LIUC
Università Cattaneo

Innovation Management and New Product Development

Concerns and Challenges in R&D

Some concerns in R&D

- Organizing;
- Measuring;
- Financing.

ORGANIZATION IN R&D

R&D Organisation

- The problem is how to organise people involved in R&D or innovation activities

- This means deciding about:
  - Structure;
  - Formalization, standardization,
  - Centralization/ decentralization;
  - Internationalization;

- Size matters

Formalization and standardization

- **Formalization** is the degree to which the firm utilizes rules, procedures, formal codified documentation to define the behaviour of individuals or groups
  - Allows to increase efficiency, standardization, control; makes the firm more rigid, stifles creativity

- **Standardization** is the degree to which activities are performed in a uniform manner
  - Ensures quality levels and reliability; may stifle creativity and innovation

Centralization vs decentralization

- **Centralization** is the degree to which decision - making authority is kept at top levels of the company
  - Enables economies of scale, division of labour among specialists, internal coherence;
  - Avoids duplication;

- **Decentralization** is the degree to which decision - making authority is pushed down to lower levels of the firm
  - Enables flexibility, exploitation of diversity, fit with different market and company's characteristics

R&D internationalisation

- Big companies increasingly spend money in foreign R&D units;
- Small companies are forced to build up an international R&D (by means of alliances and collaborations);
- The internationalisation of R&D activities creates great opportunities, but also significant risk;

Guidelines for defining the R&D structure

- Input-oriented organisation:
  - By scientific discipline/technological area;
  - By activity;

- Output oriented organisation:
  - By product line;
  - By project;

- Matrix organisation;

Input oriented organisation
Organisation by scientific discipline / technological area

- Scientists and researchers are grouped in coherence with their scientific or technical specialisation

- It’s typical within universities

Input oriented organisation
Organisation by type of activity

- Scientists and researchers are grouped in coherence with the specific phase of the innovation process (basic research, applied research, development)
- Typical in the pharmaceutical industry
- Advantages and limits are similar to the organisation by scientific / technical area

Input Oriented Organisation advantages:

- Researchers and scientists are highly autonomous;
- Favours the specialisation of competences;
- Favours the introduction of new researchers (common competences);
- Favours communication and interactions among people within the unit (again, common competences);
- Adequate to absorb competences and knowledge in the specific scientific / technical area;
- Favours economies of scale and the achievement of a critical mass;
- Adequate when innovation is the result of activity within a single scientific / technological area;

Input Oriented Organisation disadvantages:

- Low focus on the commercial aspect of innovation;
- Low integration with other disciplines;
- Low focus on time as a critical performance for innovation;
- Coordination with other units (either internal or external) is difficult (no common competences);
- Low flexibility;

Output oriented organisation
By product line

- Scientists and researchers are grouped in coherence with the specific product line / business area in which they operate

- It’s typical in divisional companies

Output oriented organisation
By product line Advantages

- High focus on innovation and market;
- High focus on customers;
- High integration with other units within the same business unit;
- High flexibility in new product development;
- High focus on costs and time;

Output oriented organisation By product line Disadvantages

- Duplication of resources and activities;
- Low flexibility of resources (for transfer to other units);
- Scientists knowledge is not up-to-date;
- Scientists and researchers are not autonomous in their work, because of the high market pressures;

Output oriented organisation
By project

- Scientists and researchers do not belong to a stable and definite group, but are assigned to specific projects. When free from projects, they have the time to update their knowledge

- This organisation is aimed at overcoming the problems deriving from the strong division among different groups. Flexibility increases as well

- It is not very diffused

Trade off between input and output oriented

- Factors influencing decisions between input and output oriented:
  - **Dynamic of scientific evolution:** input oriented is more adequate when the specific discipline / technological area is evolving very rapidly;
  - **Diversification:** output oriented is more adequate for highly diversified companies;
  - **Technology maturity:** input oriented is more adequate for new technologies or scientific areas;
  - **Interdependences among different units within the company:** when relevant, output oriented is more adequate;
  - **Economies of scale:** when relevant, input oriented is more adequate;

- Very often companies face contrasting elements

Matrix organisation

- Input and output oriented criteria are used together
- The two dimensions of the matrix usually are:
  - The project
  - The scientific / technological area
- Depending on the role and power of the project manager, the matrix organisation can be:
  - Weak (the project manager has a lower power than the scientific area manager)
  - Strong (the project manager has a higher power than the scientific area manager)
  - Hybrid

The ambidextrous organization

- The problem of balancing different types of activities:
  - Exploration vs. Exploitation
  - Radical vs. Incremental innovation
  - Change vs. Stability
  - Efficiency vs. Flexibility
  - Organic vs. Mechanistic
  - Long-term vs. Short term oriented activities

- The ambidextrous organisation
  - Spatial Separation
  - Parallel Separation

PERFORMANCE MEASUREMENT

R&D performance measurement

- The problem:
  - High uncertainty
  - Intangible results
  - Lapse between investments and returns

