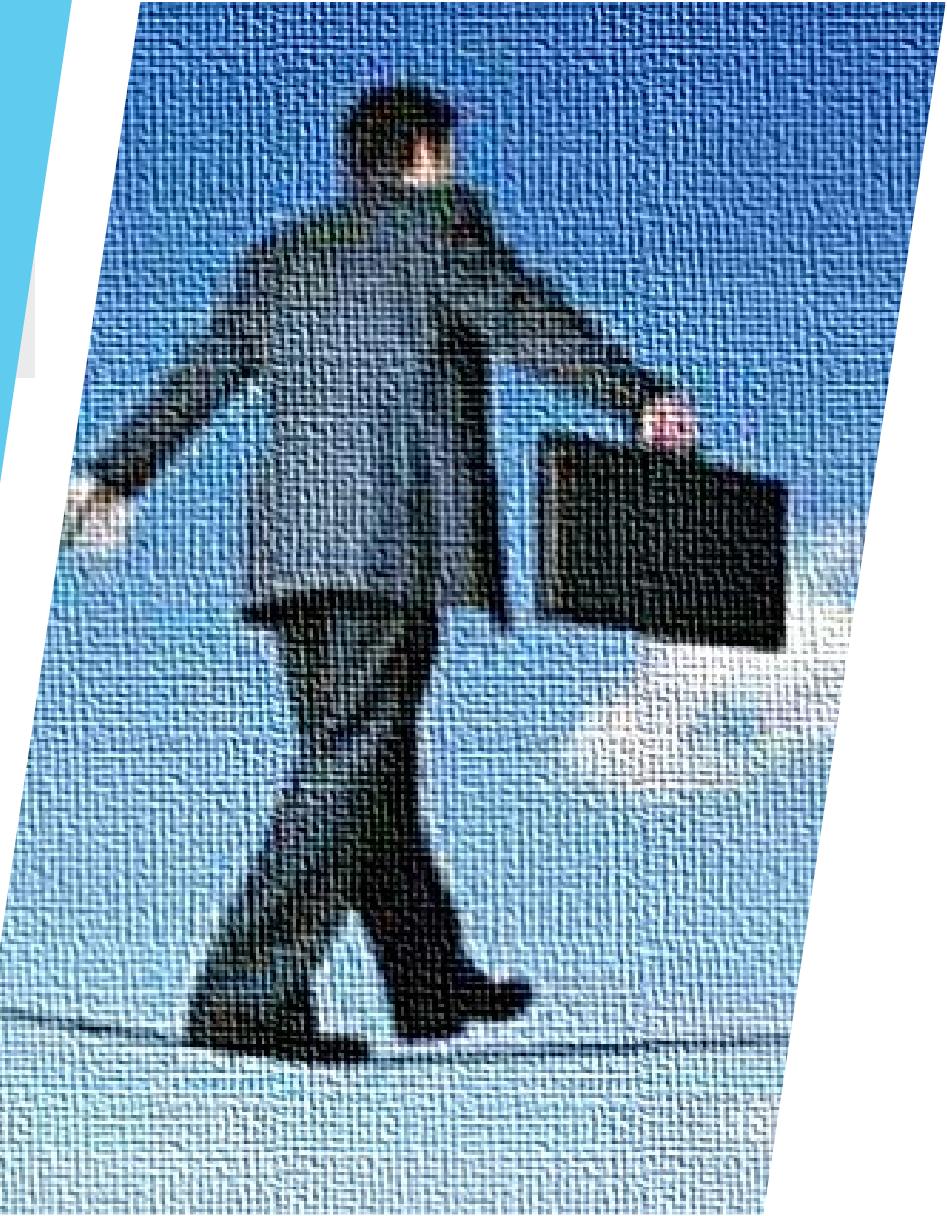
S	Specific
M	Measurable
A	Achievable
R	Realistic
T	Timely



Heart of Entrepreneurship

- ▶ Entrepreneurial Management (*Stevenson and Jarillo, 1990*).
 - ▶ Forced choice types, statements at each end, 10 point scale

Promotor	Administrator
Strategic orientation	Driven by perception of opportunity ← → driven by controlled resources
Episodic use or rent of required resources	Many stages with minimal exposure at each stage ← → Ownership or employment of required resources
Management structure	Flat, with multiple informal networks ← → Hierarchy, authority and routinized for productivity
Reward philosophy	Based on value creation ← → Based on responsibility and seniority
Growth orientation	Rapid growth is top priority; risk accepted to achieve growth ← → Safe, slow and steady
Entrepreneurial culture	Promoting broad search for opportunities ← → Opportunity search restricted by resources controlled, failure punished



Heart of Entrepreneurship

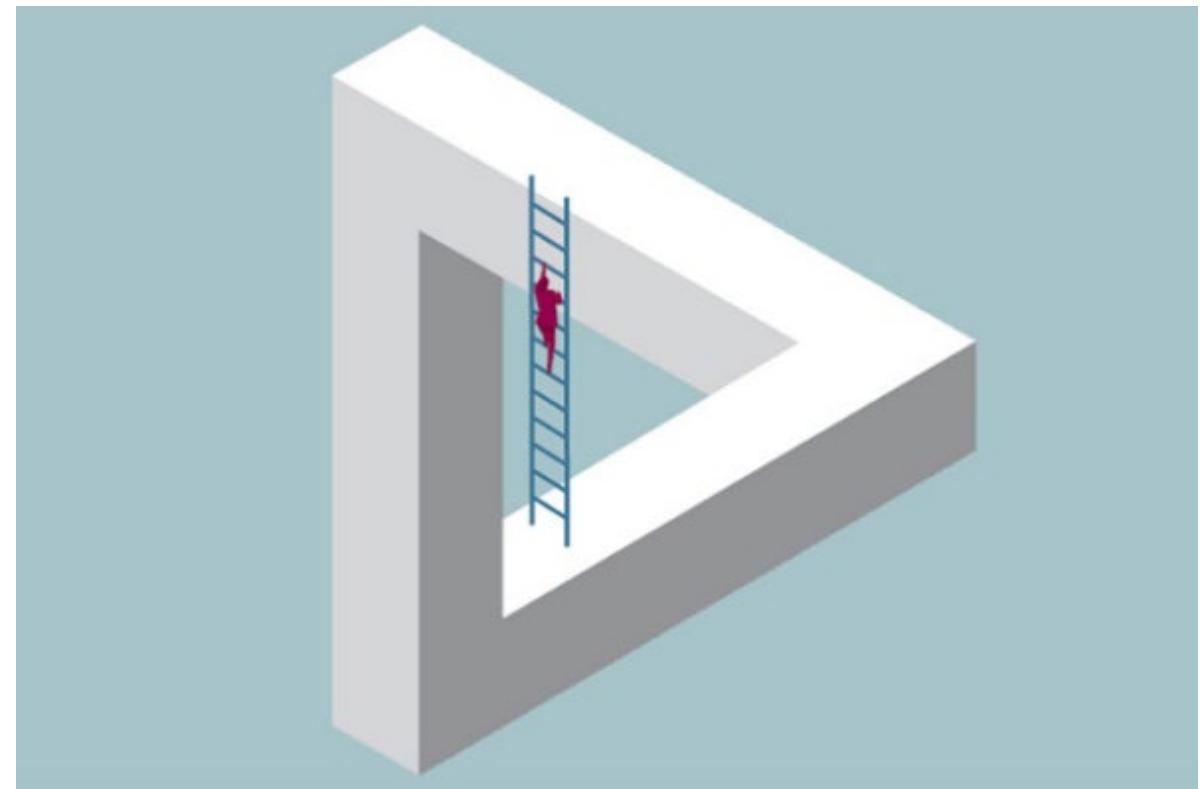
Entrepreneur versus manager attitude

competitive landscape requires both effective entrepreneurial and strategic actions (*Ireland et al., 2001; Kuratko et al., 2001*)

- *Advantage seeking behavior (strategy)*
- *Opportunity seeking behavior (entrepreneurship)*

Planning for Business: Idea description

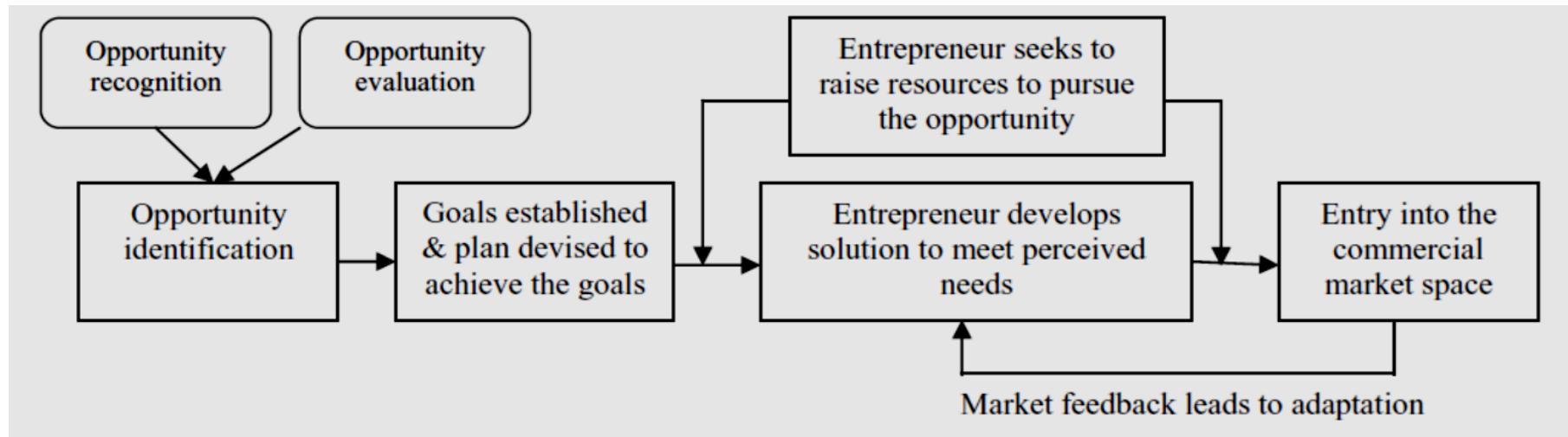
Entrepreneurship is a paradox



Planning for Business: Idea description

Creation of new ventures is a causal–planned, goal oriented, return maximizing–approach to venture development. (Fisher, 2012: opportunity discovery)

Schematic approach to develop a business plan



Planning for Business: Idea description

Rationale for a business plan

- ▶ Goal setting theory (Locke and Latham, 1990)
- ▶ Benefits:
 - ▶ - Planning improves subsequent human action
 - ▶ - Integration and alignment of goals
 - ▶ - Instrumental and forces to rethink issues
 - ▶ - Provides insight in necessary skills, resources
 - ▶ - Framework for actions, schedule and milestones

Planning for business

Business planning makes the

- ▶ product development cycles faster,
- ▶ firm failure rates lower,
- ▶ financial returns greater,
- ▶ innovation levels higher.

