UNIVERSITY of NICOSIA

Session 10

Blockchain innovation management, diffusion and new product development

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Learning objectives

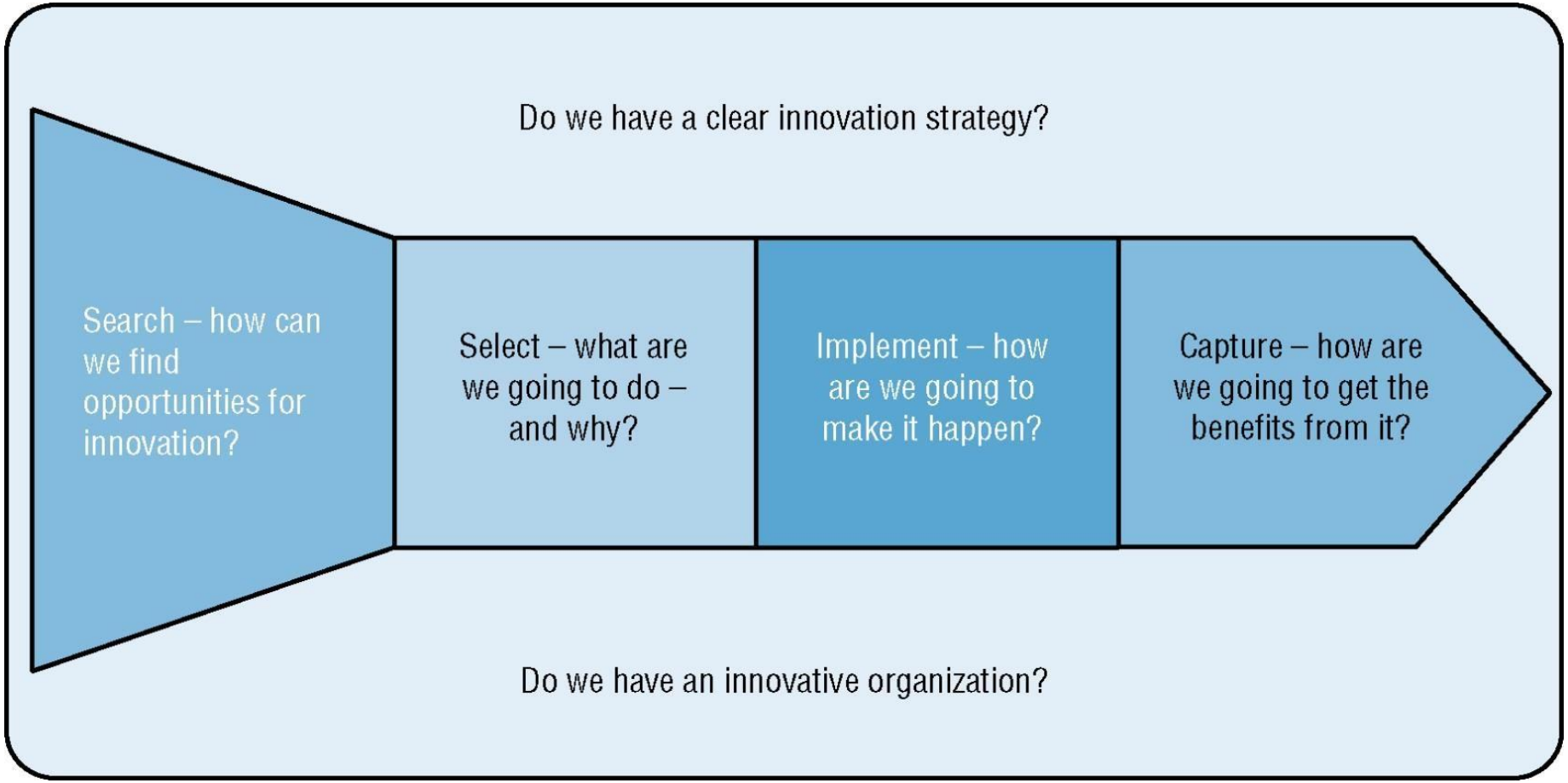
- Understand factors that influence the process of innovation in organizations
- Define routines and explore their role in innovation management
- Highlight research on successful management of innovation
- Explore models for innovation adoption and diffusion
- Explore processes of decision making under uncertainty
- Discuss processes for the development of new products and services
- Understand the influence of technology and markets on product commercialization
- Explore the differences and idiosyncrasies of commercializing technology-based and complex products

Session outline

1. A contingency model of the innovation process
2. Can we manage innovation?
3. Successful innovation management
4. Diffusion of innovations
5. Innovation Selection
6. Processes for New Product Development
7. Commercializing Technological and Complex Products
8. Conclusions

1. A Contingency Model of the Innovation process

Innovation as a process



Innovation as a process

- **Phase 1: Search**
  - Scan the environment – process opportunity/threat signals
- **Phase 2: Selection**
  - Decide which of the signals to respond to (in alignment with business strategy and competencies)
- **Phase 3: Implementation**
  - Create product/process/position/paradigm and launch to the market
- **Phase 4: Value capture**
  - Generate returns; protect gains from competition; achieve learning for future endeavors.

Innovation management

- Innovation management is a **learned capability**. In other words, skills can be acquired and applied to a successful execution of the process.
- The basic innovation process can be applied to a range of situations, for example:

Product innovation:

- signals (about customer needs and/or technological opportunities) will come from the market;
- a strategic concept will be formed to exploit them;
- a product will be launched.

Process innovation:

- signals (about internal problems or needs) will be picked up from internal customers;
- strategic options for process redesign will be considered;
- a new process will be implemented.

- **Exceptions** can be found in **public sector innovation**, where divergent or conflicting incentives and rewards may exist. Political priorities are usually taken into consideration in these cases

Innovation management

- But, although common issues exist, each situation requires its own careful assessment.
- Simply **copying ideas** from elsewhere **is not enough**.
- **Ideas and best practices must be adapted** to suit particular circumstances.

A contingency model

Influences around which the generic innovation process can be configured:

- **Sector**: different characteristics and priorities (e.g. speed of change, scale-intensity)
- **Size**: small firms innovate differently from larger ones (see next slides)
- **Systems**: countries and regions may have more or less supportive contexts, in terms of policies, funding, tax treatment, etc. (see next slides)
- **Scope**: innovation management may differ in incremental vs. disruptive innovation, as well as in cases of social innovation (see next slides)

Size: Innovation in small companies

Advantages	Disadvantages
Speed of decision making	Lack of formal systems for management control – especially, project times and costs
Informal culture	Lack of access to key resources, especially finance
High quality communications – everyone knows what's going on	Lack of key skills and experience
Shared vision	Lack of long term strategy and direction
Flexibility / Agility	Lack of structure and succession planning
Entrepreneurial spirit / Risk taking	Poor risk management
Energy, enthusiasm, passion for innovation	Lack of application to detail, lack of systems

Systems: innovation networks

Innovation is nowadays much less of a single-company activity

- It is increasingly a multi-player game in which companies work together in **networks**
- These may be **regional clusters** (see Silicon Valley), **supply chains** (University/market synergies), **strategic alliances** (Cross industry (IBM/Samsung) or **cultural alliances** (like in Korea, Japan, et al), etc.
- One of the key implications is that we need to shift our way of thinking to a **systems view**
- Including a wide range of actors, such as customers and suppliers, competitors, the government, educators, etc.

Systems: innovation networks

- **Local/regional variations** may also exist
  - Sometimes, **regional innovation clusters** may emerge as the outcome of a systematic attempt to build them (Silicon Valley – US, Cambridge – UK, Singapore, etc.)
  - The concept of **constructed advantage**: the degree to which such clustering can be organized and managed (Cooke 2007)
  - Effective innovation management is seen as a challenge of **connecting to and working with such systems**

Scope: Social Innovation

"Social entrepreneurs are not content just to give a fish or teach how to fish.
They will not rest until they have revolutionized fishing."

Bill Drayton, founder of Ashoka,
a global non-profit devoted to social entrepreneurship

Not all innovation is (directly) about making money – at least, as a stated initial intention.

Can you give any examples?

- Tim Berners-Lee and the World Wide Web.
- *Satoshi Nakamoto and Bitcoin?*

Scope: social innovation

- **Social entrepreneurship starts from a mission to create some form of social value**.
  - That is *not* to say that money can't be a by-product of this process for the social entrepreneur!
  - Social entrepreneurship can prove to be a great vehicle for **platform innovation** by creating the infrastructure needed for other (profit- oriented) innovations to build upon.

