LIUC
Università Cattaneo

Innovation Management and New Product Development

Technology intelligence

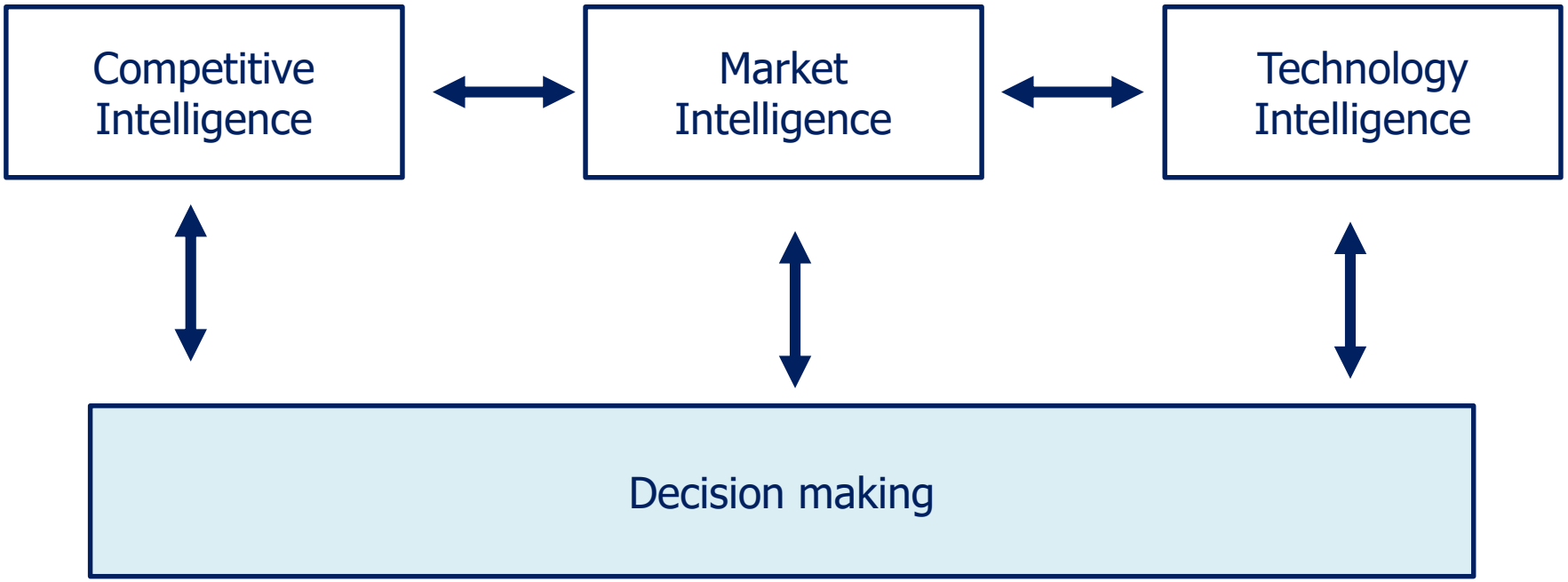
Agenda of today

Sources of information → dott.ssa Ballestra from Liuc library

Technology Intelligence

- What technology intelligence is
- Why to use technology intelligence
- How to use technology intelligence

Technology intelligence tools (focus on information analysis)


Competitive Intelligence
Market Intelligence
Technology Intelligence
Decision making

What is technology intelligence?

Some definitions…

*«Business & Technology Intelligence are **tasks** that support **decision-making of technological** and **general management concerns** by **taking advantage** of a timely preparation of relevant information on facts and trends (opportunities and threats) of the organization's environment by means of collection, analysis and dissemination.»*

(Lichtenthaler and Savioz, 2002)

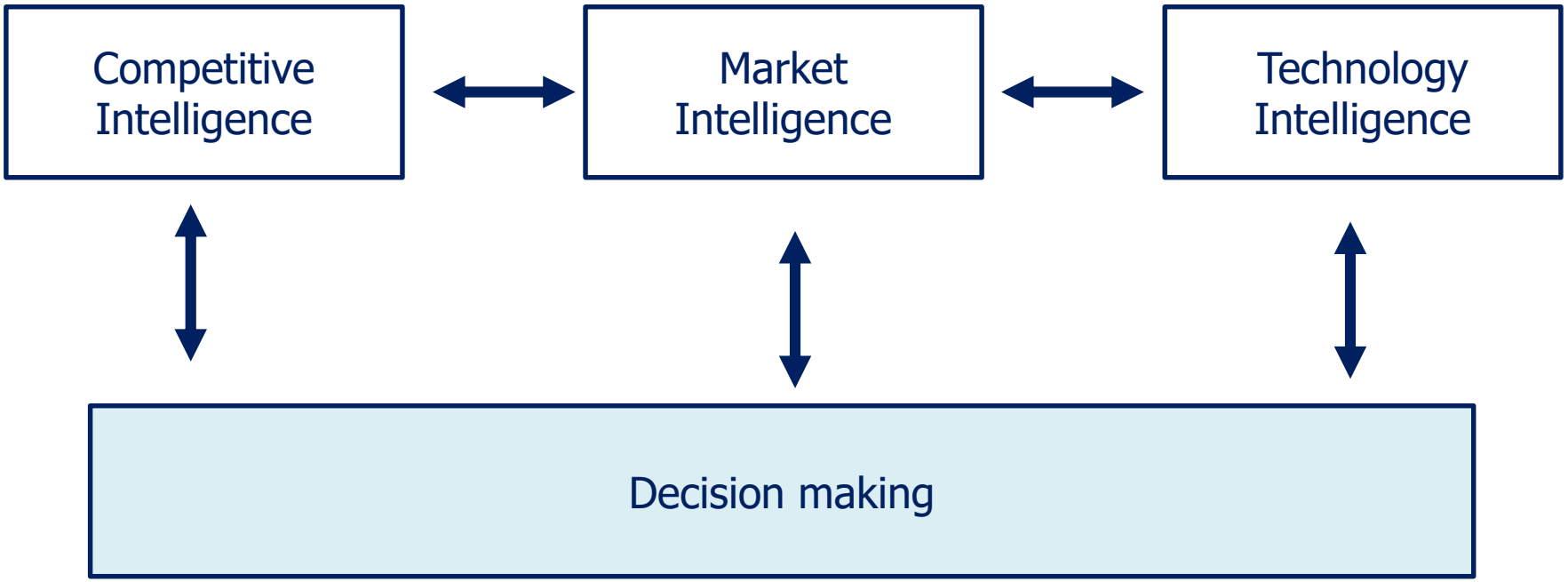
*«Collection and delivery of **information** about new technologies to **support decision making process** within an organization. An effective TI system will **warn** your company about technology **threats** and identify **opportunities**, in time for your (company) to act on the information.»*