In education, business plan courses are common (Honig 2004) and business planning is rated as the most important feature of entrepreneurship courses by leading entrepreneurship professors.

Planning for business

Paradox:

- ▶ Entrepreneurship requires considerable thought, preparation and planning, yet it is a basically unplannable event
- ▶ For creativity and innovativeness to prosper, rigor and discipline must accompany the process.
- ▶ Entrepreneurship requires a bias toward action and a sense of urgency, but also demands patience and perseverance.

“In preparing for battle, I have found that planning is essential, but plans are useless.”

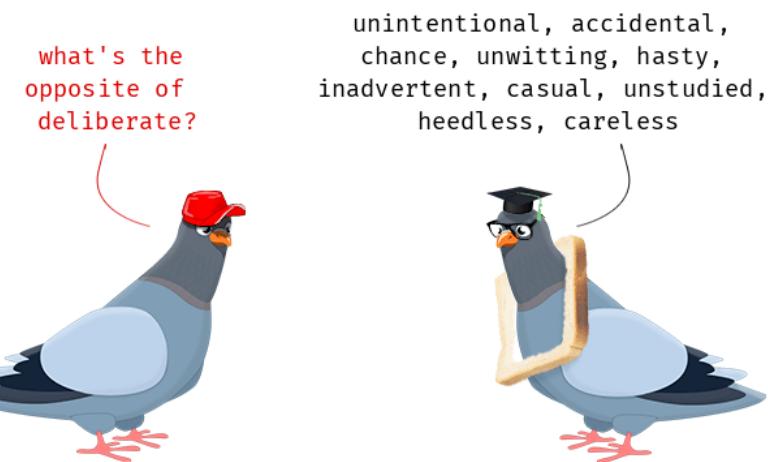
Dwight D. Eisenhower

Planning for business



Planning for a business: causation or improvising?

- ▶ Business planning (deliberate)
 - ▶ Design-then-execution or design-precedes-execution framework
 - ▶ Assumes a linear process
 - ▶ Entrepreneurial activity leads to gestation
- ▶ Improvisation (emergent)
 - ▶ Founders plunge in the start-up and design the firm as they create it
 - ▶ Does not assume linear, rationale or anticipatory action

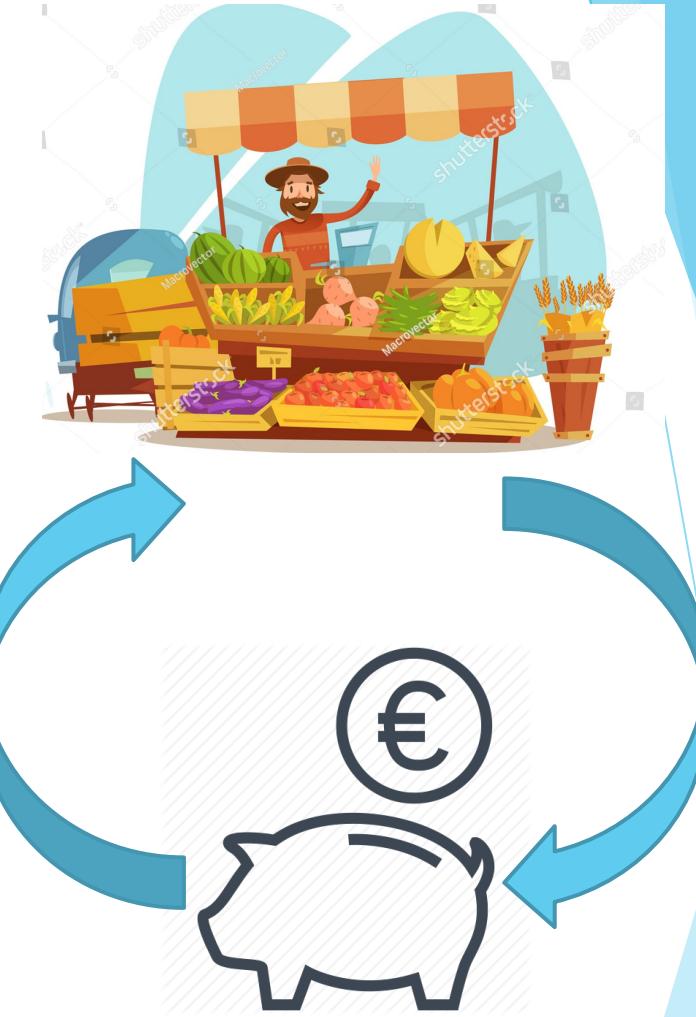


Baker, T., Miner, A.S. and Eesley, D.T. (2003). *Improvising firms: bricolage, account giving and improvisational competencies in the founding process*. *Research Policy*, 32(2): 255-276

Planning for a business: Bootstrapping

Improvisation and bootstrapping

- ▶ Based on your own financial resources or assets
 - ▶ Reinvestment of own revenues
- ▶ Making do and bricolage
 - ▶ Realistic goals
 - ▶ Smart financing
 - ▶ Free publicity
 - ▶ Lean organizing, outsourcing
- ▶ Minimize and control instead of maximise and own
(remember heart of entrepreneurship)



Planning for a business: Causation or effectuation

Saravathy (2001): causation versus effectuation

- ▶ **Causation** when effects are given and focus is on selection of a possible set of resources
- ▶ **Effectuation** is when possible effects can be created given a certain set of resources
- ▶ Entrepreneurs aren't different from anyone else: they simply adopt a different approach to problem solving (Sarasvathy, 2001)
- ▶ Effectuation: heuristics for making decisions under uncertainty

Planning for a business: Causation or effectuation

Causation: Effect is given

- ▶ Rationale analyses
- ▶ Static and linear development
- ▶ Multiple options but predictable
- ▶ Focus on predicting future rather than controlling it
- ▶ Risk is focussed on expected returns
- ▶ Existing markets

Planning for a business: Causation or effectuation

Effectuation: Only some resources and tools are given

- ▶ Outcome is dependent on entrepreneur's traits
- ▶ Dynamic and non-linear developments
- ▶ Focus on controlling future rather than predicting it
- ▶ Focus is on affordable losses
- ▶ Emergent markets



Planning for a business: Causation or effectuation

Effectual decision making logics

Bird in hand (start with what you have)

Lemonade (leverage surprises)

Affordable Loss (focus on the downside)

Crazy-quilt (co-creation)

Pilot in the Plane (embrace uncertainty)

Effectual decision making logics

Means

BIRD-IN HAND



Bird in hand (start with what you have)

- Who I am—my traits, tastes, and abilities
- What I know—my education, training, expertise, and experience
- Who I know—my social and professional networks.

Effectual decision making logics

Leverage
Contingencies

LEMONADE

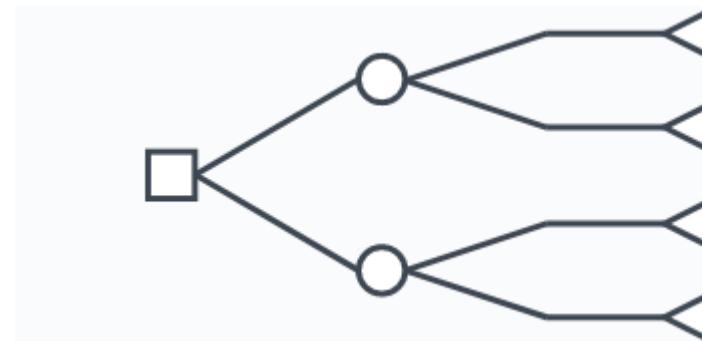


The ability to turn the unexpected into the profitable.