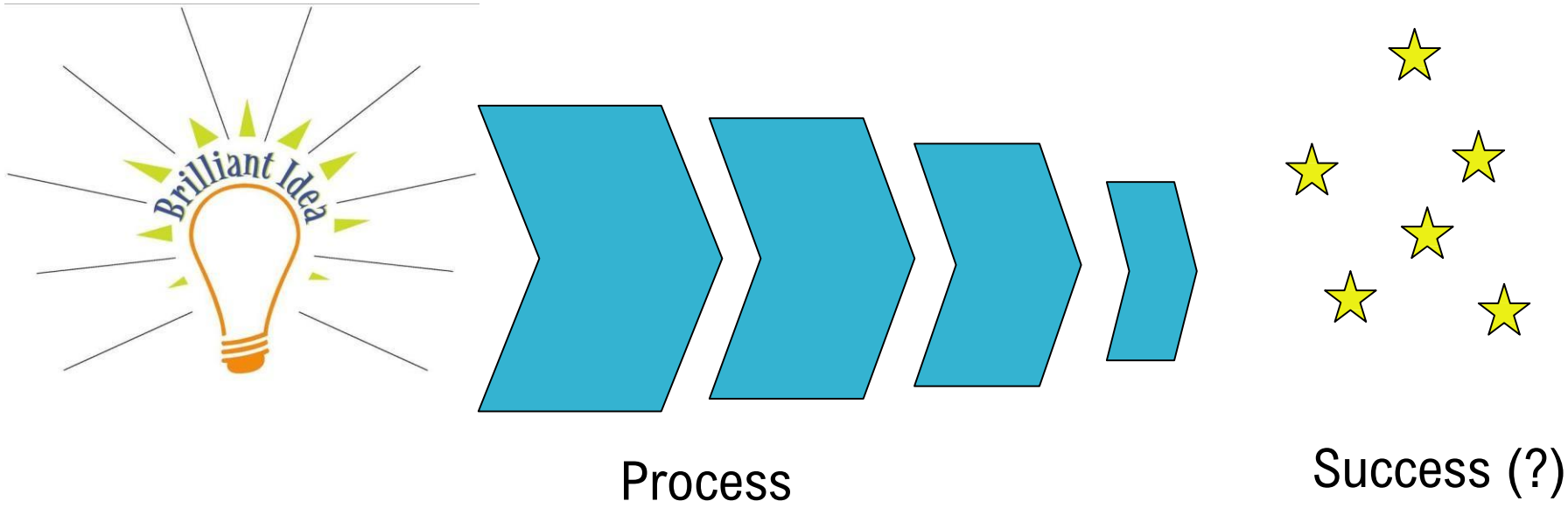
- *A case for Bitcoin and blockchain?*
- *Smart contracts?*
- *CBDCs?*

Scope: social innovation

- Different **types of entrepreneurs** (Fauchart and Gruber 2011):
  - **Darwinians**: Concerned with competing and creating business success.
  - **Communitarians**: concerned with social identities relating to community participation/contribution.
  - **Missionaries**: those with a strong inner vision – a desire to change the world.

2. Can we manage innovation?

How innovation happens (theory)



How innovation happens (practice)

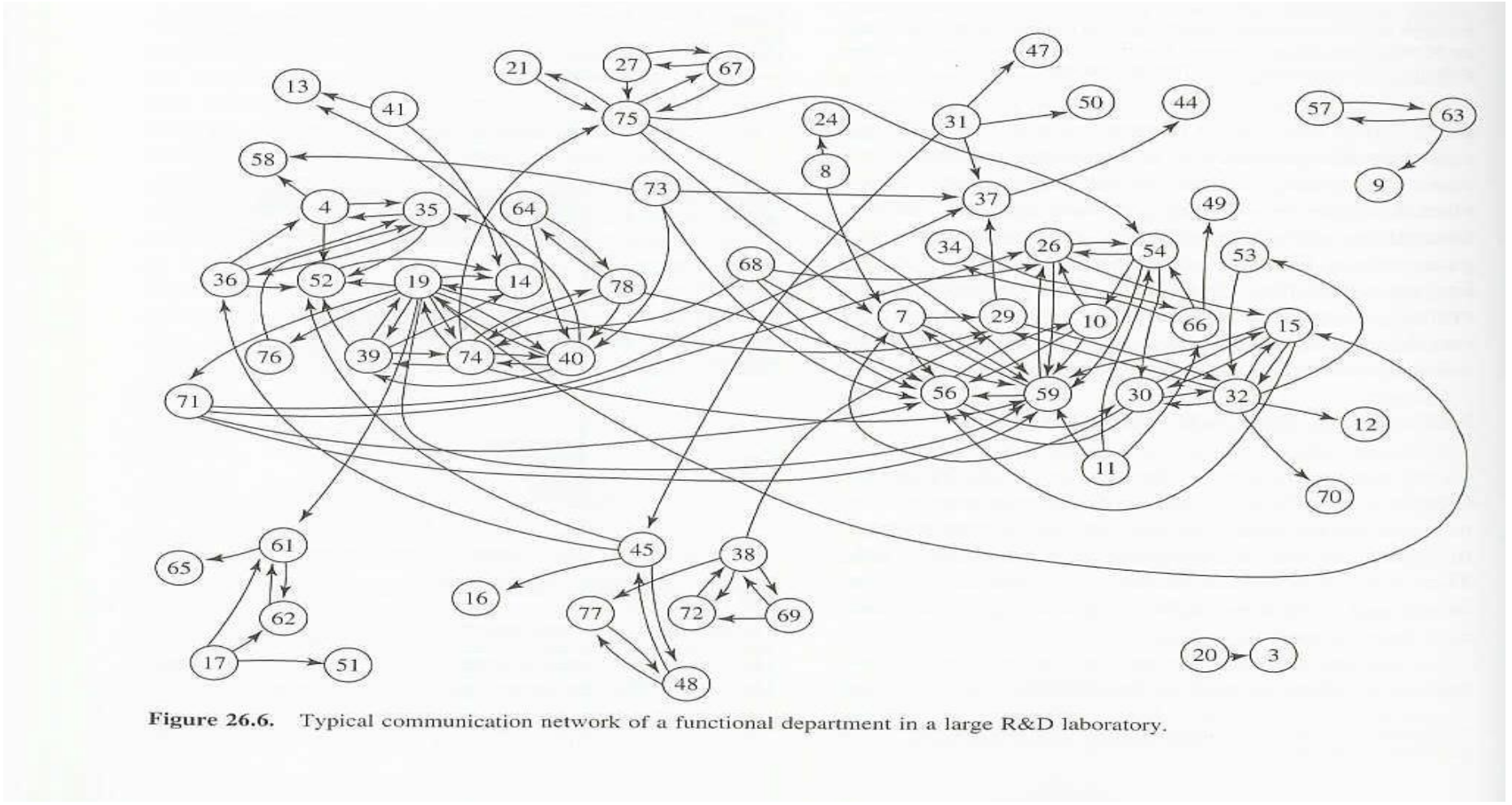


Figure 26.6. Typical communication network of a functional department in a large R&D laboratory.

Innovation management

- Ok, innovation is important – But, **is it manageable**?
- Can something so complex and uncertain be subject to systematic management?
- Although there are no easy recipes, we may find an **underlying pattern of success**
  - Not by designing and running a complex but predictable mechanism
  - But, by **creating conditions** to maximize the likelihood of successful outcomes from an overly complex process
- Success seems to be based on two key ingredients:
  - **Resource availability and allocation**
  - **Management capabilities of the organization (routines)**

Routines

Organizations develop, over time, embedded patterns of behaving

- Result of repetition and reinforcement
- '*the way we do things around here*'

These patterns reflect an **underlying set of shared beliefs** and form part of the organization's **culture**

- Think about Google's culture, Apple's culture, Toyota's culture.

Routines emerge from **repeated experimentation and experience**

- In other words, **culture is learned** (but takes time!)
- Over time, it becomes embedded and triggers automatic responses to particular situations (routines)

This does not mean that routines do not require detailed conscious thought and constant adaptation (*The analogy of driving a car)*

What are routines?

According to Nelson & Winter (1982):

- Regular and predictable collective, social and tacit
- They guide cognition, behavior and performance
- They promise to bridge (economic/cognition) theory and (management/organizational) practices
- They can promote or prohibit innovation

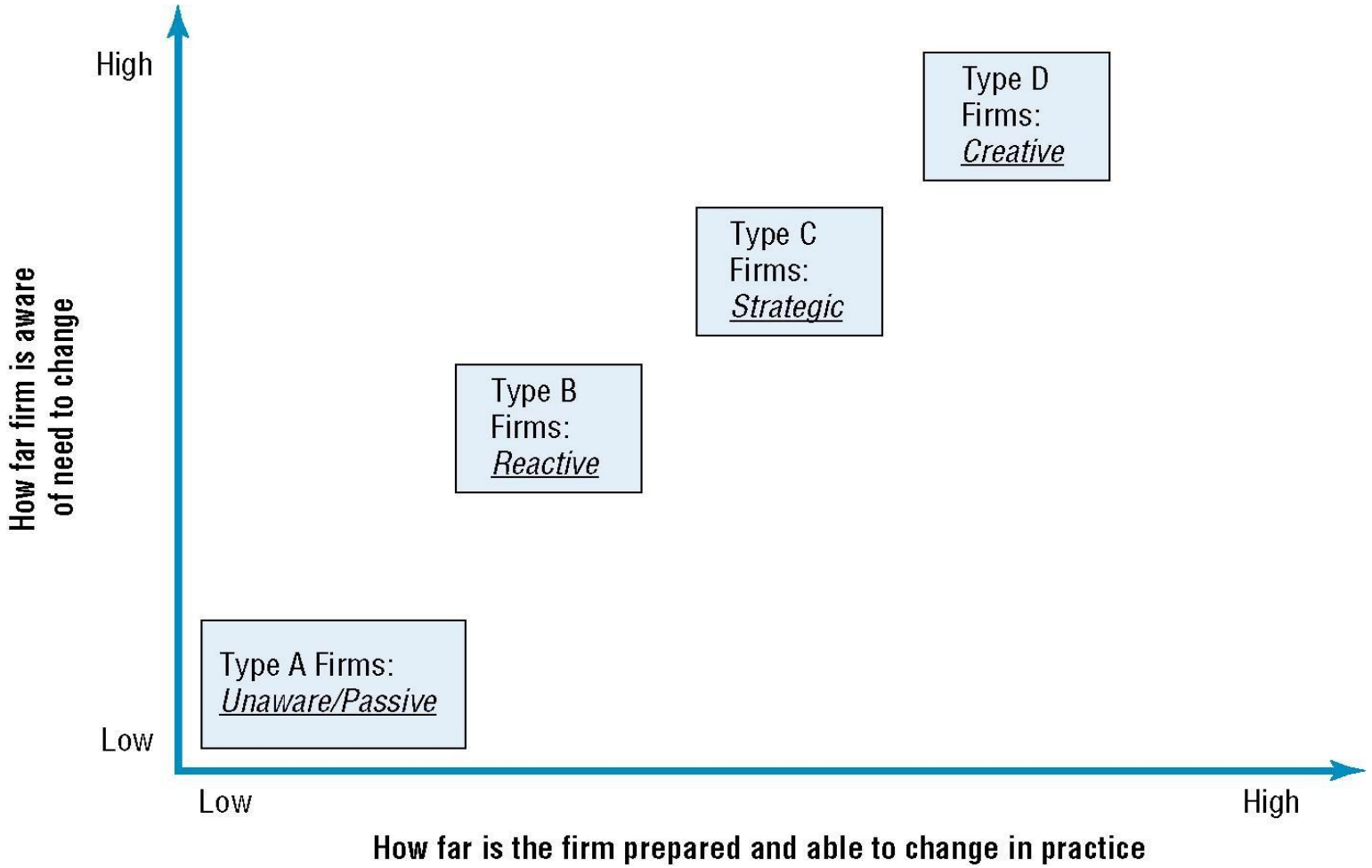
Routines and innovation capability

- Obviously, some routines are better than others
- So, it is possible (and important) to learn from others (best practice transfer)
- Keeping in mind that routines are firm-specific and that blindly copying them rarely works