Cambridge book of technology intelligence

Technology intelligence

*«The capture and delivery of **technological information** as part of the **process** whereby an organisation develops an **awareness of technological threats and opportunities**. »* (Kerr et al., 2006).

Why technology intelligence? And why business should do TI?


Competitive Intelligence
Market Intelligence
Technology Intelligence
Decision making

Several reasons...

- Changes in technology can have a significant impact on business
- Industry that did not anticipate the impact of ... Struggled to maintain the position in the market
- Identify technologies that have the potential to revolutionise an industry, early enough to allow your company to take on board a new opportunity or to react to a threat

In a nutshell…

What are the gaps between intelligence needs and intelligence provision?

How do firms do TI?

Technology intelligence process

The technology intelligence process should comprise the following steps:

Determination of the information needs

Information search

Information filter and analysis

Information communication

Why clarify the information need

"little internal acceptance"

"some wanted information is not received and some information received is not wanted"

Determination of information needs

- Which kind of decision should be supported?
  - Identification of opportunities
    - Emerging technologies
    - Exploitation of possessed proprietary technologies
    - Exploitation of existing available technologies not yet used in the business
    - Description of possible partners
  - Threat avoidance
  - Avoiding to invest in a technology too early or too much /too late or too poorly
  - Prioritizing R&D projects / supporting R&D project selection

- All technology strategy decisions should be supported by the TI process

What matters?

- What kind of information
- Company context, industry and product specificities
- Future and strategy
- Who the decision makers are and what information they want
- How to receive the information