Prepare for best - worst cases, be flexible

Affordable Loss

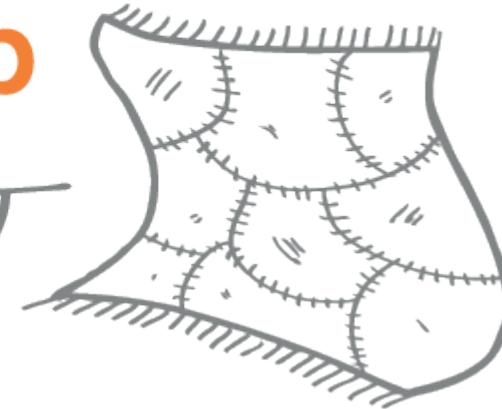
*Focus on
Downside*



Effectual decision making logics

Co-Creation Partnership

CRAZY QUILT



Effectual decision making logics

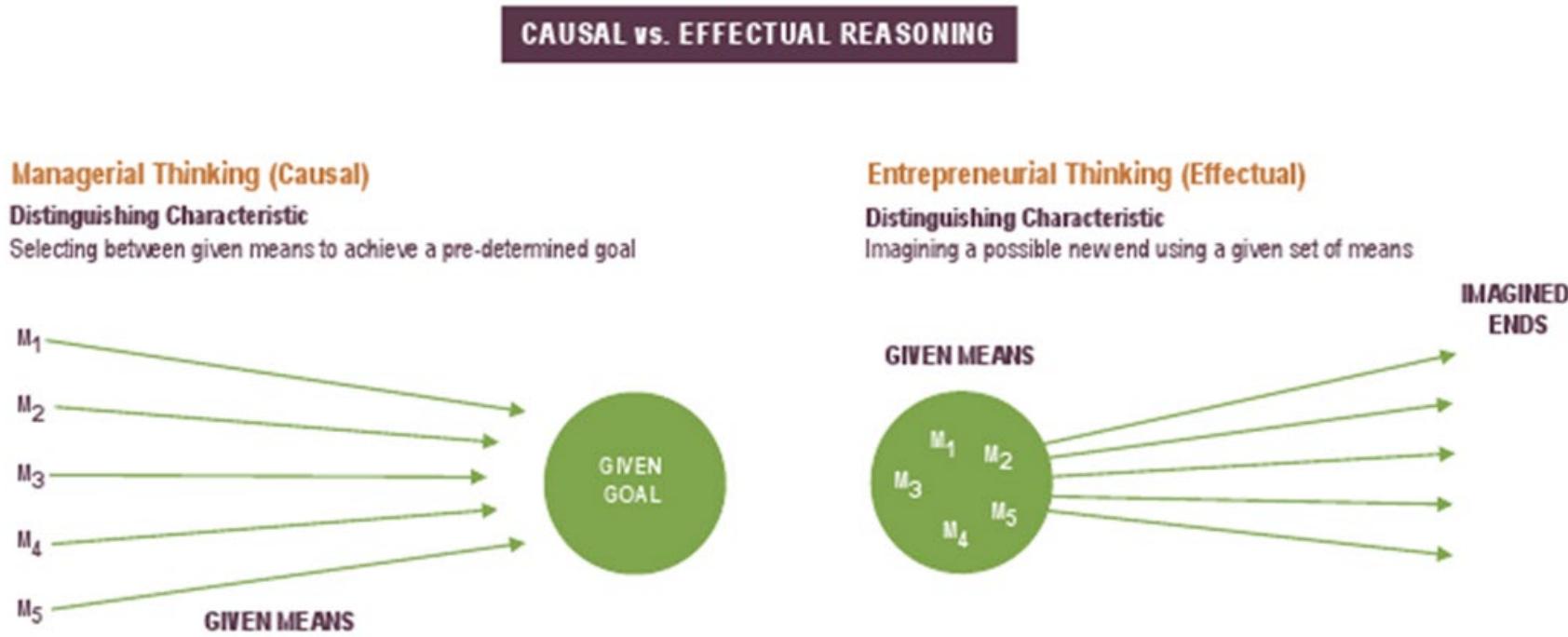
Worldview:

CONTROL vs. PREDICTION



Pilot in a plane, stay in control of the process

Planning for a business: Causation or effectuation



Planning for a business: Causation of effectuation

What heuristics do effectual entrepreneurs use?

	Causal (manager/ administrator)	Effectual (entrepreneur/ promotor)
View on future?	Predictable	Unknowable
Basis for action?	Given goals Available means	Bird in Hand (who I am, what I know, whom I know)
View on risk?	Expected Return	Affordable loss
View on others?	Competitive	Co-creative
View on unexpected?	Avoid/minimize surprise	Leverage surprise