- Successful innovation management is about building and improving effective routines
- Not all firms can do that equally

- We can identify four types of firms in terms of innovation capability (see next slide):
- **Type A: Unaware** (not able to pick up signals quickly; unconscious of the need to change)
- **Type B: Reactive** (able to respond to the external threats, but not to create opportunities)
- **Type C: Strategic** (capable of executing a strategy of continuous innovation; unprepared for disruptive)
- **Type D: Creative** (proactive approach to building and sustaining competitive advantage)

Types of firms (innovation capability)



3. Successful innovation management

What do we know?

- Research has highlighted aspects of *successful* innovation management:
- Successful innovation correlates strongly with **how a company selects and manages projects** (e.g. being able to introduce new products faster than others brings competitive advantage)
- Successful innovation needs **integrated management; not partial development of abilities** (e.g. strong R&D is not enough; links to market are also crucial)
- Successful innovation needs processes of **constant learning and adaptation**

Case: innovation management & DLT

- Successful innovation correlates strongly with how a company selects and manages projects (e.g. being able to introduce new products faster than others brings competitive advantage)

- **Blockchains tend to create markets with strong first-mover advantages, coupled with multi-sided network effects (i.e. the more users/developers/merchants, the more valuable a product offering)**

- **Being first to market is crucial – hence, fast and robust project selection and management is imperative**

- **Any example?**
- Bitcoin (cryptocurrency)
- Ethereum (blockchain platform)
- Opensea (NFTs marketplace)

Case: innovation management & DLT

- Successful innovation needs integrated management; not partial development of abilities (e.g. strong R&D is not enough; links to market are also crucial)
  - Distributed technologies rely as much on acceptance/adoption as on technology invention.
  - Companies need to combine strong technical skills with superior market access (easier said than done!)

- Successful innovation needs processes of constant learning and adaptation
  - Digital Currencies & DLT applications are fast-moving markets; think of the experience of early exchanges and others that failed to learn and adapt – expect lots of failures, repeated boom-and-bust cycles

Characteristics of a learning organization

- A learning organization will:
  - Exercise effective knowledge management & **IPR protection**
  - Implement processes for **continuous experimentation and structured reflection**
  - Insist on **formal processes and proper documentation**
  - Set targets and continuously **measure achievement**
  - Display and **disseminate results** – internally and externally
  - Place emphasis on people's **training and development**

4. Diffusion of Innovation

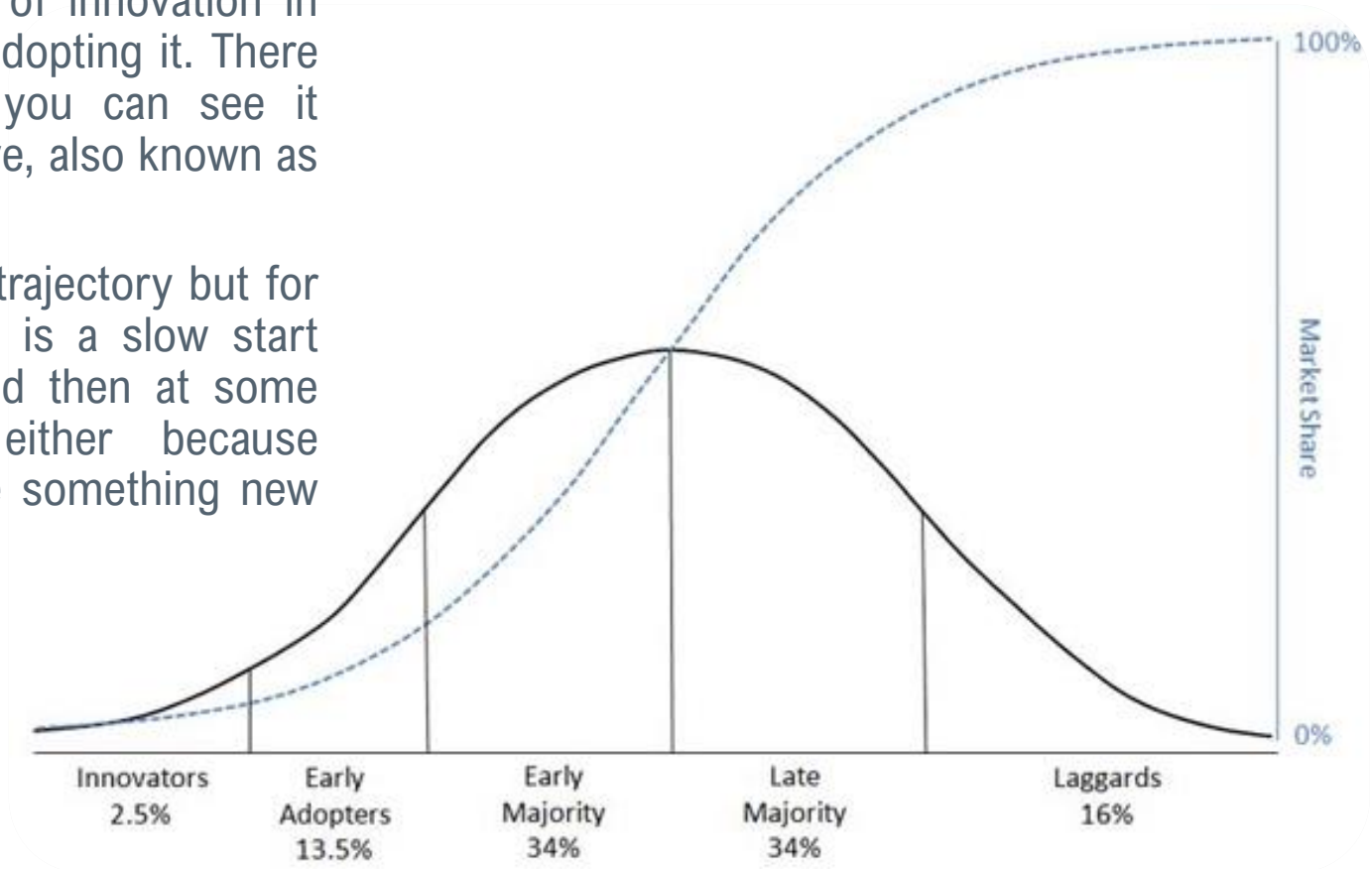
Diffusion of Innovation

- Innovations do not always translate into market successes.
- Typical **factors affecting innovation diffusion**:
  - **Economic**: personal costs vs. social benefits; insufficient incentives
  - **Behavioral:** priorities; inertia; risk propensity/aversion
  - **Organizational:** goals; routines; power and influence; culture
  - **Structural:** infrastructure; governance

Diffusion of innovation

Not all people or organizations adopt innovations at the same pace.

- The graph illustrates the diffusion of innovation in terms of the people/organizations adopting it. There are five distinct groups and as you can see it generally follows a bell-shaped curve, also known as a “normal” distribution.
- Not all innovations have this exact trajectory but for most successful innovations there is a slow start then a high degree of interest and then at some point the interest decreases either because everyone now has one or because something new took its place.



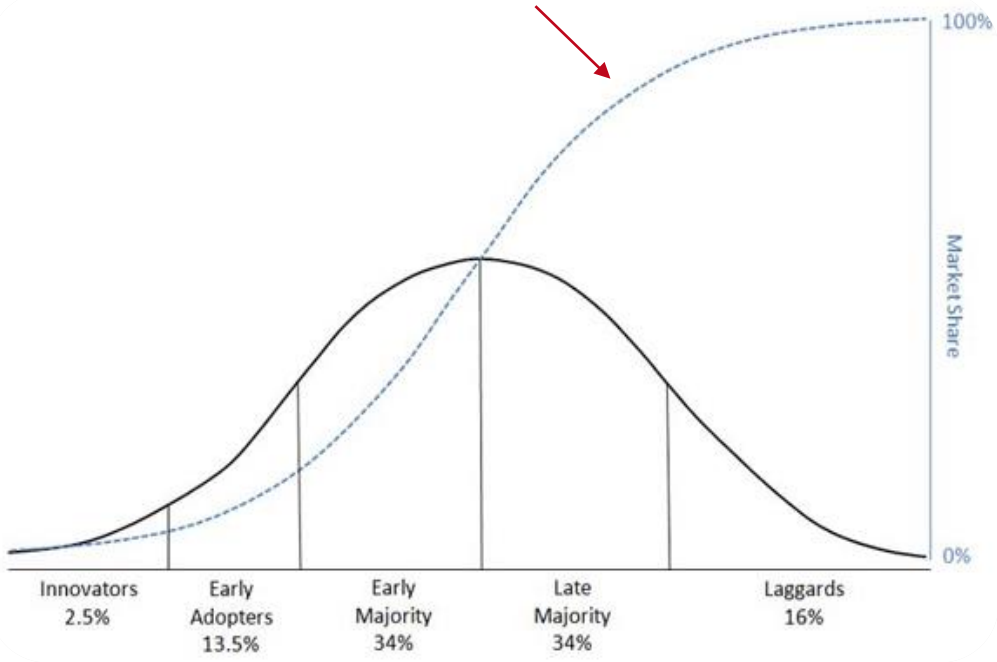
Diffusion of innovation

Based on the speed of adoption, there are five categories of adopters.