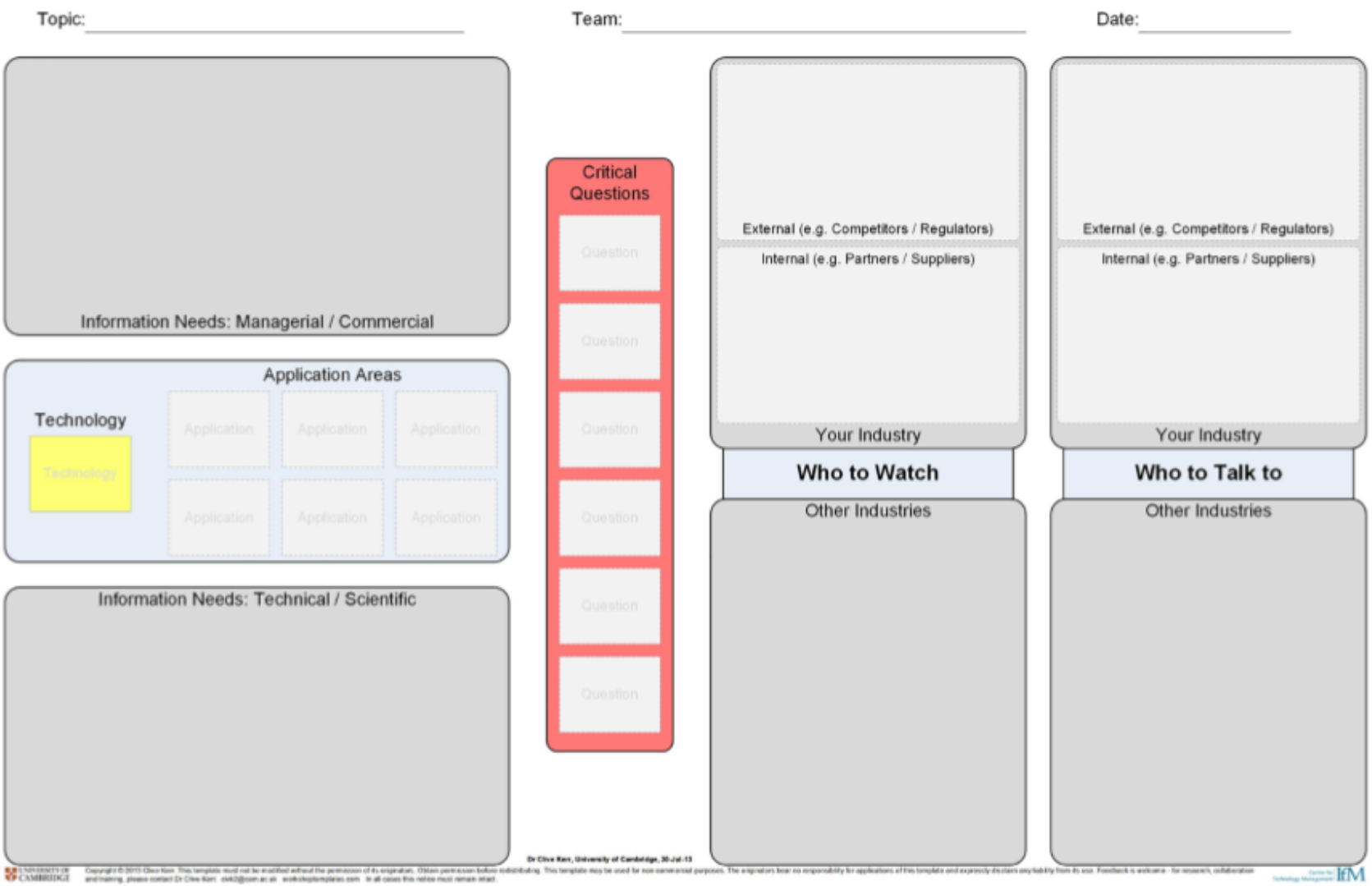


Fig. 1. Technology intelligence 'information needs' template.