Traditional Product Development

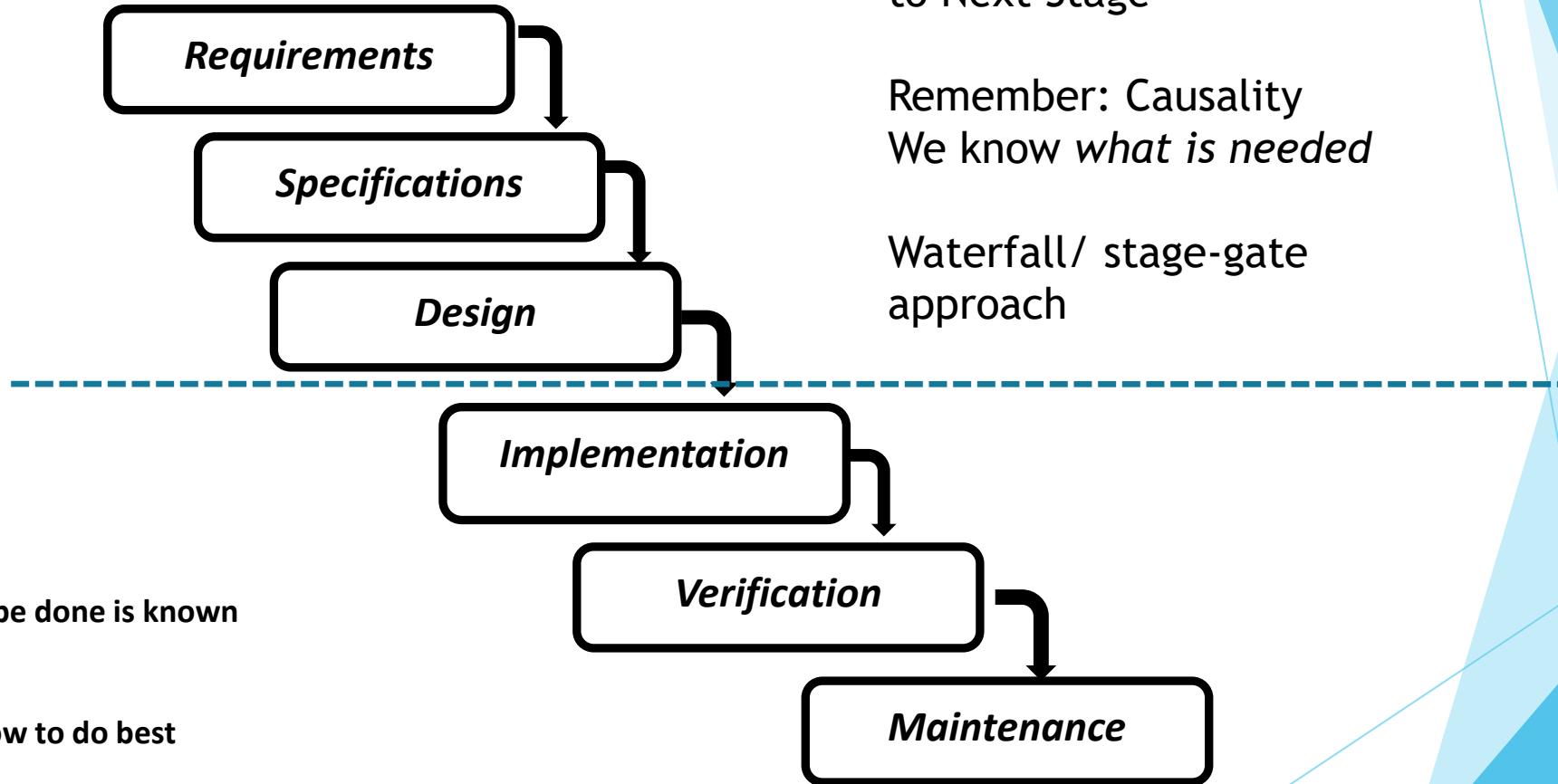
Problem Space

Problem is known

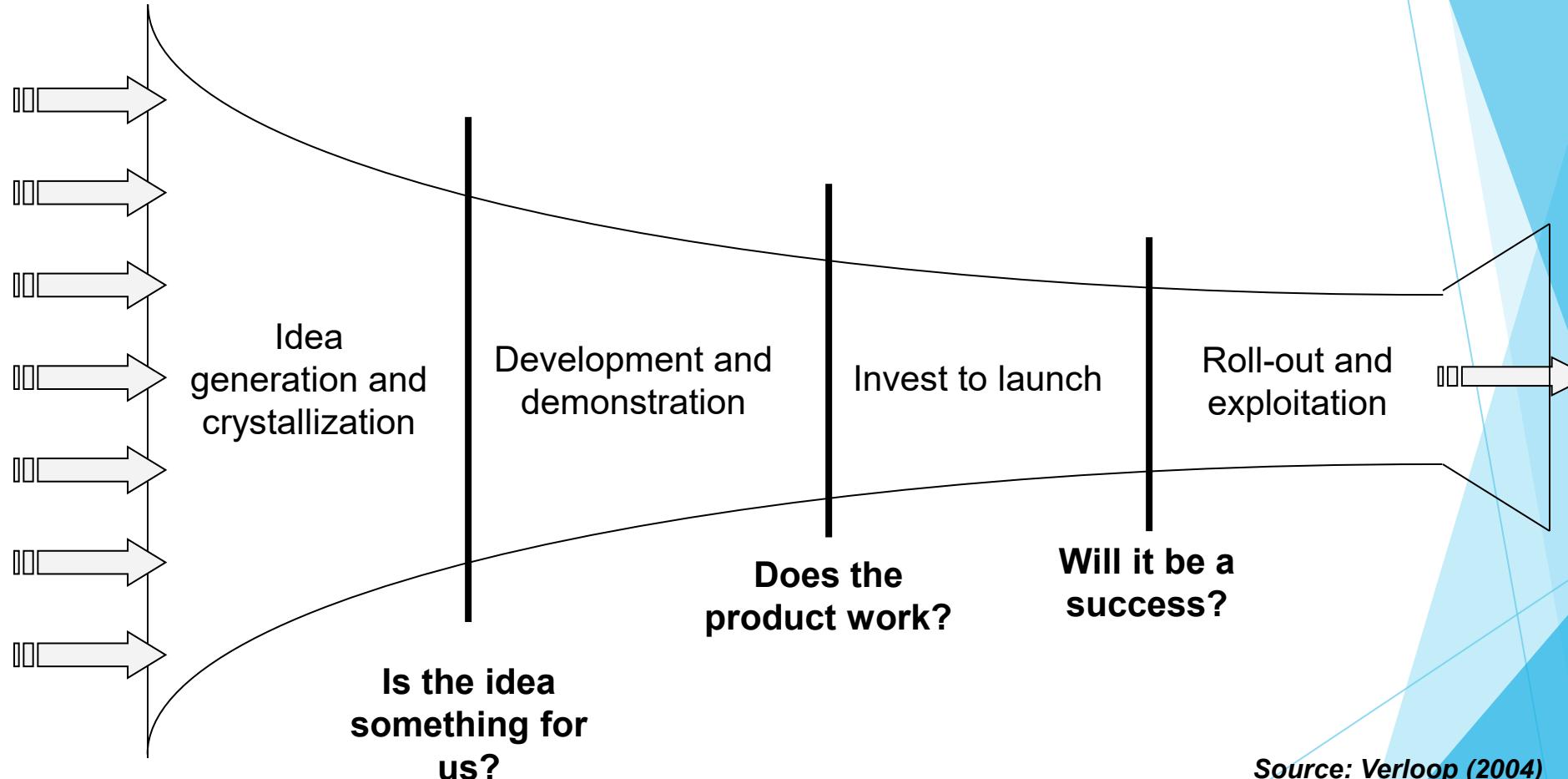
Solution Space

What needs to be done is known

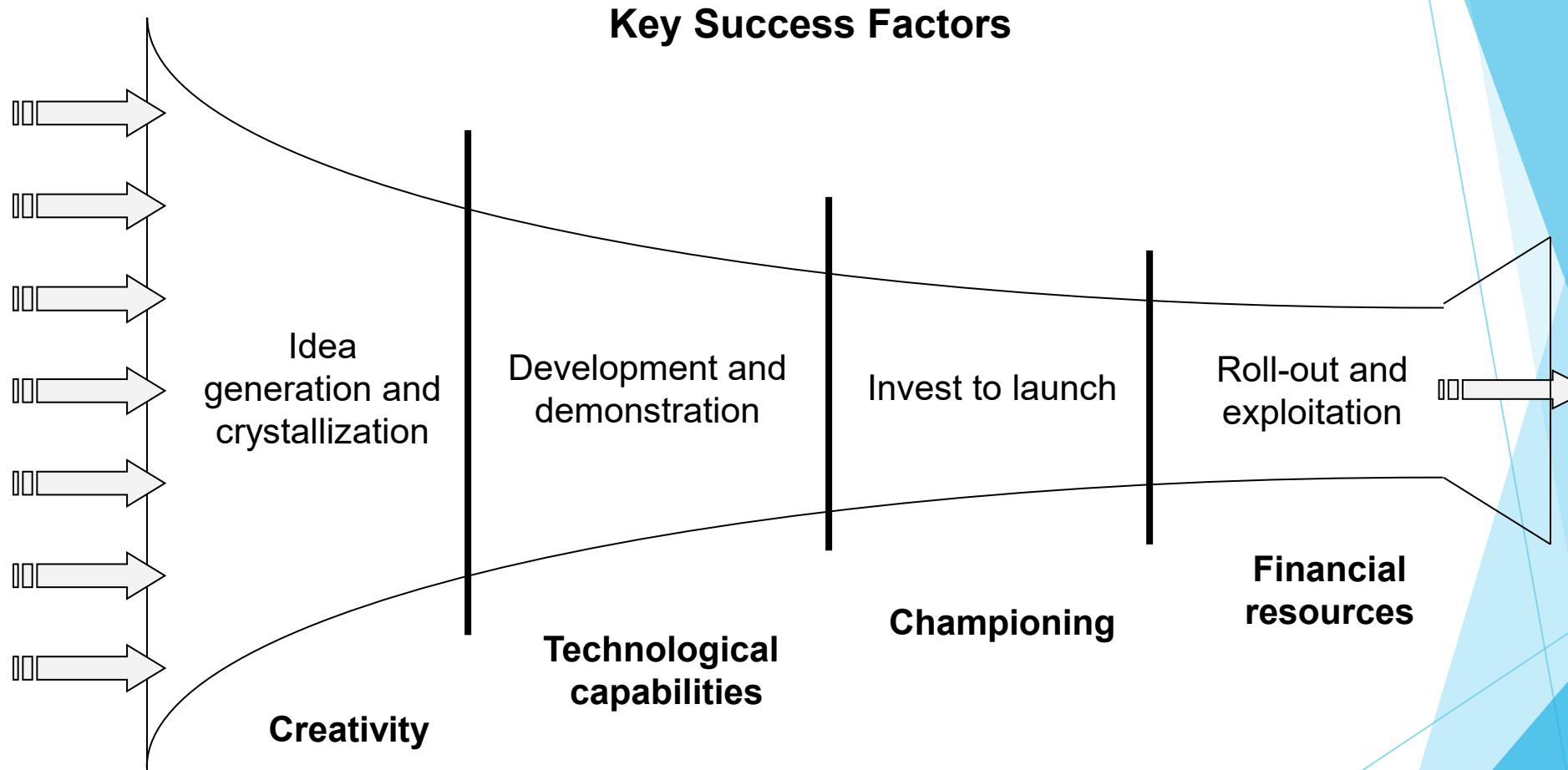
The search is how to do best



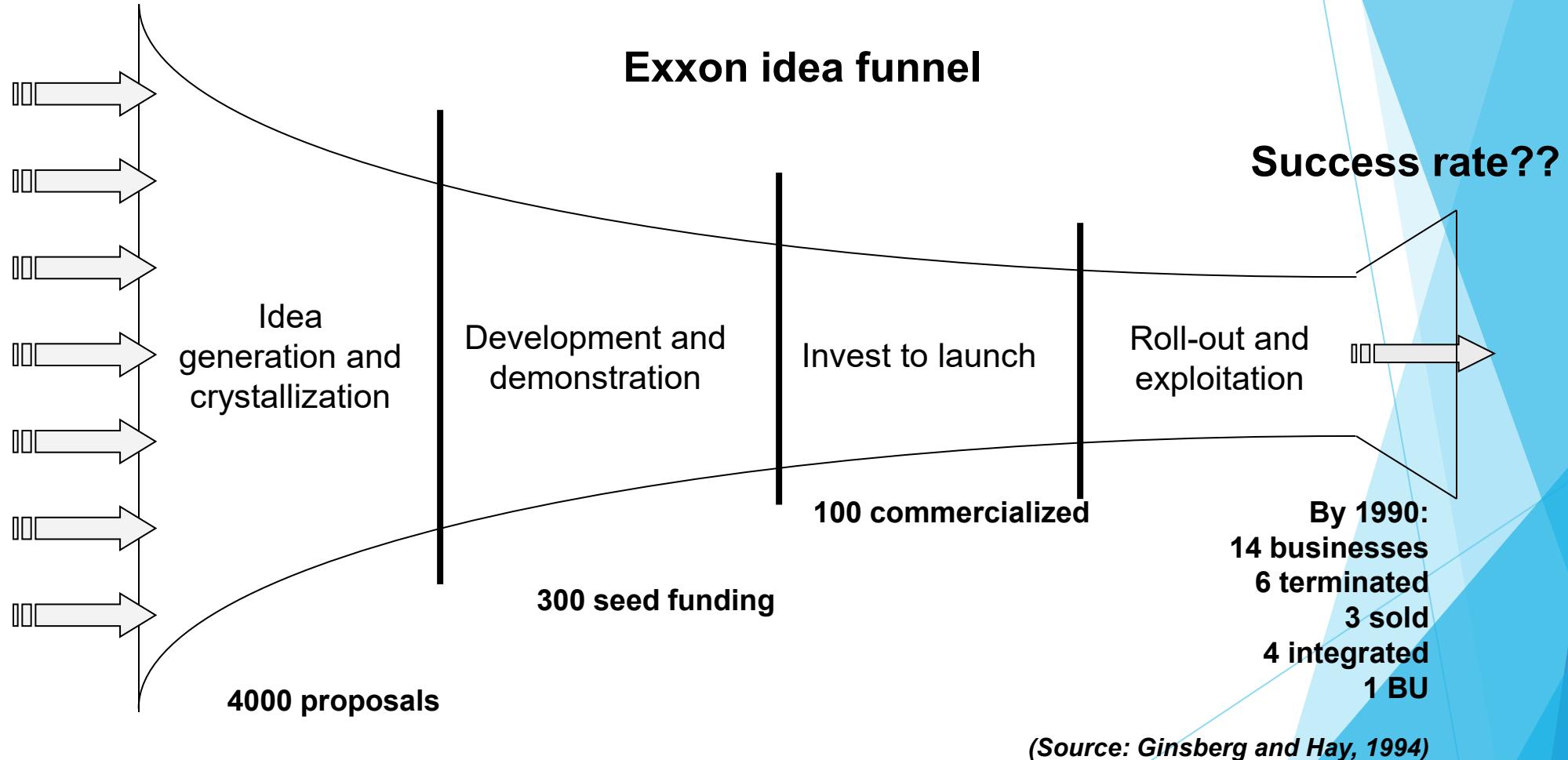
Traditional New Product Development



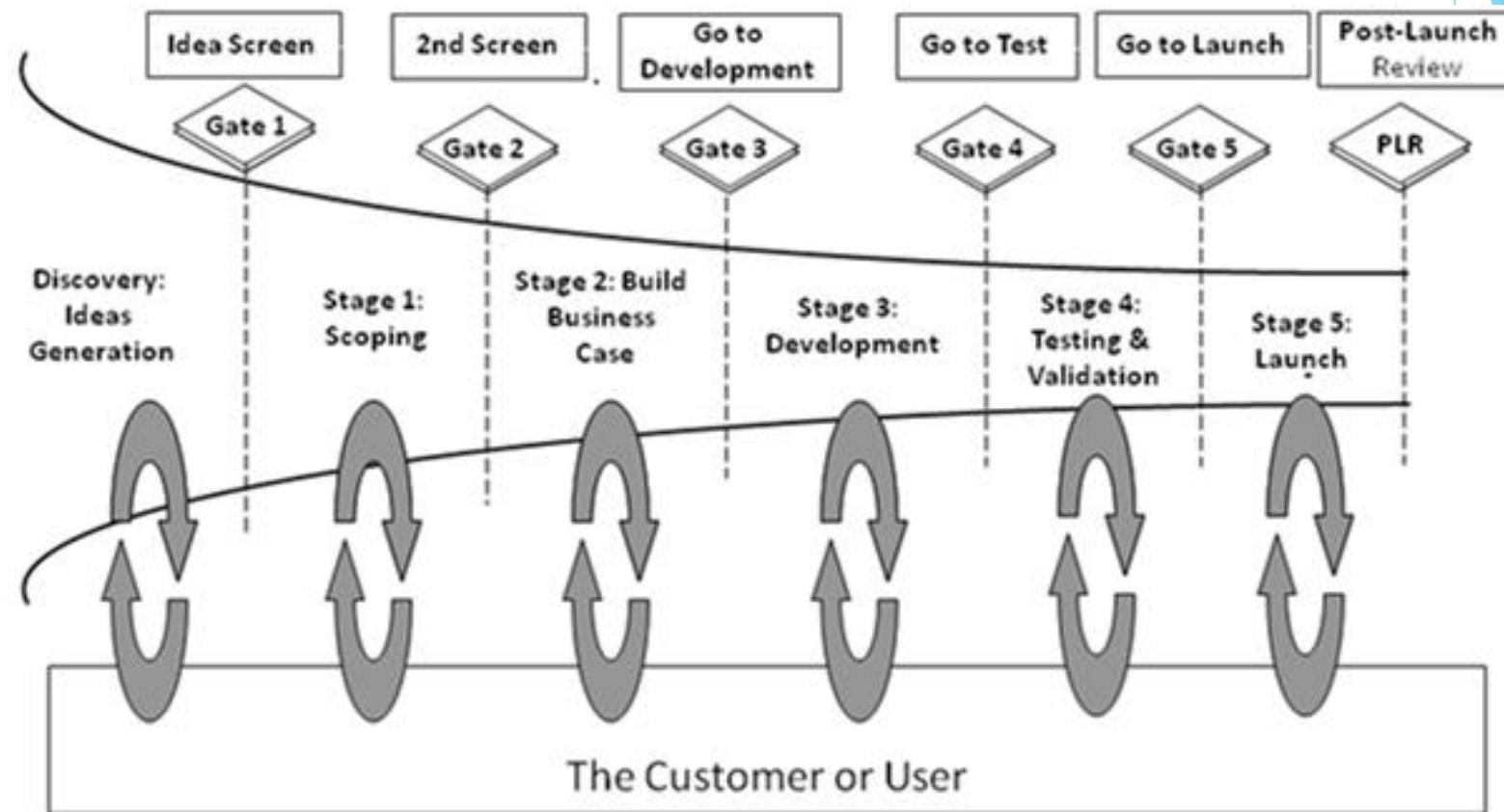
Traditional New Product Development



Traditional New Product Development



Traditional New Product Development



For Less Complex and Smaller Development Projects,
Use an Abbreviated Version: 2-3 Gates

Innovations that failed

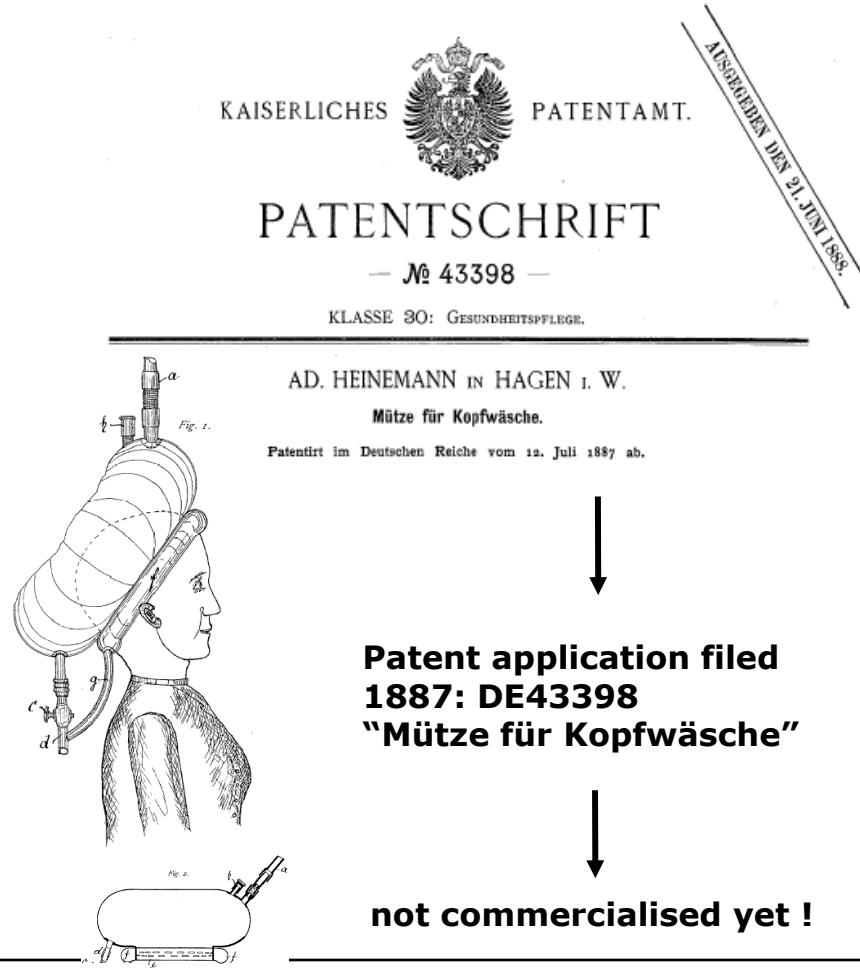