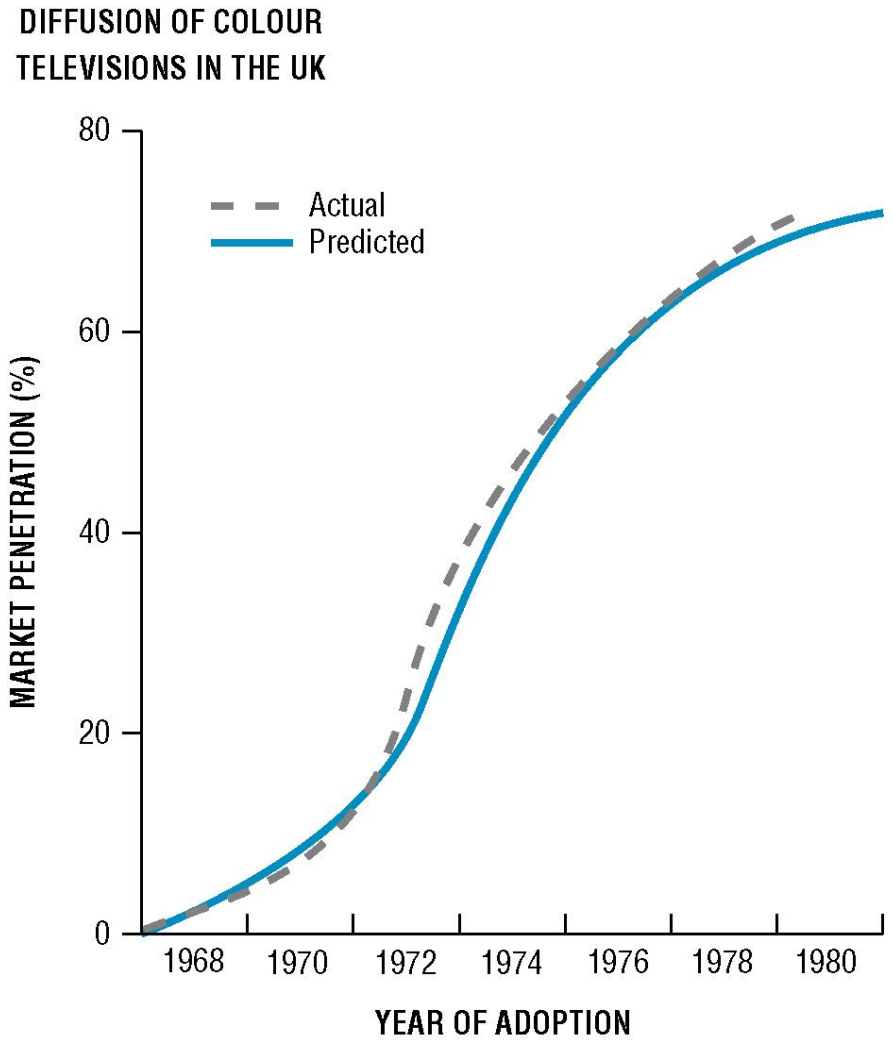
Each of these categories have distinctive characteristics:

- **Innovators**: Seek new ideas, can cope with uncertainty and increased risk, broader perspectives.
- **Early adopters**: More localized and less global perspective, their opinion is more respected than innovators, often leaders, tend to back "winners".
- **Early majority:** Less familiar and aware than innovators and early adopters, but willing to test a new product/technology.
- **Late majority**: May adopt only when they feel pressure to do so by peers. Will only join once uncertainty is reduced.
- **Laggards**: Not opinion leaders, less sociable, focus on the past, innovators may have moved to a replacement by the time the laggards adopt.

The "S-curve" of the market share. This refers to the cumulative market share that a successful innovation would follow finally reaching 100% saturation. Think for a second: What is the phase of the crypto world right now?



S-Shaped of diffusion example

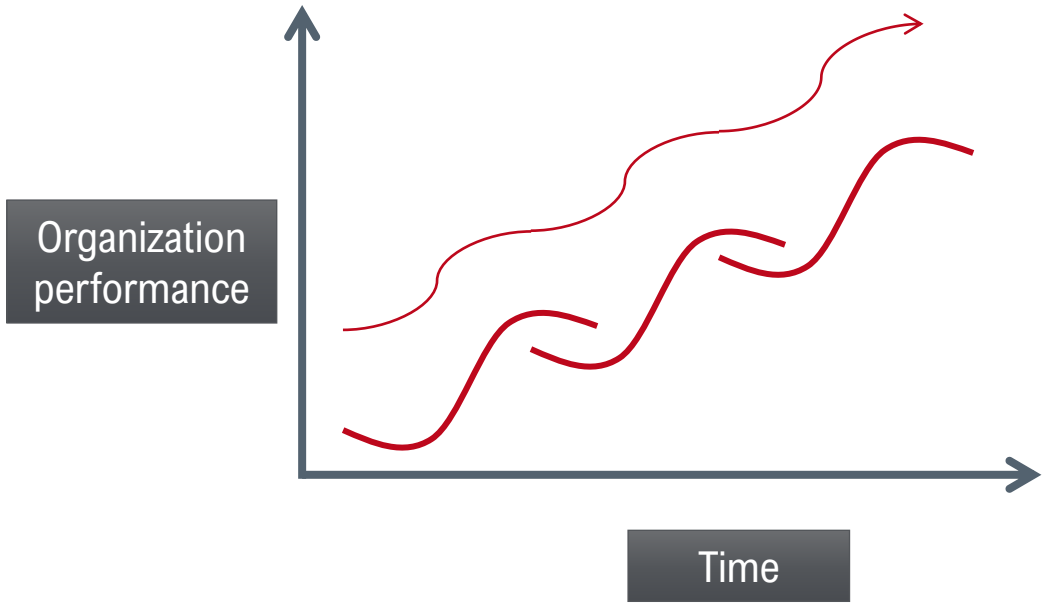


Diffusion of innovation

But most successful innovations follow an S-curve of adoption.

- Organizations try to promote the next successful innovation at the right time in order to maximize the overall performance. Too soon and they will *"cannibalize"* the previous innovations market share, too late and something else will *"steal"* the initiative.
- If the new product or service needs to be ready at a specific period then the preparation needs to start earlier, possibly halfway through the previous S-curve. This period is referred to as the innovation window. Using the word window further suggests it is an opportunity that can be missed if the timing is not right.

Climbing and jumping S-curves

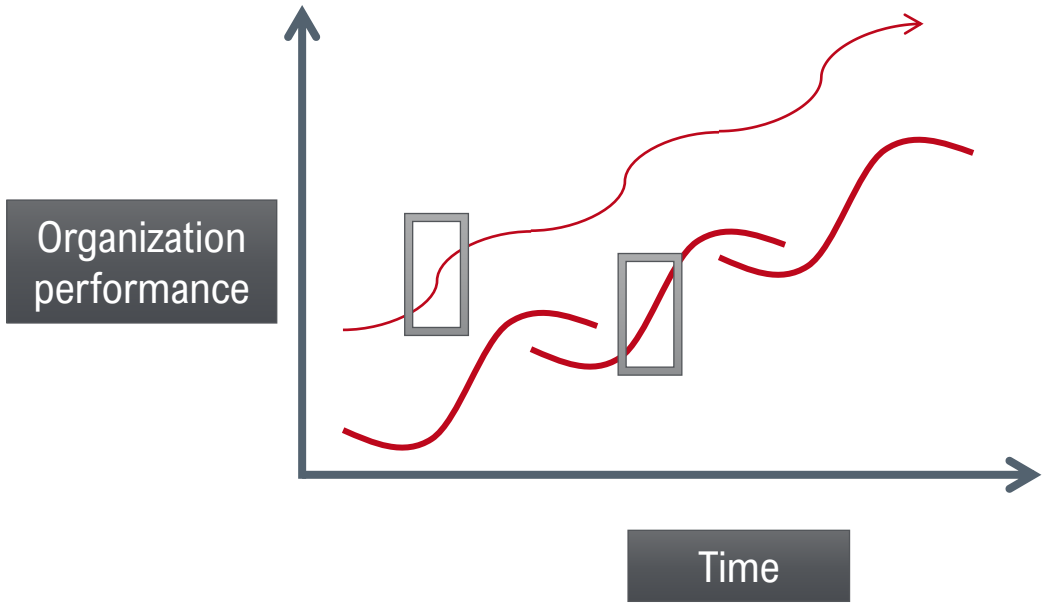


Diffusion of innovation

Climbing and jumping an S-curve is an art as innovation windows always exist

- Usually, S-curves are not that smooth as the ones depicted in the diagram; the actual curves are full of ups and downs, highlighting major events that affect the adoption or negative view of a new product or service by the market.
- The parts outlines within grey rectangles, are known as the *"vertical"* parts, that is depicting the point in time that major adoption of a new idea or business venture takes place. At this point, increase of users / adoption is expected to be exponential.