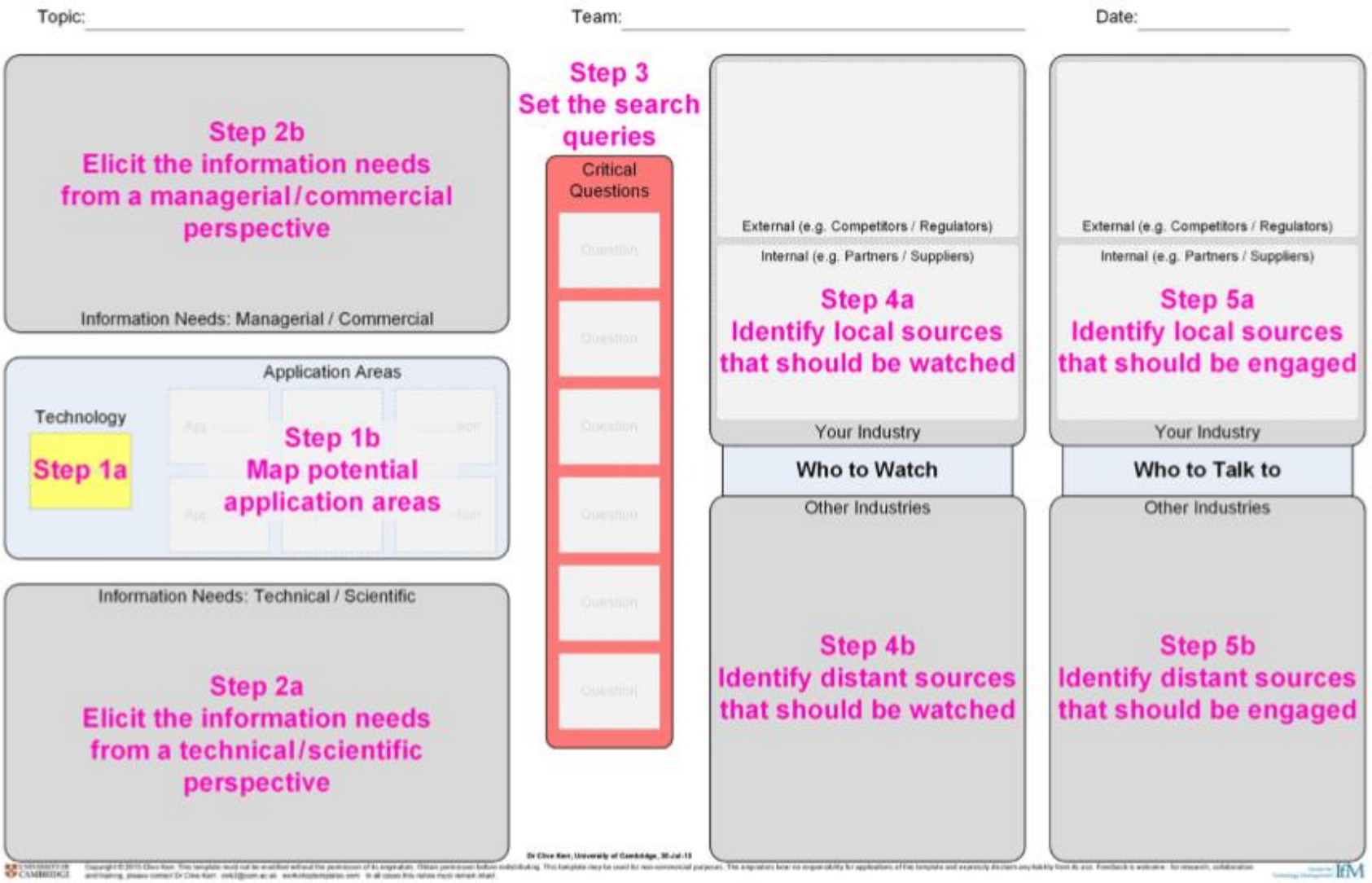
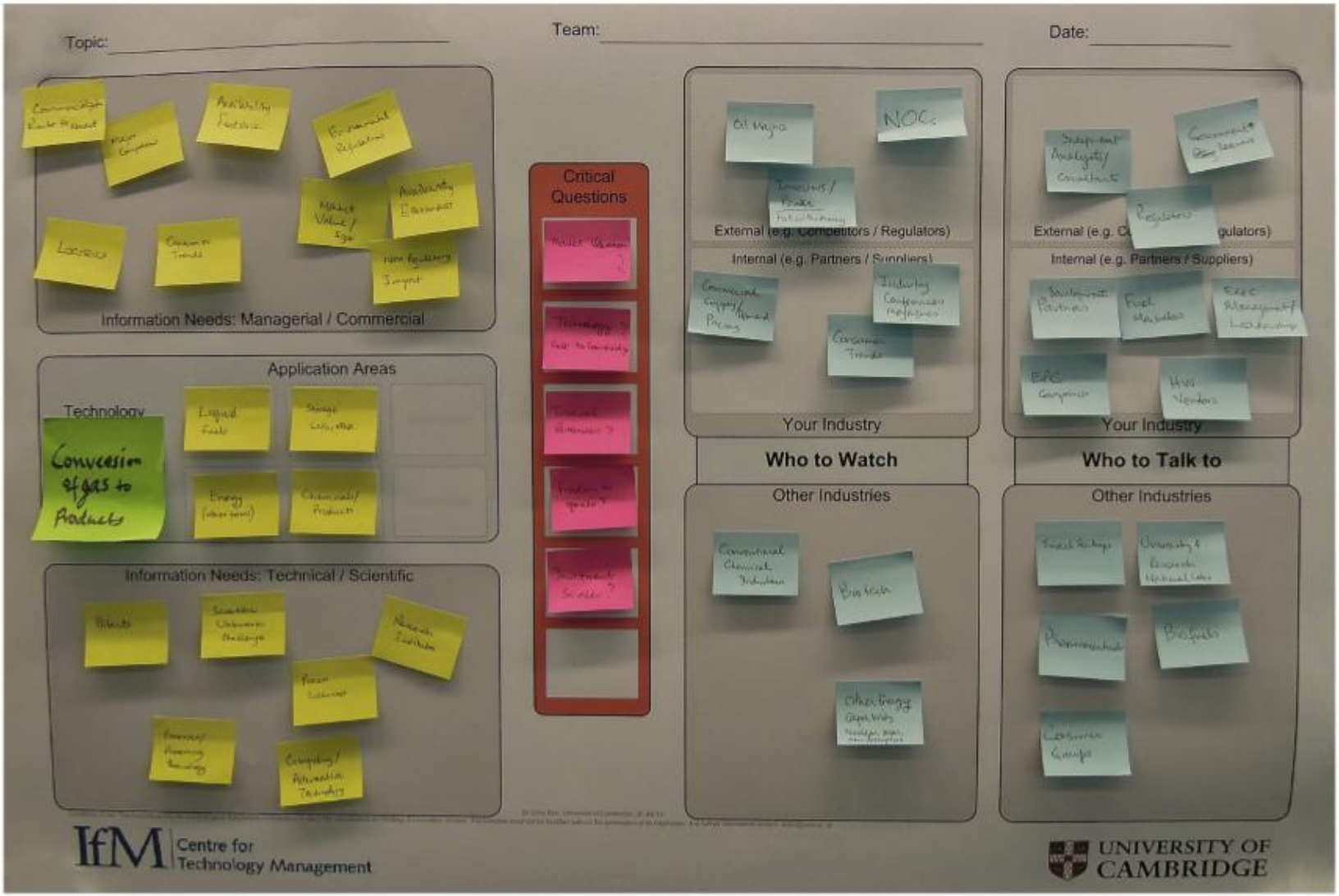
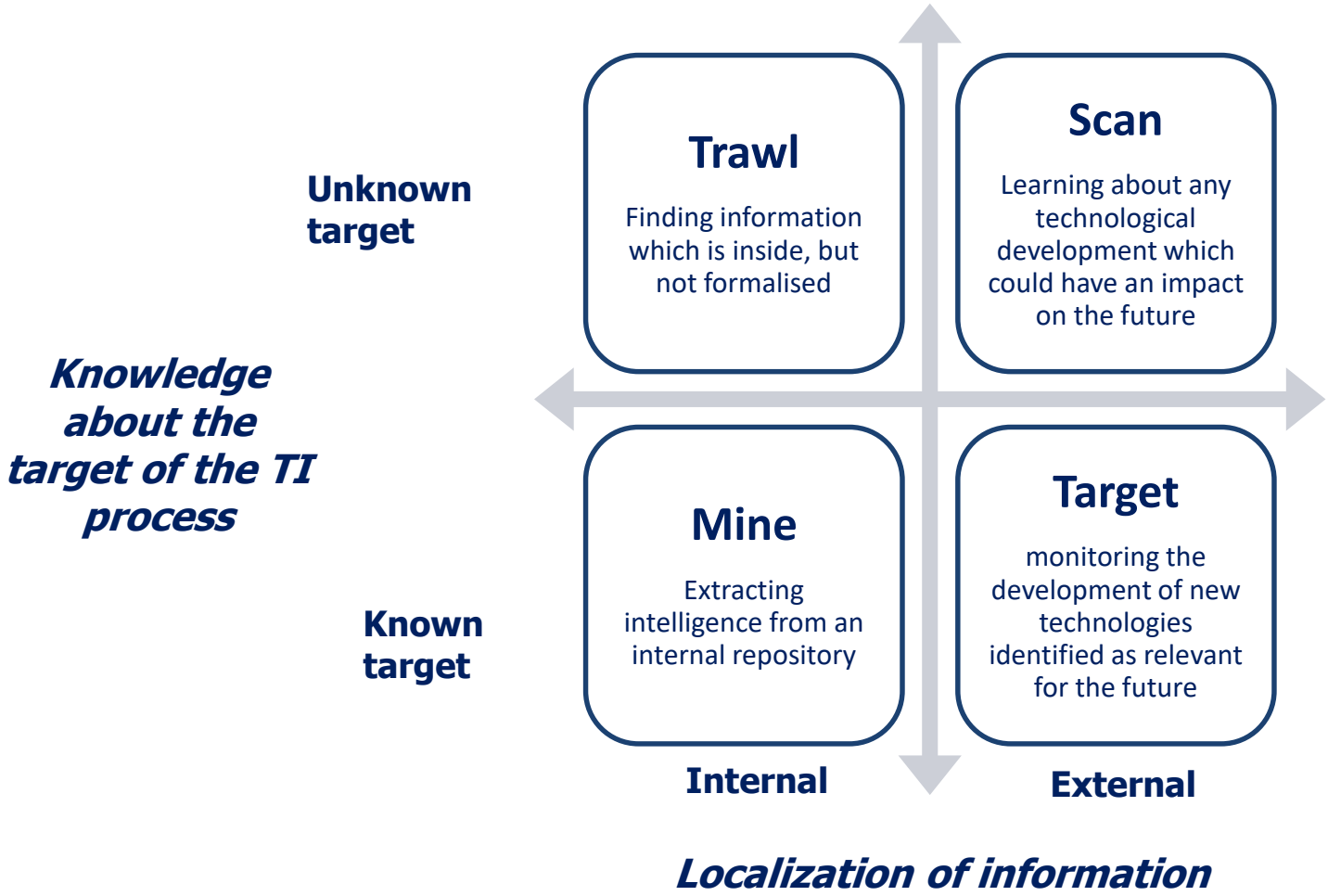