Laserdisk: Philips, Pioneer, MCA



The Apple Newton PDA



Innovations that failed



COMPUTER AS EYEPATCH

The American . . Xybernaut introduced . . at the Consumer Electronics Show . . the Poma, a portable computer with a small display to be put on the head . . .

Source: De Ingenieur / 5 / 15-3-2002



Patent application filed 1995:
EP767417
"Hands-free portable computer and system"

→ commercialised 2000 !
By Hitachi but successful?

If we're building something nobody wants, what does it matter if we accomplish it:

On time?

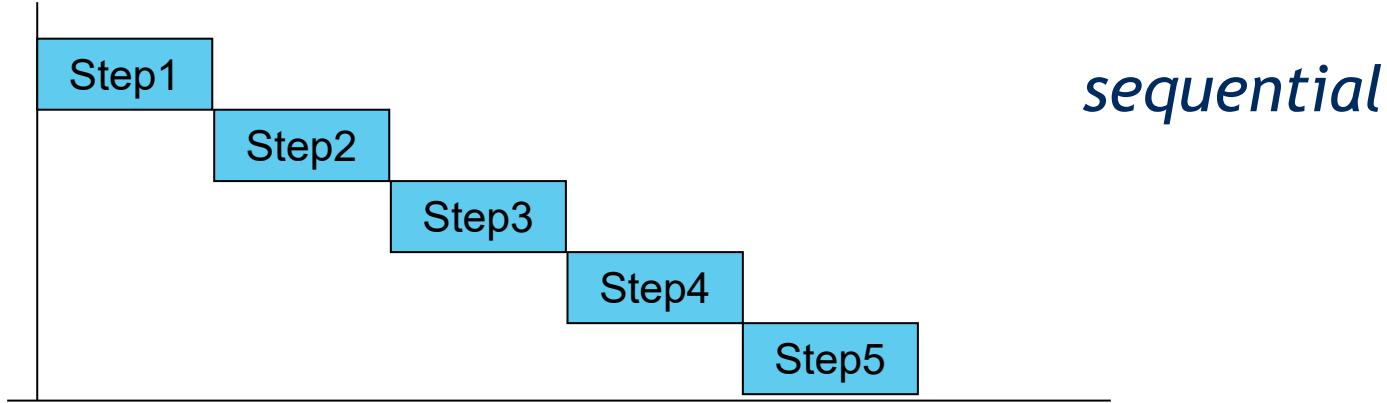
On budget?

With high quality?

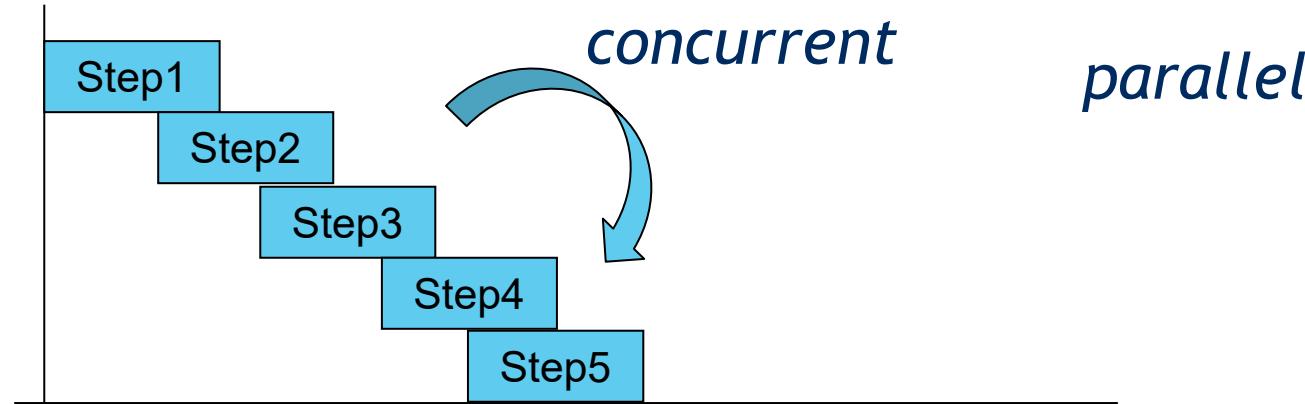
With beautiful design?