Climbing and jumping S-curves



Diffusion of disruptive innovations

- **Forecasting and the S-curve become misleading**
  - They ask wrong questions and track wrong data
  - Alternative technologies are not the problem
  - Intersection of new trajectory and potential market need

- **Markets for disruptive technologies do not exist – so, they cannot be analysed or forecast:**
  - Process of trial-and-error versus selection
  - Systematic experimentation and learning
  - Technology and markets co-evolve
  - Suppliers and customers co-determine

Diffusion of disruptive innovations

- **Incumbents usually miss on the potential of disruptive technologies**
  - Such technologies are often simpler, cheaper and lower margin
  - They first appear in niche or emerging markets – and, thus, have no or little value to current customers and markets
  - Start-ups and new entrants have more incentives to experiment in niche markets
  - (Few) successes move into larger, established markets
  - Incumbents may then attempt to respond with improvements in sustaining technology
  - Incumbents finally attempt to exploit disruptive technology, but with limited success (late entrance)

Factors influencing adoption

- **Relative Advantage**

  The degree to which an innovation is perceived as better than the product it supersedes

- **Compatibility**

  The degree to which an innovation is perceived to be consistent with existing experiences and needs of customers

- **Complexity**

  The degree to which an innovation is perceived to be difficult to understand or use

- **Trialability**

  The degree to which an innovation can be experimented with on a limited (trial) basis

- **Observability**

  The degree to which the results of an innovation are visible to others

5. Innovation Selection

Innovation as a process

- **Phase 1: Search**
  - Scan the environment – process opportunity/threat signals
- **Phase 2: Selection**
  - Decide which of the signals to respond to (in alignment with business strategy and competencies)
- **Phase 3: Implementation**
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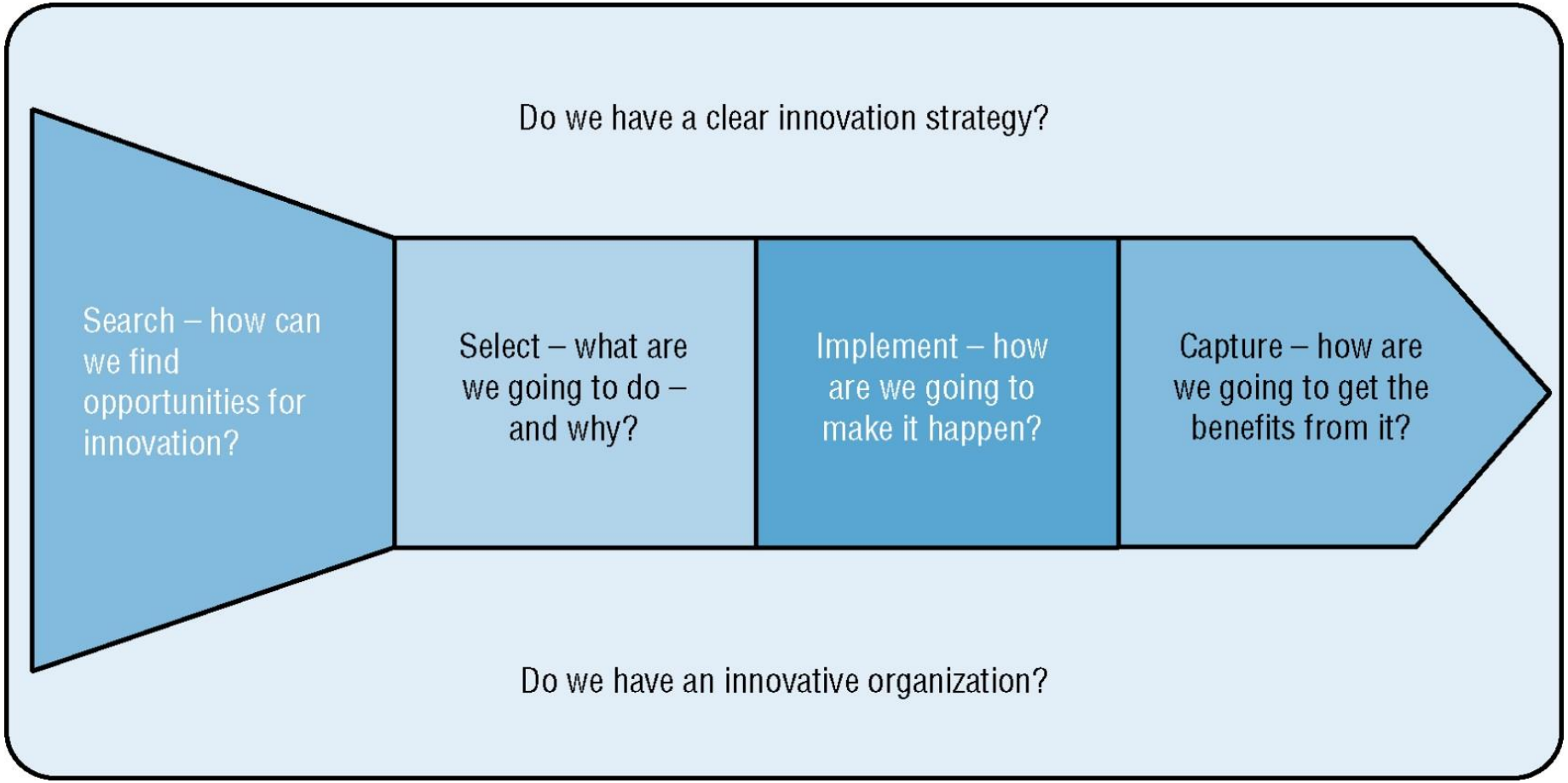
  - Generate returns; protect gains from competition; achieve learning for future endeavors.