Fig. 3. Steps for completing the template.


Topic:
Team:
Date:
Information Needs: Managerial / Commercial
Application Areas
Technology
Conversion of gas to Products
Information Needs: Technical / Scientific
Critical Questions
External (e.g. Competitors / Regulators)
Internal (e.g. Partners / Suppliers)
Your Industry
Who to Watch
Other Industries
External (e.g. C
gulators)
Internal (e.g. Partners / Suppliers)
Your Industry
Who to Talk to
Other Industries
IfM Centre for Technology Management
UNIVERSITY OF CAMBRIDGE

Information search

Search modes



Information search

- Formal sources: journals, books, reports, studies, databases
- Informal sources: conferences, meetings, collaborations and alliances; expert circles

- Internal sources: employees from R&D, marketing, manufacturing, TI specialists
- External sources: external TI specialists, info broker

Information users:

- Internal researchers, engineers, decision makers, IT specialists

- External brokers, TI specialists

Source advantages and disadvantages

- Formal sources:
  - Advantages: Easy access, low priced, analyzed, structured, impersonal
  - Disadvantages: Late, widespread (non exclusive), analyzed, information overload

- Informal sources:
  - Advantages: Early (maybe), exclusive, non analyzed
  - Disadvantages: Expensive, non analyzed, doubtful, fuzzy, incomplete, personal, previous knowledge require

And other sources

- Publications
- Patents
- VC funds
- Start-up fairs
- Contacts to universities
- Consultants, extl. experts
- Scientific conferences
- Product fairs
- Commercial conferences
- Cooperations
- Suppliers
- Lead users
- Information brokers
- Stock market information
- Governmental programs
- Standards committee
- National research committee
- Financing PhD studies
- Sabbaticals
- Employ Post Docs
- Personal networks
- Journals, newspapers
- Databases
- WW

Factors influencing the choices

- Degree of formality (formal vs. informal, primary vs. secondary)
- Type of Sender (competitor, university, supplier, customer, ...) and its openness
- Stage of innovation (research vs. development, early vs. mature technologies)
- Industry specific technology development
- Directedness of information search (scanning vs. monitoring)
- Strategic importance of information need

Information filter and analysis

Information filter and analysis

- Information collected should be:
  - Filtered
  - Integrated
  - Assessed

- In coherence with the information needs

Information filter and analysis

Methods for elaborating information can be distinguished according to:

- The (prevailing) nature of data
  - Quantitative methods
  - Qualitative methods
- The (prevailing) use
  - Explorative
  - Normative
- The time horizon
- The (prevailing) focus:
  - Internal
  - External

Communication

Communication

- Face-to-face dialog, meeting
- Video communication
- Phone / conference call
- Documents

- Mix of oral and document communication

Some tips

- "To ensure accuracy and completeness, always use more than one source of information." *(Coburn, 1999)*

- Large numbers of information sources do exist. The challenge is to choose the appropriate source for an information acquisition task.

- The relevance of information sources for a certain information acquisition task differs depending on the degree of formality, the type of sender… and the strategic importance of information need

In a nutshell…

How well does the company utilise available sources to satisfy its intelligence needs?