Achieving Failure = successfully executing a bad plan

Traditional New Product Development



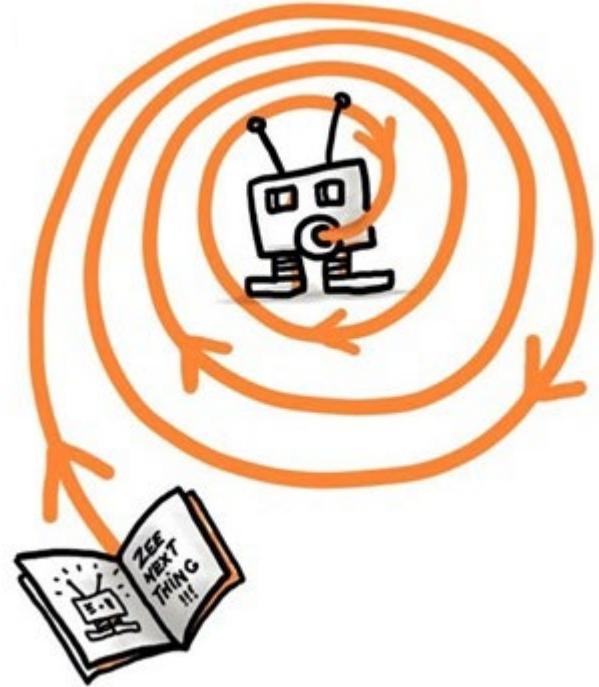
sequential



concurrent

parallel

Customer Discovery



Iterative process with
continuous customer feedback

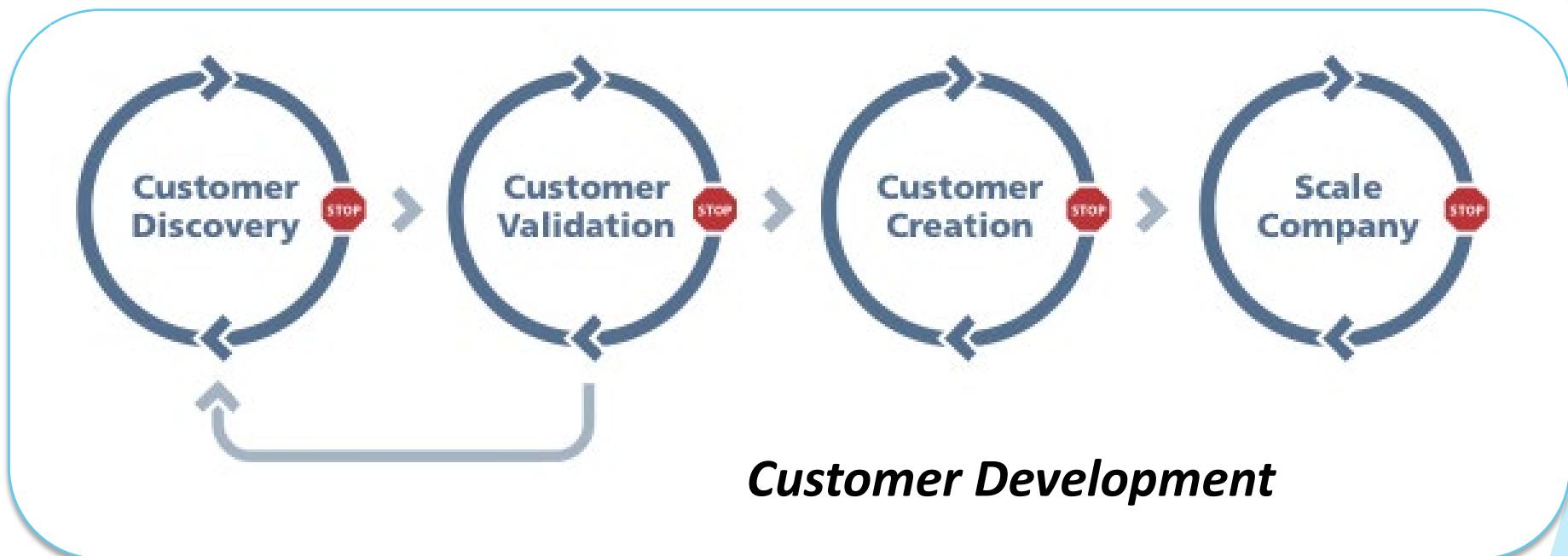
Two approaches commonly used

Lean design thinking

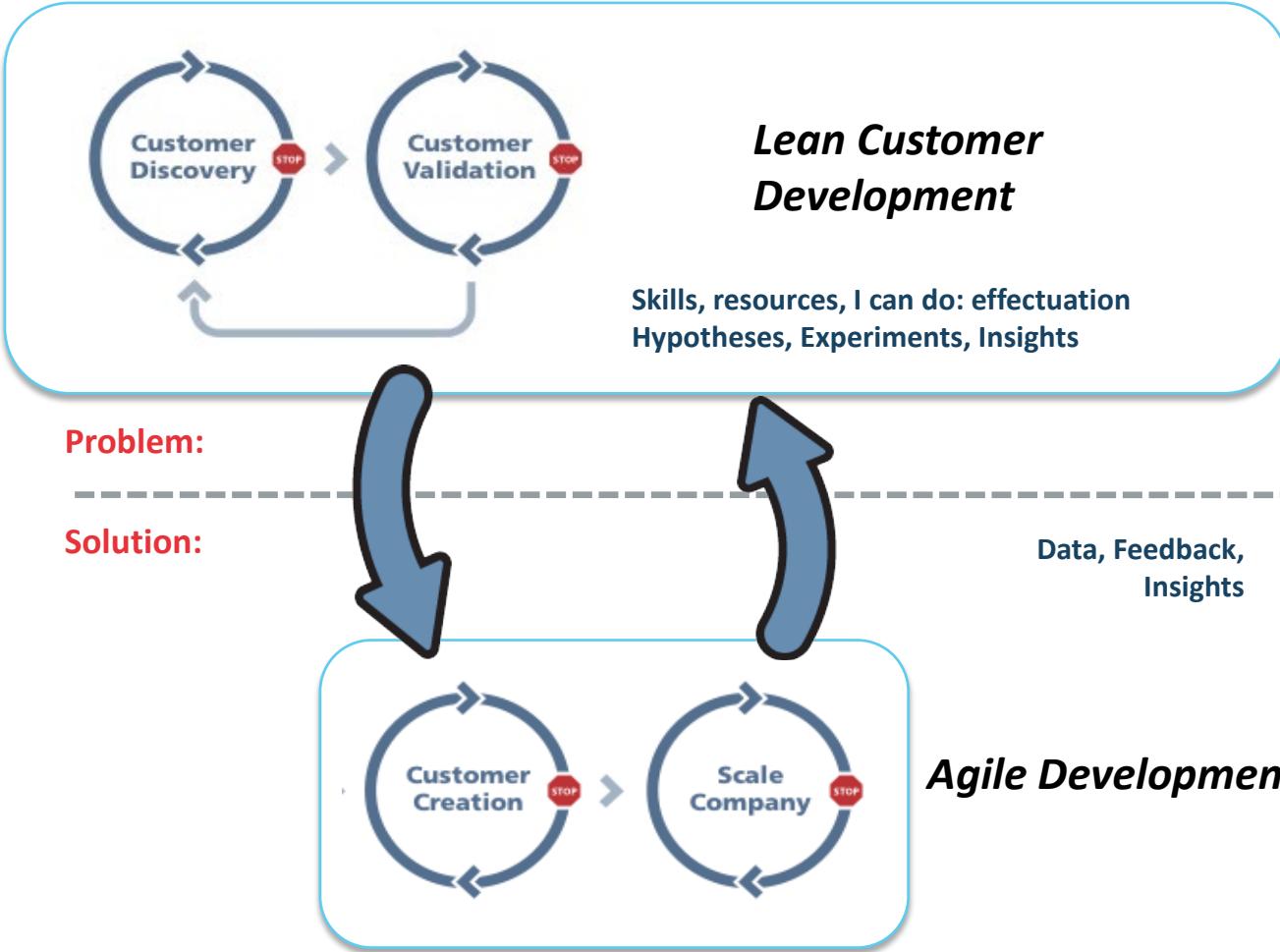
and

agile product development

Customer development



Lean Customer Development



Lean Customer Development



Focus on *technical* problem

How can the business needs be satisfied efficiently?

Unit of Progress:
Validated Learning



Steve Blank

Lean design: from an effectuation point of view

What are the skills, resources, people I know
→ what I can do: effectuation

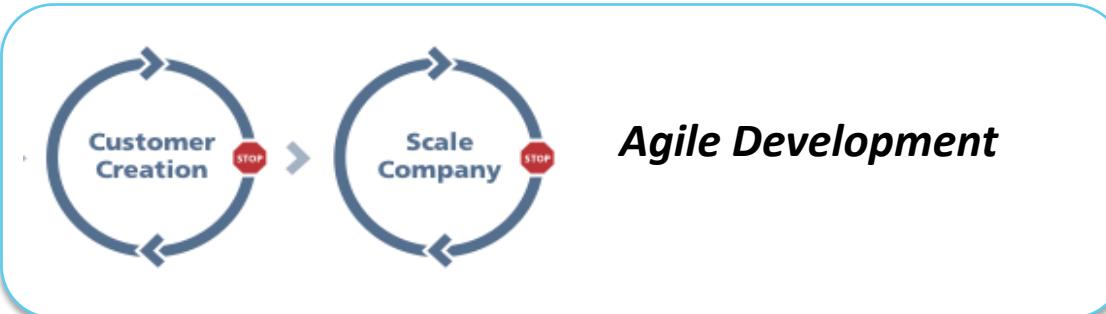
Best fit when one has a fixed set of resources and clear scope, but uncertainty in what the time and effort ("technical needs") really are to achieve that scope.