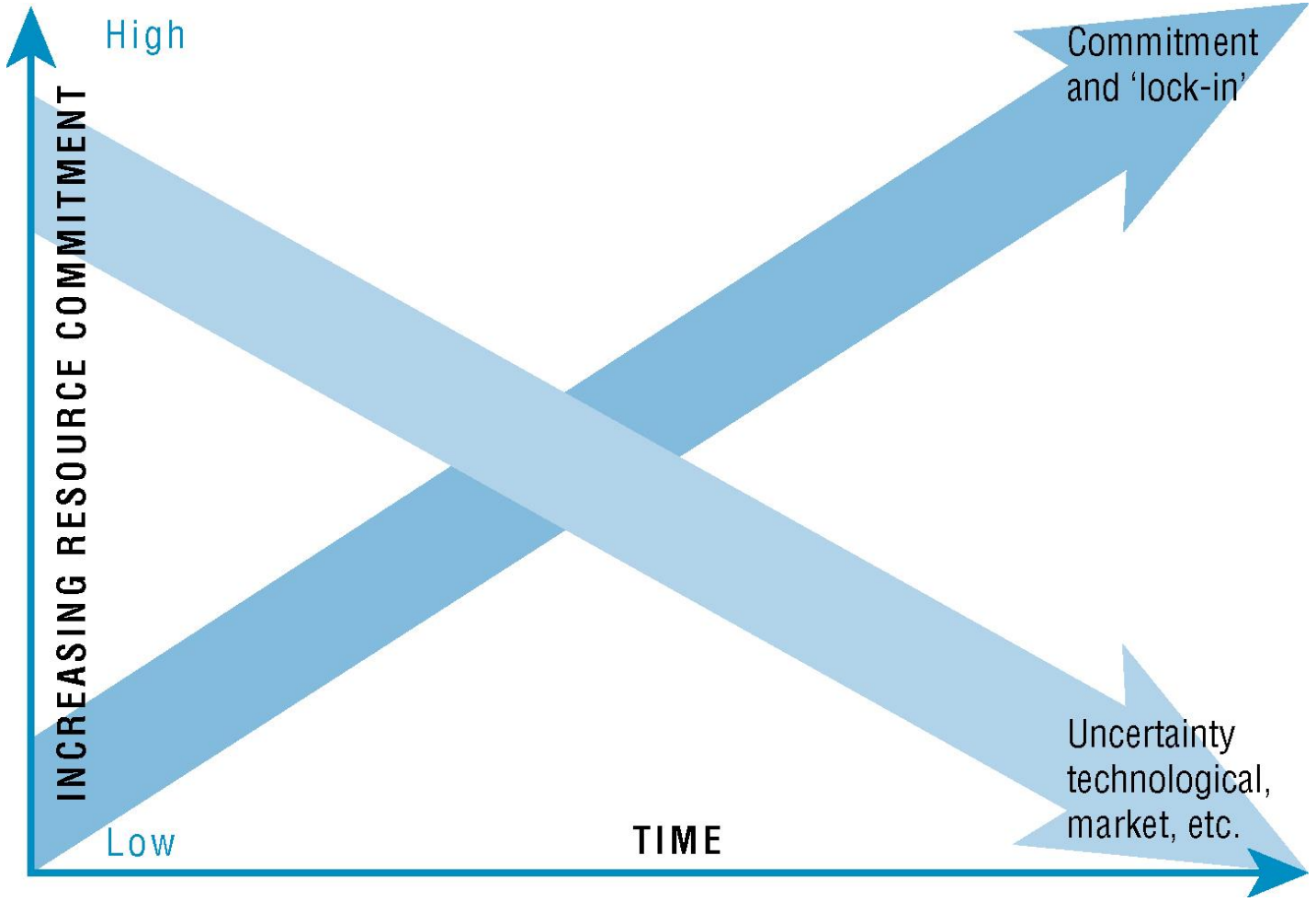
Innovation as a Process



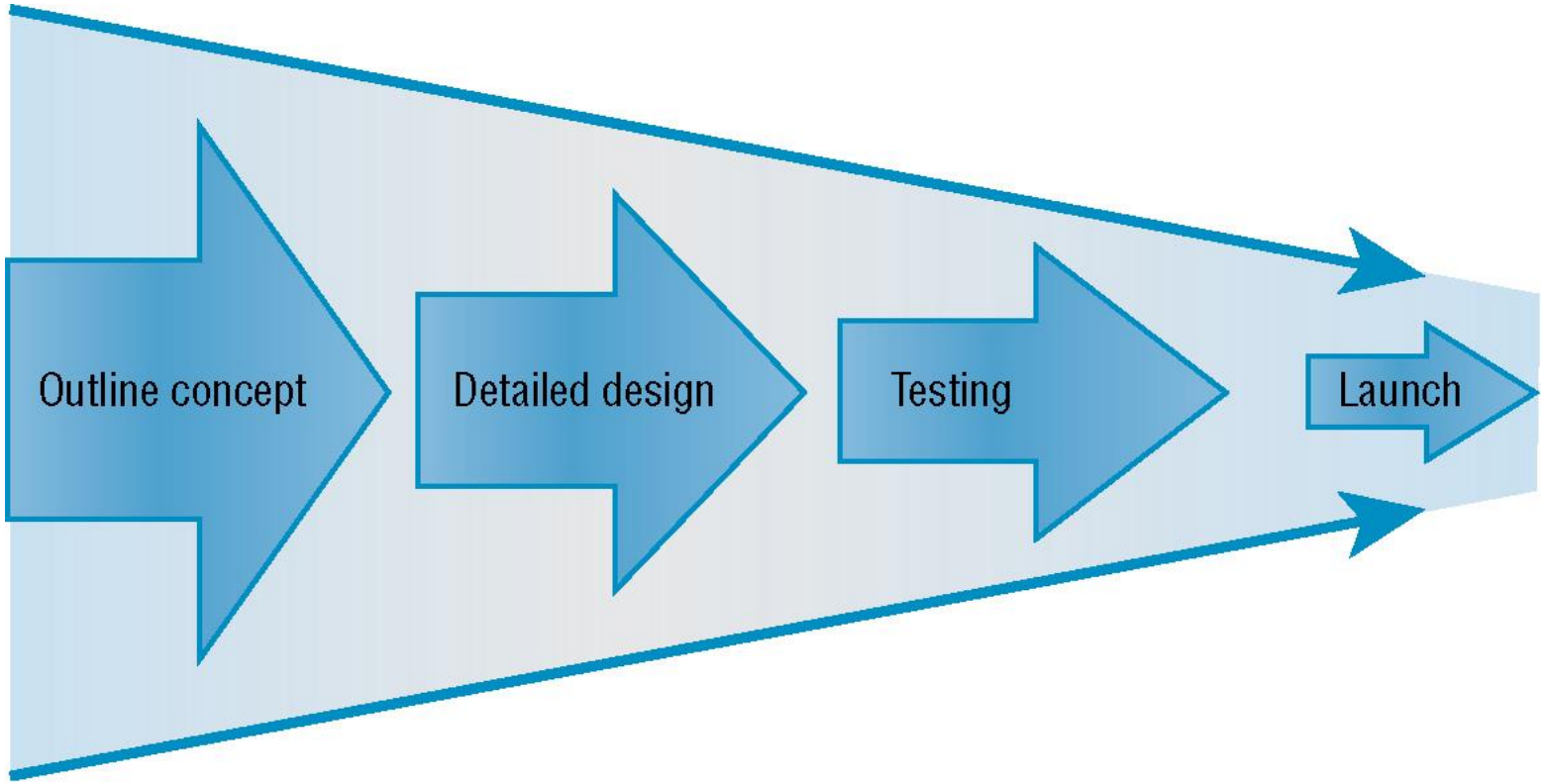
Meeting the challenge of uncertainty

- Innovation management is about **transforming market uncertainty into a calculated risk**
  - There can never be a guarantee of success; but, we can review options and assign approximate probabilities to the chances of successful outcomes
  - Knowledge is the key to this process: the more we know about something the better we can calculate risk
  - This puts a premium on early knowledge (acquired through R&D, market research, competitor analysis, trend-spotting, etc.).
  - We can think of innovation as a process of reducing uncertainty while increasing resource commitment (see next two slides)

Resource commitment vs uncertainty



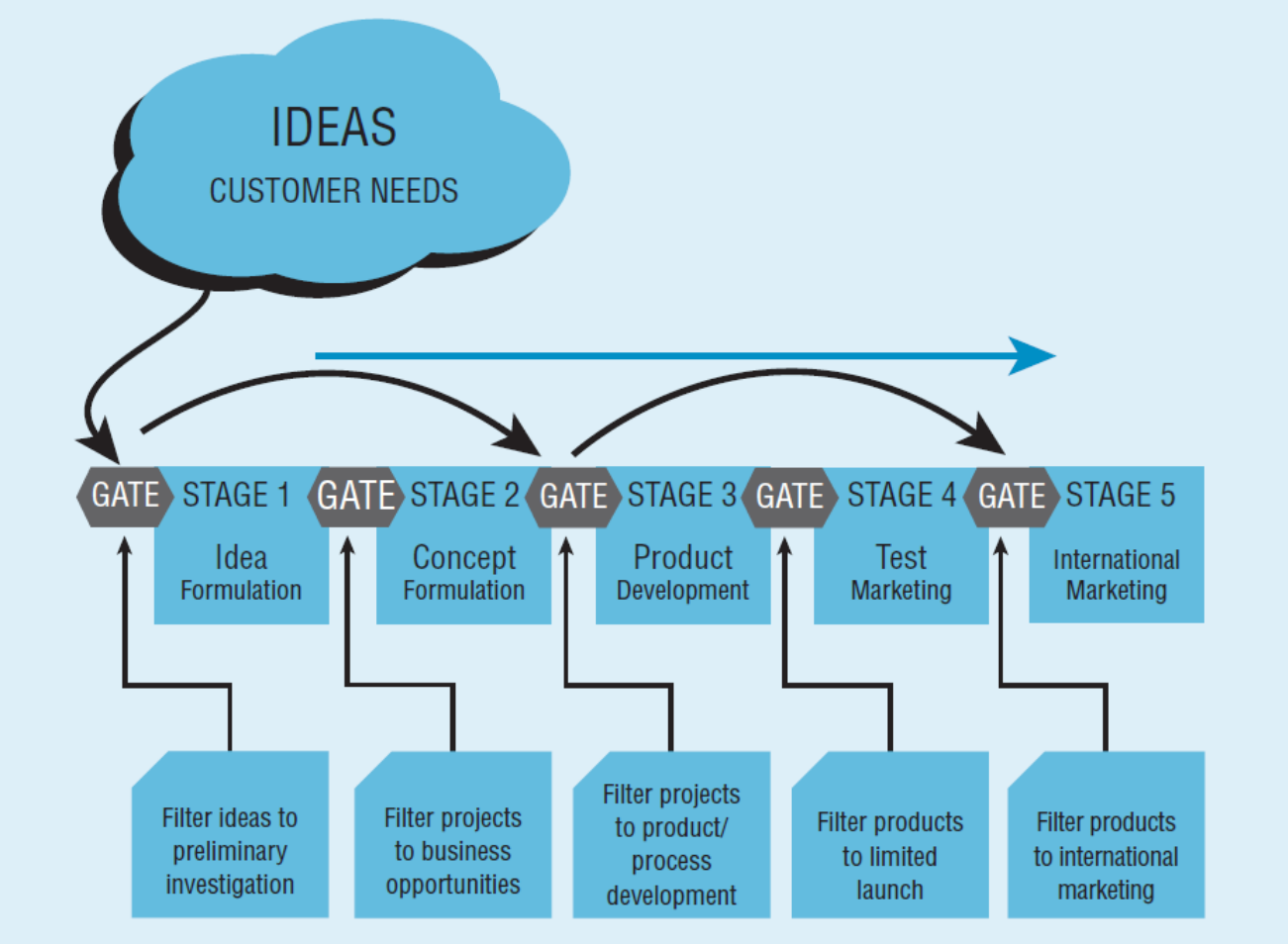
The innovation funnel



Stage-gate models

- Looked from a project management perspective, managing innovation is a balancing act between the costs of continuing with projects that may not succeed and the dangers of closing down too soon on promising opportunities
  - Structured systems with clear decision points and agreed criteria are needed
  - **Staged review process**: a series of stepwise decisions is better than early commit-everything rulings
  - This decision-making model essentially involves putting in a series of **gates at key stages** and then reviewing the project's progress against clearly defined and agreed criteria: the gate 'opens' only if these criteria are met/passed (*see next slide*)