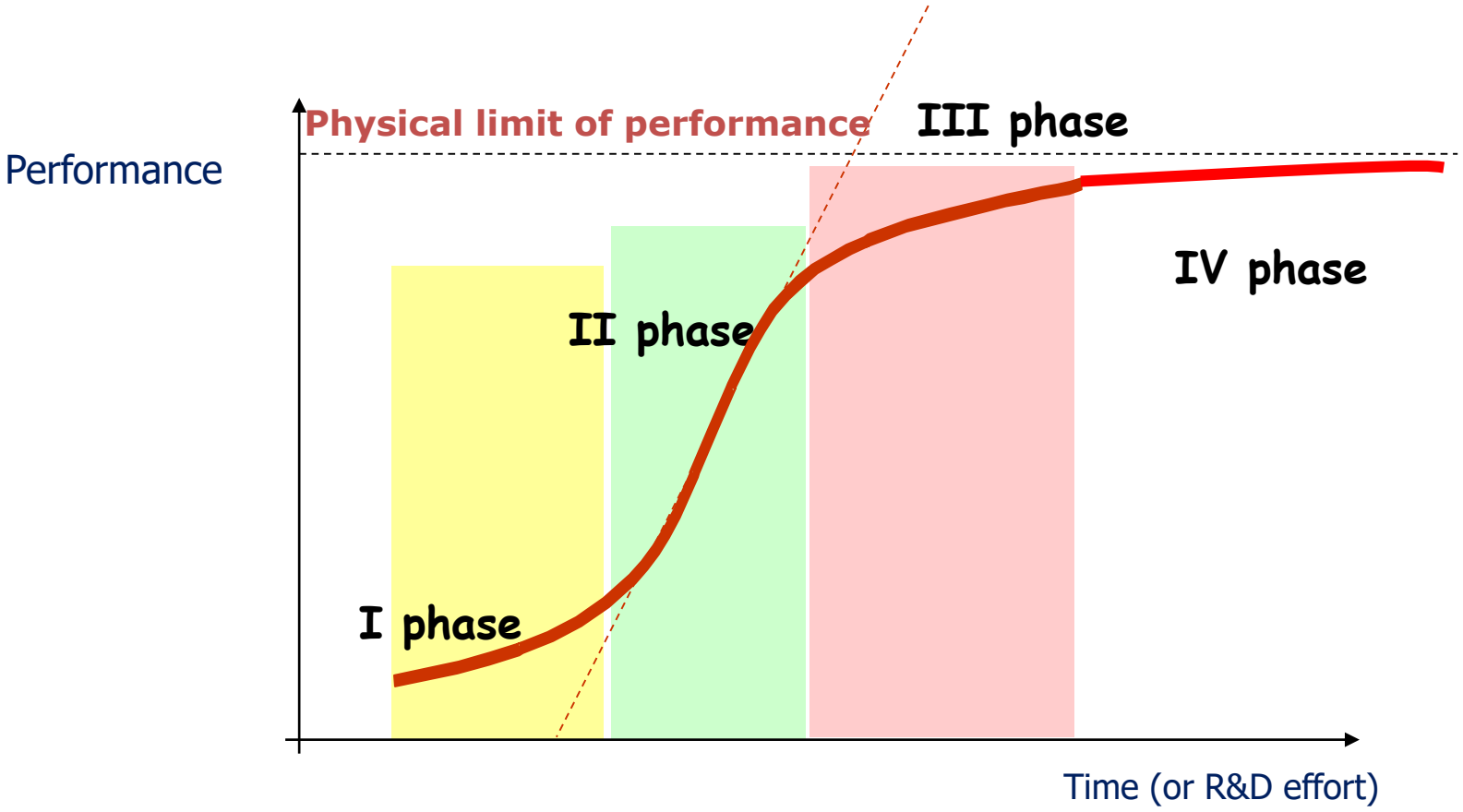
Technology Intelligence Methods

- S-curve
- Patent analysis
- Publication analysis
- Scenario analysis
- Roadmapping
- Relevance trees
- Delphi method
- Brainstorming
- Lead users analysis
- Quality function deployment
- Skill – application matrix
- Technical innovation audit
- Benchmarking
- ……

Technology intelligence – Methods

- The choice of the intelligence method should take into consideration:
  - Information needs and the type of use expected for results
  - Time, resources, competences available
  - Familiarity with the methods
  - Time horizon
  - Uncertainty
  - Strategic relevance of the TI process

S-curve


Performance
Physical limit of performance
III phase
IV phase
II phase
I phase
Time (or R&D effort)

S-curve

- The evolution of performance for a specific technology can be described with a S-curve (or substitution curve)

- Technology progress is not a casual process: the analysis of the historic evolution of performance paramenters (technical, functional or economic parameters) has demonstrated that these evolve with a regular path:
  1. Embrionic phase, with a very low imporvement of performance
  2. Growth phase, with a very rapid increase of performance
  3. Maturity, again with a low increase of performance
  4. Obsolescence, when the performance is asymptotically near to its limit

S-curve

$$y = \frac{L}{1 + ae^{-bt}}$$

- L= superior limit of performance y
- *b* defines the slope
- *a* defines the inflection point

- Parameters *a* and *b* are valuated on the basis of historical data

- Assumptions:
  - L is known
  - The form of the function is correct
  - Historical data allow to valuate *a* and *b* with statistical significance