Lean manages the uncertainty by prototyping, "learning by doing," and iteratively elaborating the technical needs to reduce time to delivery

Lean startup methodology

- ▶ Evaluate your Strengths (Experience, Expertise, and Social Capital)
- ▶ Evaluate Markets that align to your Strengths
- ▶ Select a beachhead market to target
- ▶ Interview (~30) Decision Makers in the Target Market
- ▶ Map Value proposition canvas: Customer Needs (Pain Points and Gain Points)
- ▶ Articulate the Problem/ Challenge of the Customer
- ▶ Generate Product Lists, your Potential Offerings
- ▶ Evaluate products against your Strengths and Market Needs
- ▶ Select a product and customer

Agile Product Development



Agile fits when the customer is not changing and the business needs are able to be prioritized at least for a set period of time.

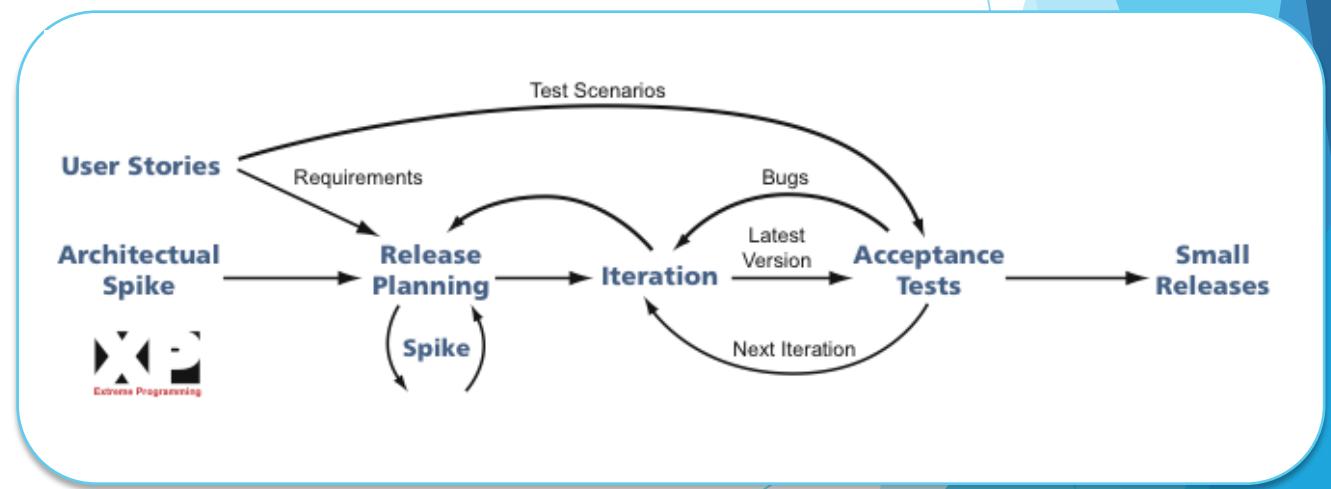
Agile's goal is to ensure that only the truly necessary business needs are satisfied to reduce the price and time to delivery.

“What are the business needs that must be satisfied?”

Unit of Progress:
A line of Working Code



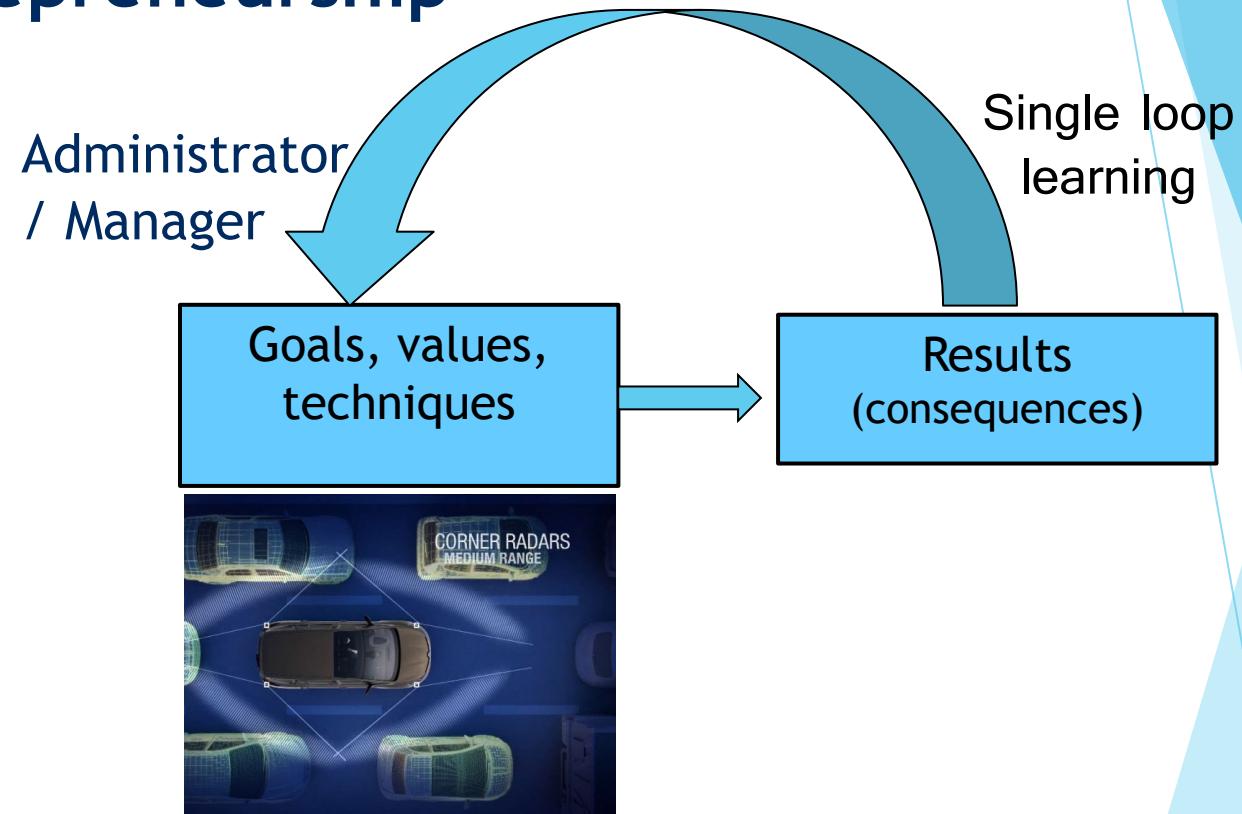
Kent Beck



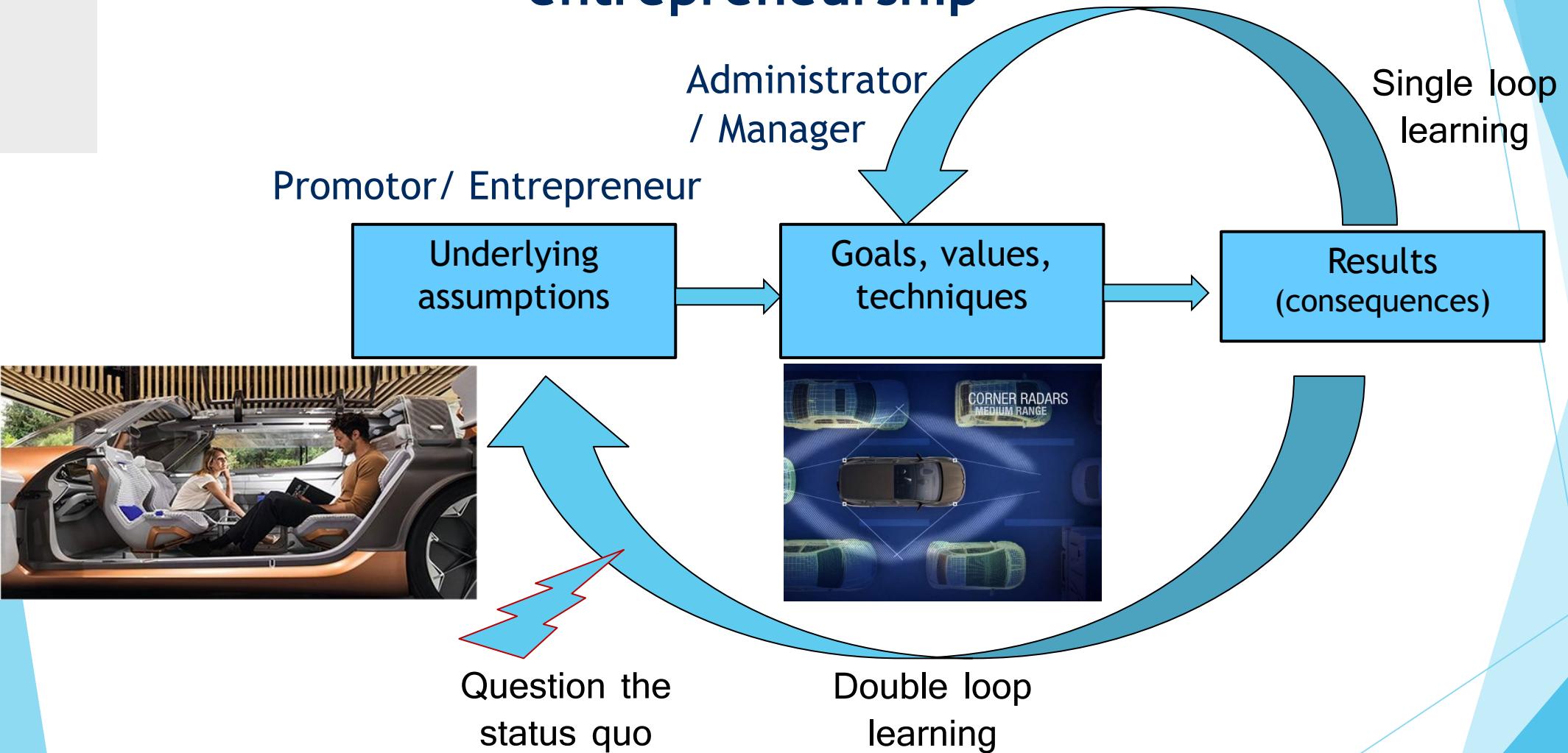
Agile methodology

- ▶ **User Stories** - every work feature component is described from the perspective of the primary user, what the user wants to do, and why they want to do it.
- ▶ **Timeboxes** - work is listed as a backlog and performed within a set period of time, or “timebox.” Timeboxes enable Agile teams to innovate how to accomplish tasks while avoiding the stress of deadlines.
- ▶ **Colocated Teams** - Teams work colocated to ensure everyone can communicate efficiently face-to-face. This also improves team unity and opportunity for inspiration from working near people who are thinking and dealing with similar work challenges.
- ▶ **Whole Teams** - the team also works through the whole lifecycle of a work item together, including design, development, and testing. This ensures adequate breakdown of work and the whole team’s ownership of getting the work done.