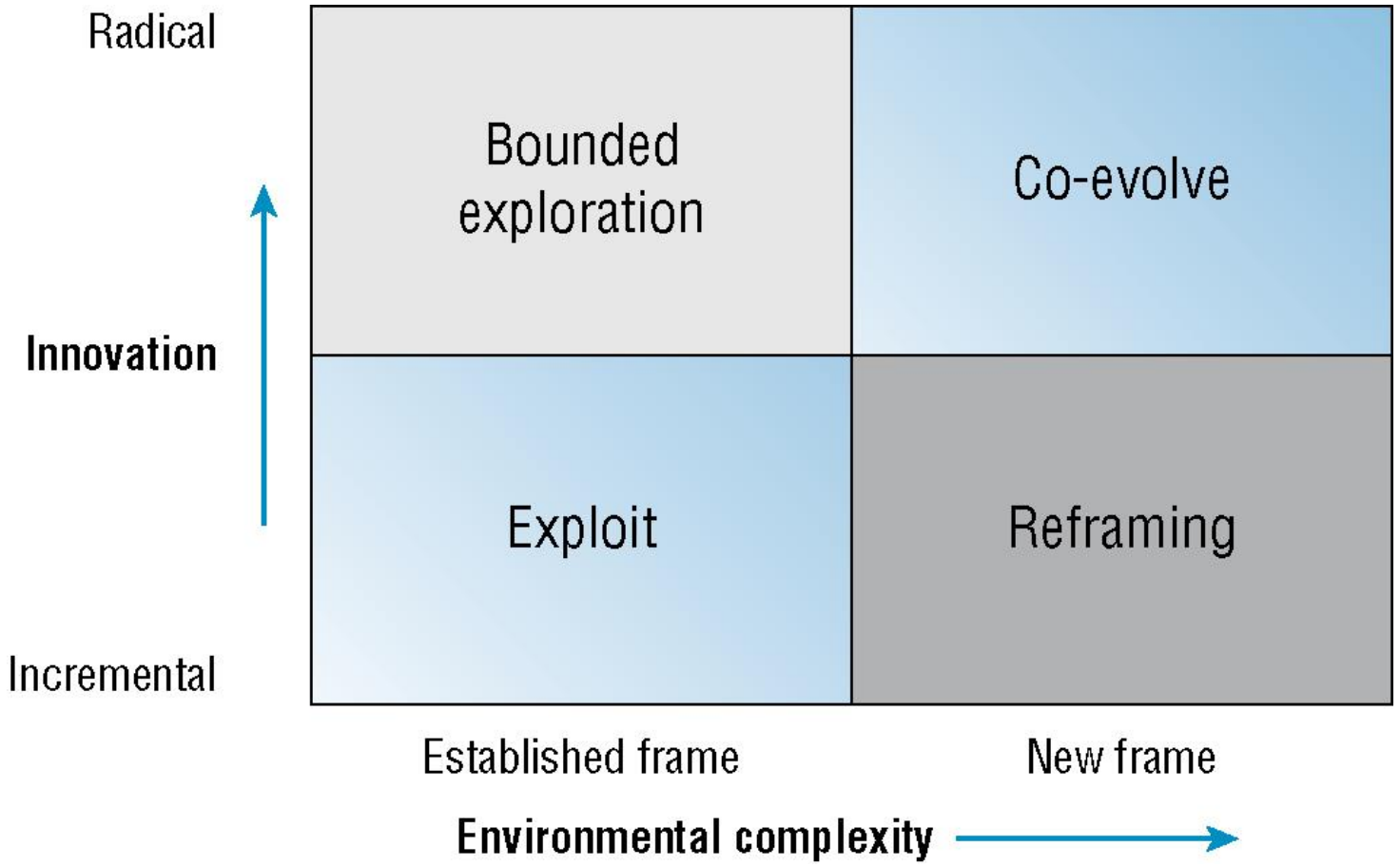
Stage-gate models



Spreading the risk-project portfolios

- Even the smallest firm will need to **manage a number of innovation activities running at the same time**
  - This poses the question of *which* projects to devote resources to, balancing risks and rewards that change all the time
- **Portfolio management** is about managing an array of simultaneous projects. Without it there may be:
  - **No limit to projects taken on** (resources will be spread too thin)
  - **Reluctance to kill (de-select) projects (leading to resource starvation, cost overruns and failures)**
  - **Lack of strategic focus in project mix (unimportant projects, random selection, opportunity costs)**
  - **Ambiguous selection criteria (politics, power games, emotions as determinants of project selection)**

Mapping the selection space



Mapping the selection space

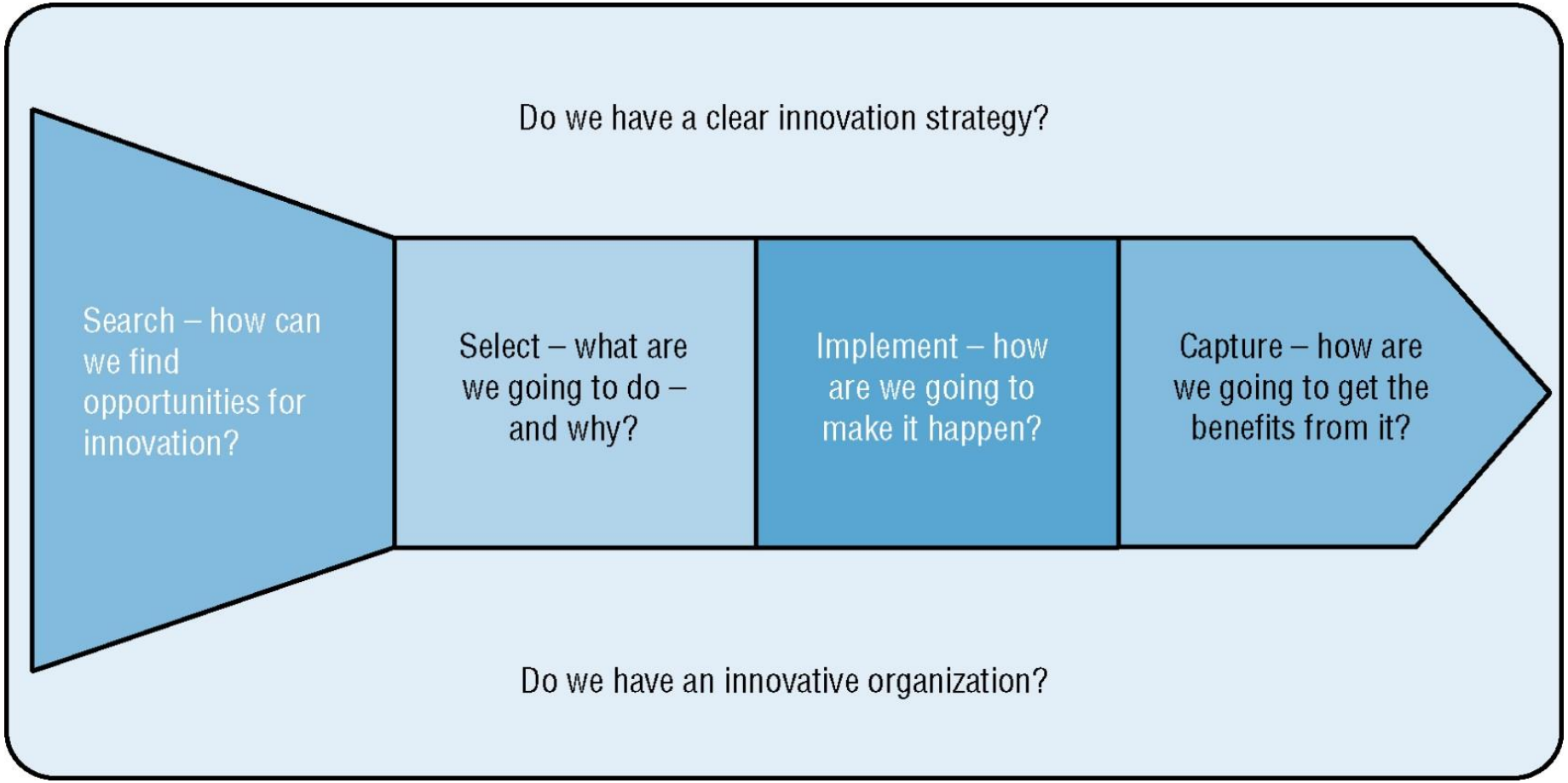
- Zone 1: **Exploit** (stable frame; incremental innovation)
  - *Selection routines*: portfolio management; stage-gate models; clear resource allocation criteria
- Zone 2: **Bounded exploration** (stable frame; radical innovation)
  - *Selection routines: strategic decisions; acts of faith; champion-based*
- Zone 3: **Reframing** (new frame; incremental innovation)
  - *Selection routines: cooperation with outsiders; networking, incl. with start-ups; mobilize entrepreneurship*
- Zone 4: **Co-evolving** (new frame; radical innovation)
  - *Selection routines: difficult to define ('be there – be there early – be there actively')*
  - Bitcoin and blockchain zone?

Exercise 1 (5 minutes)

1. Use the map of the selection space (slides 48-49) to position the following blockchain-related innovations: (1) sidechains; (2) smart contracts; (3) DAOs, (4) NFTs, (5) Metaverse. Explain why you think each of them fits in what quadrant in the map.

6. Process for New Product Development

Innovation as a Process



Implementation processes

- After **searching** (generating innovation ideas) and **selecting** (choosing among alternatives), an organization is faced with the challenge of **implementing** the chosen ideas into marketable products or services
  - Implementation usually takes the form of organizing and managing innovation **projects** (the process is known as **New Product Development – NPD**)
  - But, sometimes, it may also involve New Venture Development (NVD), like joint ventures, spin-offs, spin-outs, etc. (not covered in this session)

NPD challenges

- **Most organizations are not good at developing new products** (or services or ventures)
  - They have been designed and structured for a different purpose: serving day-to-day operational needs.
  - In contrast, new product development is an infrequent and unusual requirement.
- So, the first decision is: what kind of **team** to put together to do NPD?
  - **Functional teams**: people from a single department/division, typically research, marketing or design
    (✓ coherent groups; ✕ beware of organizational myopia)
  - **Project teams: cross-functional groups, dedicated to NPD**
    (✓ more effective at bringing ideas to fruition; ✕ loss of touch with everyday business)
  - **Matrix teams: teams of people from different functions who also retain their normal jobs**
    (✓ very effective; ✕ difficult to manage; beware of organizational politics and day-job priorities)
- **Project management structure is strongly correlated with product success**.