Examples

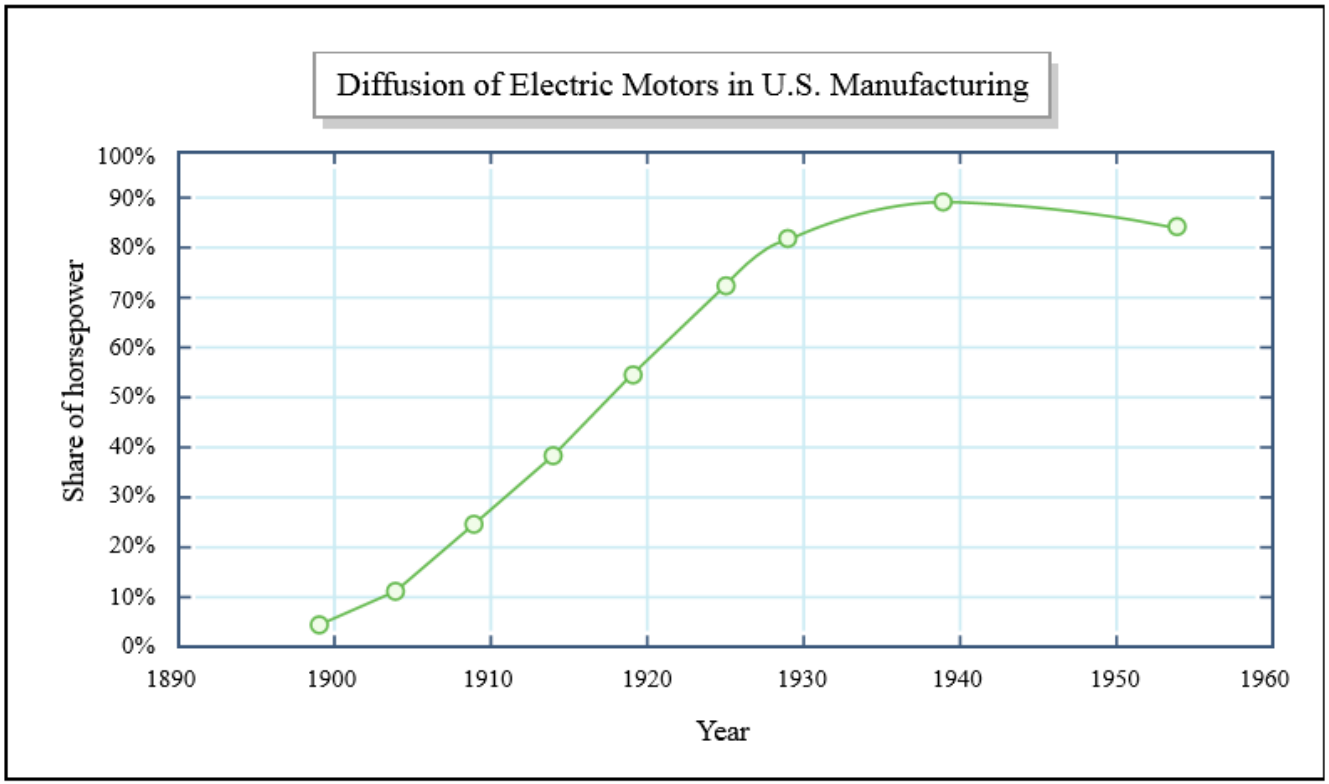
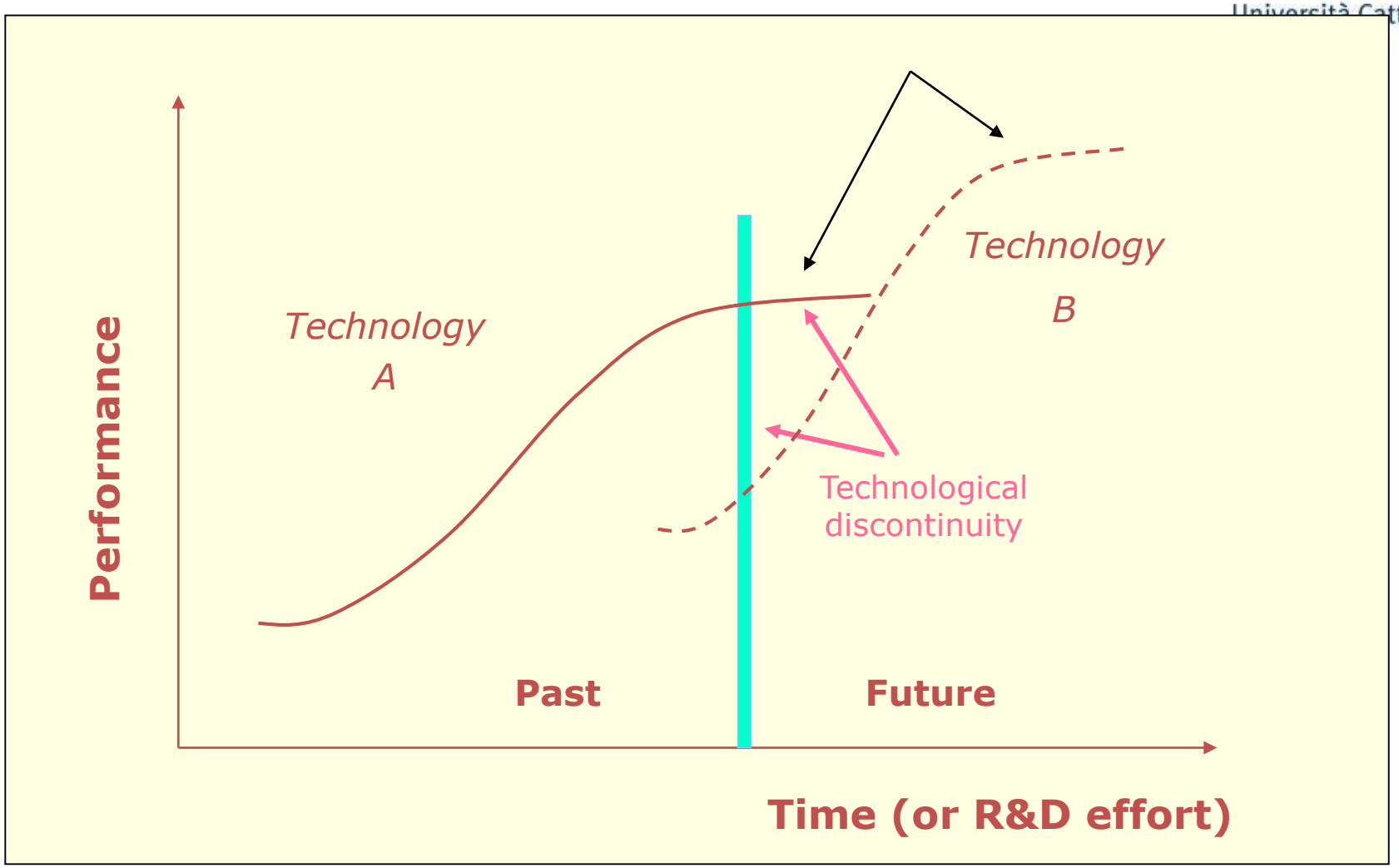


Image by MIT OpenCourseWare.