New Product Development: learning and entrepreneurship



New Product Development: learning and entrepreneurship



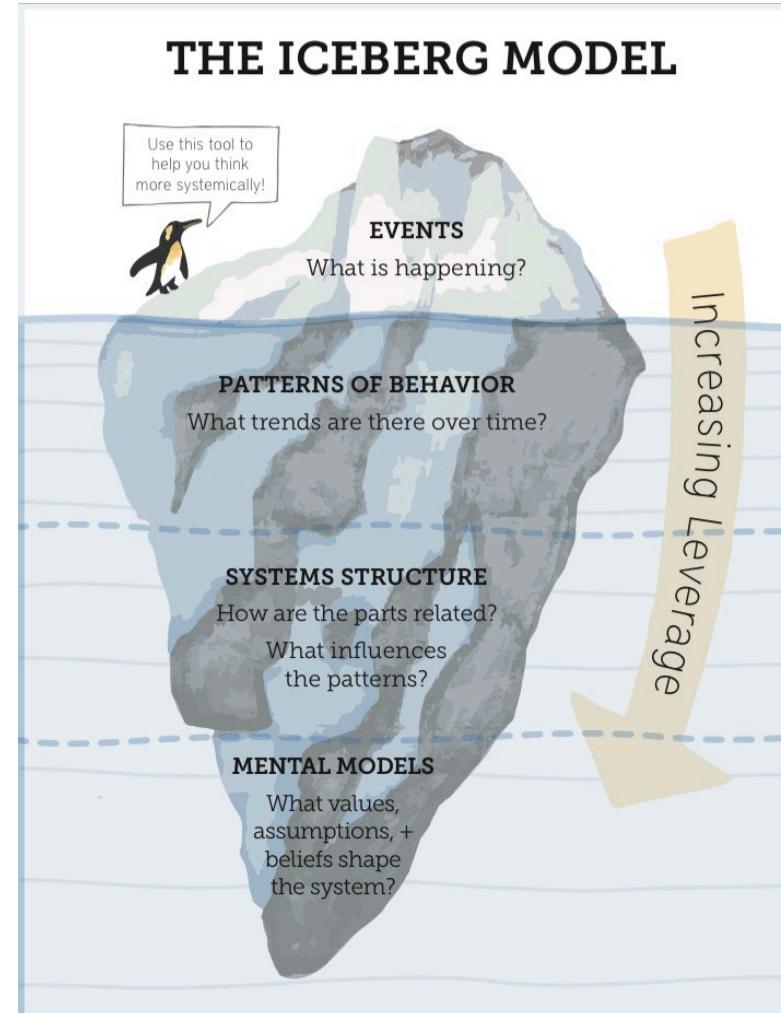
New Product Development: learning and entrepreneurship

- ▶ Tabula rasa learning
 - Blank state
 - No mental models,
 - No cognition,
 - No path dependencies
 - No dominant logics
 - No content,
 - all knowledge comes from experience or perception



New Product Development: learning and entrepreneurship

- ▶ Understand the user business case
- ▶ Understanding the customer
- ▶ Importance of various sources of information
- ▶ Open approach to learning



Ideas and opportunities

Idea ≠ Opportunity

Ideas

...remain

...are free

...do not need clients to exist

...can be the basis of a business opportunity



Ideas and opportunities

Opportunities

- ...need to be valuable,
- ...need to solve a problem
- ...need work
- ...require a fit
- ...are temporal

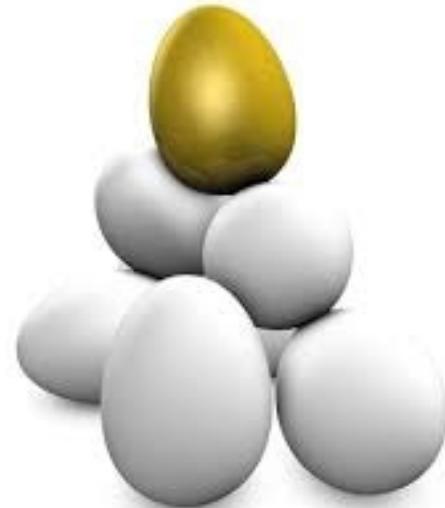
→ Opportunities: ideas that can be implemented



Ideas and opportunities

You have a first idea, but this idea needs to be valuable

- ▶ For customers
- ▶ For you
- ▶ For investors and other stakeholders

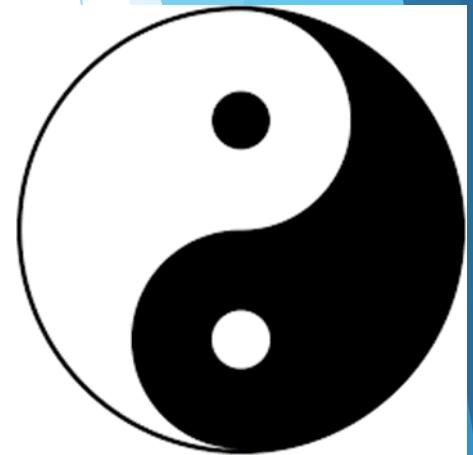


Ideas and opportunities

Two fundamental views on entrepreneurship Cheah 1990:

Kirznerian Entrepreneurship: New ventures provide products or services that are very nearly imitations of existing offerings, reproduced with minor variations (Kirzner, 1973).

Schumpeterian Entrepreneurship: New ventures offer products or services that are truly novel and that represent new and different combinations of resources (Schumpeter, 1934).



Ideas and opportunities

Kirzner entrepreneur as '*agent of adjustment*' - responds to new information and adapts to circumstances dictated by external world

Entrepreneur defined by superior perception of market opportunities - defined as '*entrepreneurial alertness*' (Kirzner, 1973)

Skill of the entrepreneur lies in the ability to constantly scan environment for new opportunities, utilising information in new ways to *fill* gaps in the market

According to Kirzner, environment dictates entrepreneurial behaviour

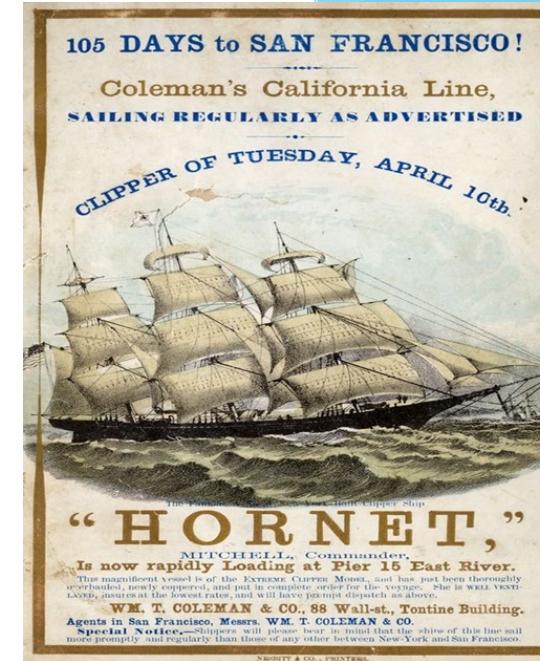
But **Schumpeter** defined entrepreneur as '*agent of change*' - spontaneous, discontinuous change and destroy existing paradigms.

According to Schumpeter, knowledge and attitude dictates entrepreneurial behaviour

Ideas and opportunities

► Schumpeter:

- ▶ Reform and revolutionize
- ▶ Creative destruction
- ▶ Reorganizing industry
- ▶ Disturb existing economic equilibrium



► Kirzner

- ▶ Alertness, and perceive opportunities before others do
- ▶ Establish equilibrium
- ▶ Opportunities as combinations of existing knowledge
- ▶ Incrementalism

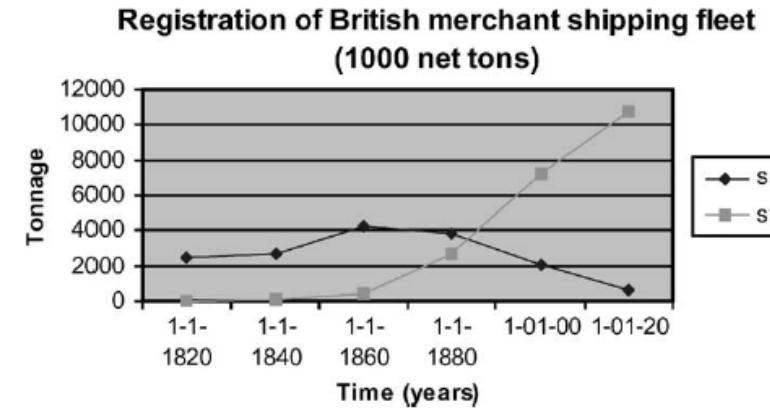


Fig. 6. British fleets of steamships and sailing ships (data are based on Ville, 1990, 68–71).

Ideas and opportunities

Opportunity recognition

1. sensing or perceiving market **needs** and/ or under employed resources

identifying an information asymmetry

2. recognizing a **fit between needs and resources**

closing the information asymmetry

3. creating a fit through a **business concept**

exploiting the opportunity



What have we learnt

- ▶ Scientific management and strategy schools of thought
- ▶ Strategic thinking (causation) and entrepreneurial thinking (effectuation)
- ▶ Lean startup and agile development
- ▶ What is entrepreneurship

Thank you for your time - Victor Scholten - www.tudelft.nl/dce