A Simple NPD model

Most models (stage-gate, funnel, etc.) basically consist of **four basic steps**:

1. **Concept generation**: identifying opportunities for NPD
2. **Project assessment/selection**: choosing projects that satisfy certain criteria
3. **Product development**: translating the chosen concept into a real product (or service or position …)
4. **Product commercialization**: testing, launching and marketing the new product

1. Concept Generation

- Market-pull or knowledge-push?
  - The best strategy is dependent on the novelty of the new product
  - Incremental innovations are typically based on addressing market needs
  - **Radical innovations** are usually the result of new technologies (scientific/engineering/design discoveries)
- Important: **customers do not buy technologies; they buy products/services for the benefits they see in them**
- What benefits would make customers adopt Bitcoin? (or smart contracts, other blockchain apps, etc.)
- Do they even need to know about Bitcoin/blockchain? (how many Internet users know of TCP/IP?)
- Some form of market research is important even for the most radical innovation
- This stage is usually referred to as **the fuzzy front-end**

2. Project assessment/selection

- **Costs of failure** to select the 'best' project:
  - **Scarce resources are under-utilized** (spent on sub-optimal projects)
  - **Opportunity costs** of other projects (which may have succeeded with additional resources)
- **Filtering levels**:
  - **Specific project plan**
  - **Aggregate plan** (new product development **portfolio**)
    - Integrate projects into a product mix aligned with the company's strategy
    - Distribute resources across projects
    - Develop a capacity plan to balance supply and demand of resources

3. Product Development

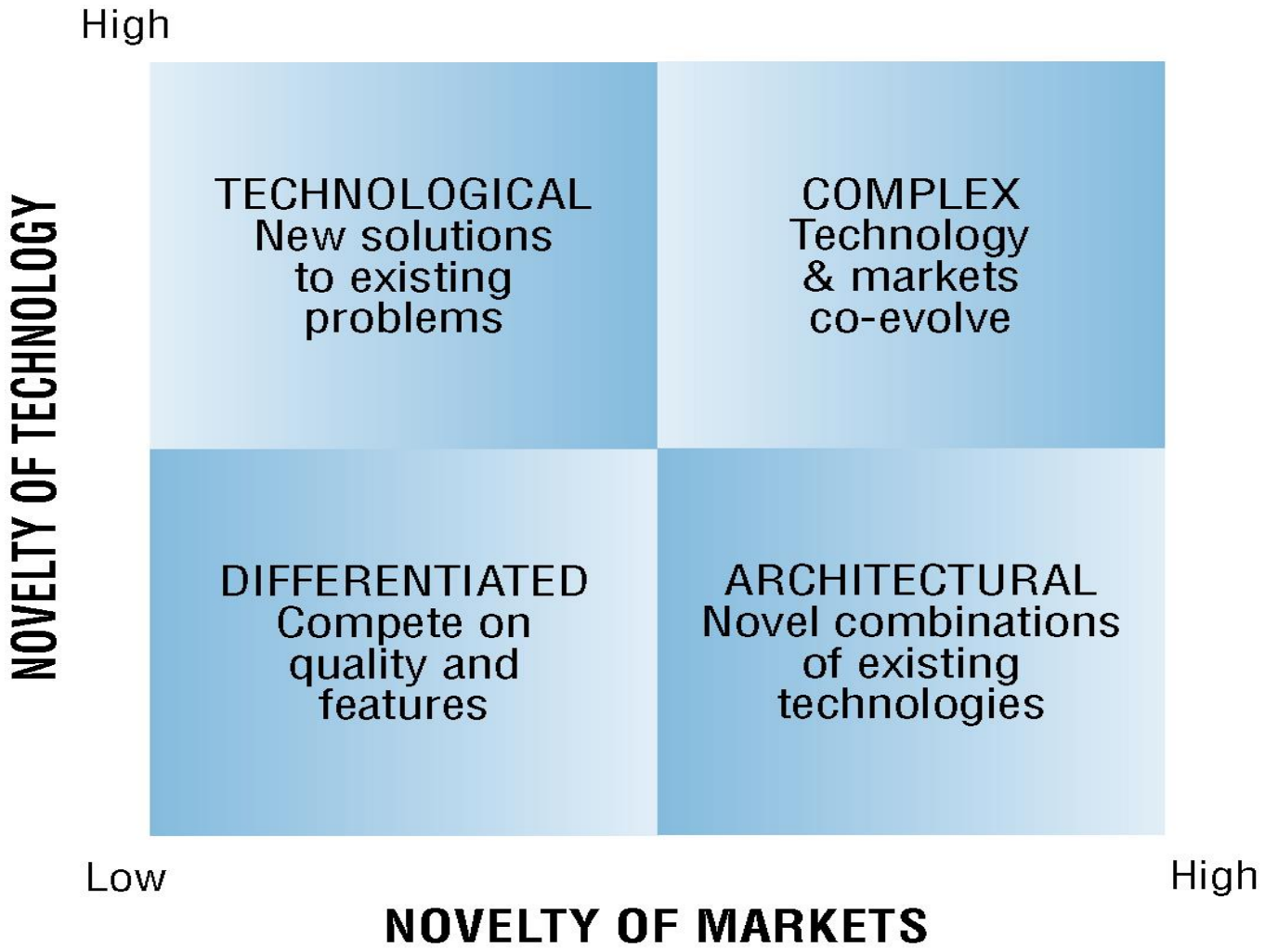
- This stage includes **all the activities necessary for delivering a product ready for commercialization**.
  - Team structure is critical for success
  - **Cross-functional teams** are in best position to solve specific issues and make decisions on the details
  - R&D, designers, engineers/developers, and marketing
- Product development typically works in ***design – test – build*** **cycles**
  - Addresses, in an iterative cycle, gaps between current product design and changing market requirements
  - Determines the speed and effectiveness of the problem-solving process
  - The **participation of actual users/customers** is important at this stage

4. Product Commercialization

- It **may be combined with the previous step** (product development), especially when customers are involved in the process
  - Processes for yielding data on customer requirements: **customer co-development, test marketing, alpha/beta/gamma test sites**, etc.
  - Further to eliciting requirements, these processes also help **achieve customer buy-in and prime the market**
- Main **factors affecting commercialization success**:
  - **Product advantage**: real or perceived (in the eyes of the customer), performance-to-cost ratio
  - **Product definition**: target market, positioning strategy, esp. against competition
  - **Project organization/resources**: team structure, skill availability, proficiency of execution, effective information exchange, collaboration under pressure, top management support
  - **Risk assessment**: market, technological, regulatory, economic, etc.

7. Commercializing Technological and Complex Products

Different Types of Influences



Different Types of Influences

- Technological maturity and market maturity co-determine the influence on NPD:\
  - **Differentiated**: both technology and markets are mature. New products are incremental innovations and may differentiate on pricing, features, support, etc.
  - **Architectural**: Existing technologies are applied to new markets. New products address specific target segments (market niches). Innovation is typically user-led or co-developed.
  - **Technological**: New technologies emerge to satisfy existing customer needs. New products differentiate on performance or cost/performance ratio.
  - **Complex**: Both technologies and markets are novel and co-evolve. Novel technologies are implemented, which, over time, help create novel applications previously un-thought of or impossible to develop.
- Crypto-currencies, Blockchain:
  - **Bitcoin, Enterprise Blockchains, Fintech** as cases of a **technological NPD**?
  - **Smart contracts, Distributed Governance** as cases of **complex NPD**?

Commercializing Technological Products

- What's the difference? **Distinction between a technology (blockchain) and a product (an NFT)**
  - Remember: Customers do not buy technologies; they buy products!
  - **Technologists** are typically concerned with developing HW/SW; **marketing** must create products out of these.
  - **Marketing for consumers is very different from marketing for businesses** (e.g. lock-in relationships with suppliers may significantly increase switching costs; retail penetration affects adoption decisions)
  - It is easy to spot a technology that is not working; try to do the same with a product (products may fail due to inadequate logistics, poor branding, insufficient customer training, inappropriate marketing, competitive dynamics, and many more reasons)
  - **Attempting to differentiate a technological product based on functionality or performance can be expensive and futile** – it is necessary to identify why a potential customer might look for an alternative to existing solutions
  - Would customers *en masse* look into Bitcoin as an alternative to existing payment solutions? Why?

Commercializing Complex Products

- What's the difference? **Technologies and markets co-evolve as developers and potential users interact**
  - While the technical knowledge of first users (innovators) may be higher, there is still significant **burden on developers to educate potential users (Bitcoin/Ethereum learning curves)**
  - **Potential users may be unaware of, or unable to articulate, their needs**
  - **Expeditionary marketing**: how to learn as quickly as possible through experimentation; how to anticipate user requirements and pre-empt competitors
  - Choice of suppliers may be limited (**monopolistic or oligopolistic markets**). This influences many things:
    - **Potential rate of adoption** (may be multi-year)
    - **Cost of failure** (a single company's failure may adversely impact a whole market – see Silk Road, Mt. Gox, WannaCry and others)
  - The benefits of first-mover advantage versus the risks of leapfrogging competition

8. Conclusions

Conclusions

- Innovation management is a learned capability.
- But, each situation is different.
- Innovation practice will be different across sector, size, systems and scope:
- Smaller companies enjoy advantages, but need to institutionalize formal processes
- Companies will benefit from participation in innovation networks and clusters
- Social innovation plays a distinct role in developing new platforms and paradigms
- Successful innovation management is based on setting up effective routines
- Embedded patterns of behaving that result from repetition and reinforcement and reflect an underlying set of shared beliefs (culture)

Fast access to the market; integrated abilities; constant learning and adaptation

Conclusions

- Getting a project selected and funding depends on conceiving and presenting a convincing and thorough **business plan**.
- **Forecasting and s-curve diffusion of innovation** are useful models for understanding the adoption of innovations – but, they are not applicable to disruptive innovations.
- Factors that affect the adoption and diffusion of innovation include: **Relative Advantage, Compatibility, Complexity, Trialability and Observability**.

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Questions?

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