Hall, 2004

Substitution curves



S-curves, technological substitution and positioning

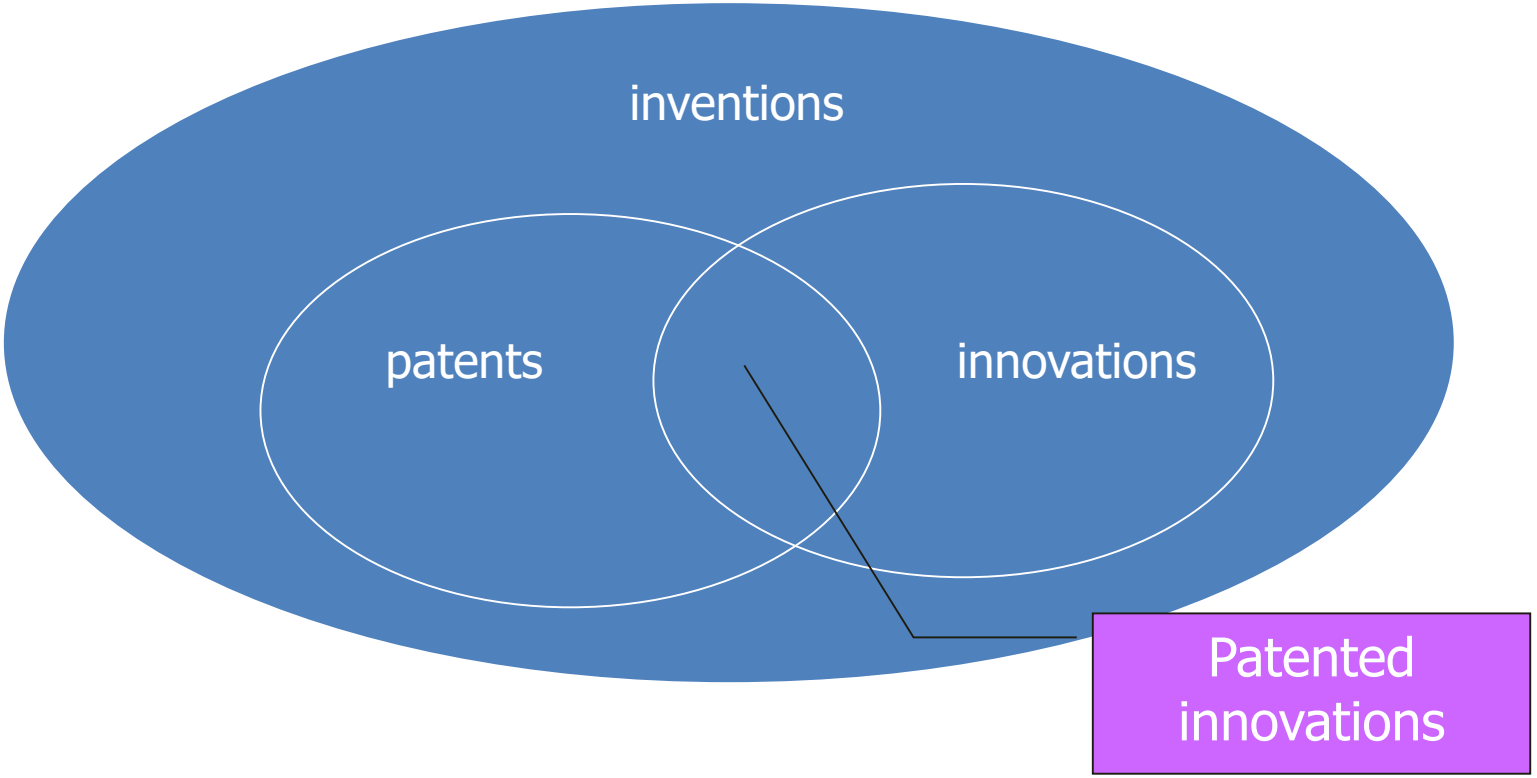
- Continuous investments in a mature technology allow for an incremental, limited improvement in performance with increasing marginal costs
- If a new technology, at a definite point in time, is characterised by higher performance with respect to the old one, firms are triggered to «jump» to the new one before the old has achieved its higher level of performance
- Companies that do not identify their position and /or do not recognize the level of maturity of a technology may fall into increasing investments with decreasing returns in terms of performance

S-curves: limits

- Time is a significant variable only if associated with continuous R&D effort
- It is difficult to estimate L, *a* and *b*
- Unexpected changes in the customer or competitors' behaviuor may lead to a different evolutionary path with respect to what estimated

Patent analysis

- Patents represent a highly relevant information source, even if:
  - Not all innovations are patented
  - What is patented is not always an innovation



Patent analysis

- Patent analysis can be used to:
  - Understand the positioning of a technology in its lifecycle
  - Identify and monitor major technological competitors
  - Valuate technological positioning with respect to competitors
  - Compare the patent strategy against competitors
  - Communicate the innovation activity

Example of patent indicators

- Top assignees identification
- Top assignees in main IPC classes;
- Top publication countries (and related evolution over time);
- Technology new comers identification;
- Main applications of a technology (patent classification classes frequency and relations);
- Technology new comers identification;
- Technology maturity definition;
- Average age of patents;
- Patent publication countries;
- Most cited patents;
- Patents classification analysis (e.g. IPC classes of patents);
- Bottom 10 IPC analysis (for technology niches identification);
- Top Priority Countries (and related evolution over time);
- Find-similar analysis per codes/keywords;
- Semantic analysis of patents;
- No. of alive and dead patents;
- Legal state/status analysis;

Publication analysis

- Use of databases of scientific and technical publications to verify:
  - The frequency of occurrence of papers on a specific technology
  - The citations of such papers
    - Indication of quality
    - Indication of correlations among different science – technology areas

Questions to answer

- For this specific technology, what are the implications of 'innovate vs wait' strategies?
- What advantages are available for investing 'early vs late'?
- Who might be potential partners? What are the options for 'make vs buy'?
- Are there research initiatives that we should consider joining? What are the licensing opportunities?