Traditional measurement

- Input measurement:
  - R&D expenses
  - R&D investments
  - N. of researchers
  - ...
  - Expressed in absolute values or relative values (% with respect to turnover or profits)
  - Representing not only the quantity but also the quality of input
    - Example: % of employees with PhD

- The underlying (debatable) assumption is that the higher the input, the higher the output

Output measurement

- Directly referred to the R&D output
  - N. patents
  - N. new products launched
  - N. of process improvements introduced
  - …

- The underlying (debatable) assumption is that there is a positive correlation between the R&D output and the economic value generated

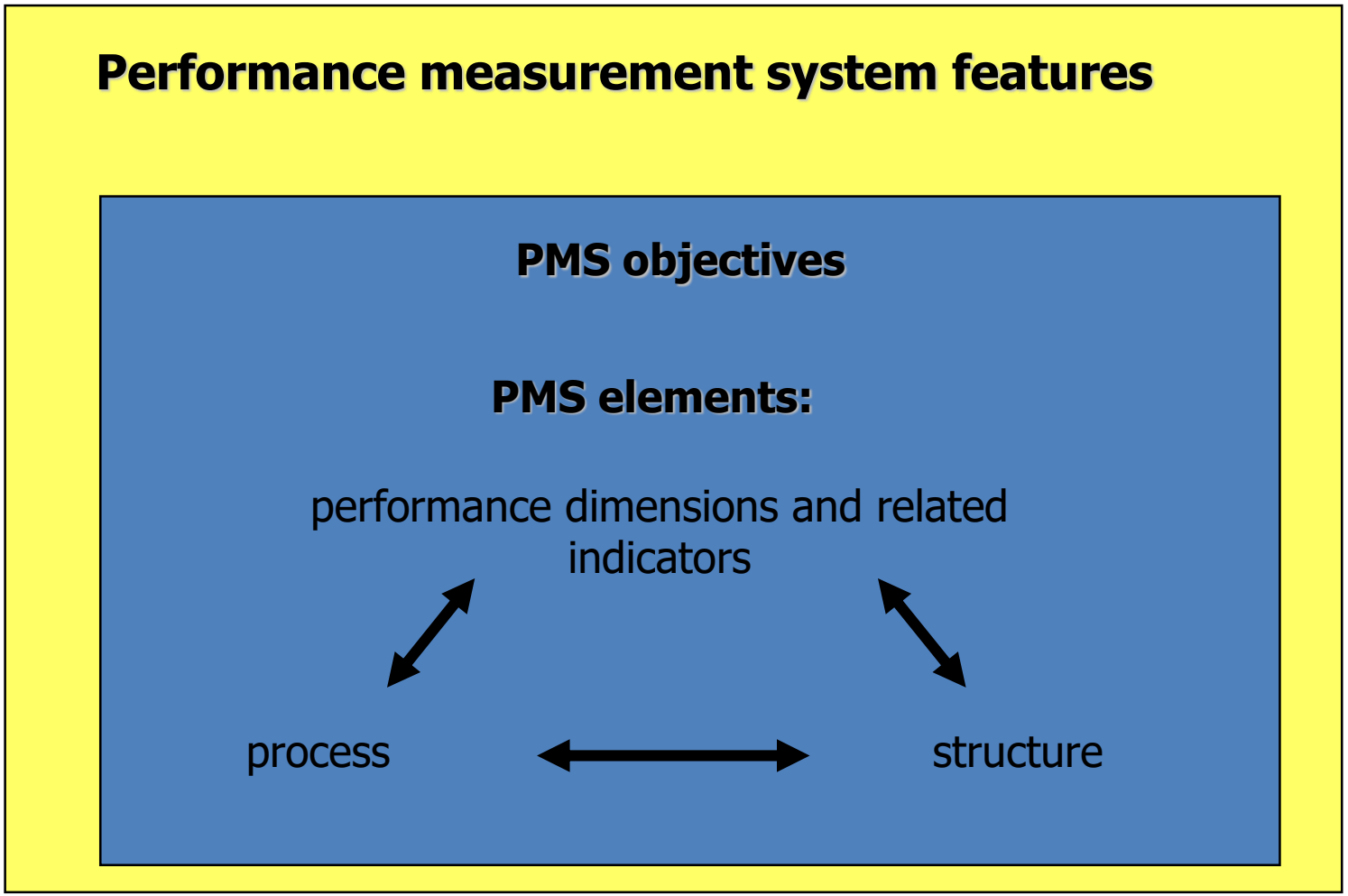
Impact measurement

- Mesurement of the economic-financial impact generated by the R&D output, in terms of, for example:
    - Cost reduction
    - Turnover increase
    - Market share increase
    - Profits from new products / services
    - …
- The underlying (debatable) assumption in that there is a positive direct correlation between the R&d results and the economic-financial performance

Process measurement

- Opening the R&D box and evaluating the internal processes

A systemic approach to R&D performance measurement



PMS objectives

- Motivating researchers;
- Monitoring activities;
- Evaluating the economic impact of R&D projects, selecting projects;
- Improving R&D performance;
- Coordination and communication;
- Reducing uncertainty;
- Encouraging learning;
- Supporting decision making.

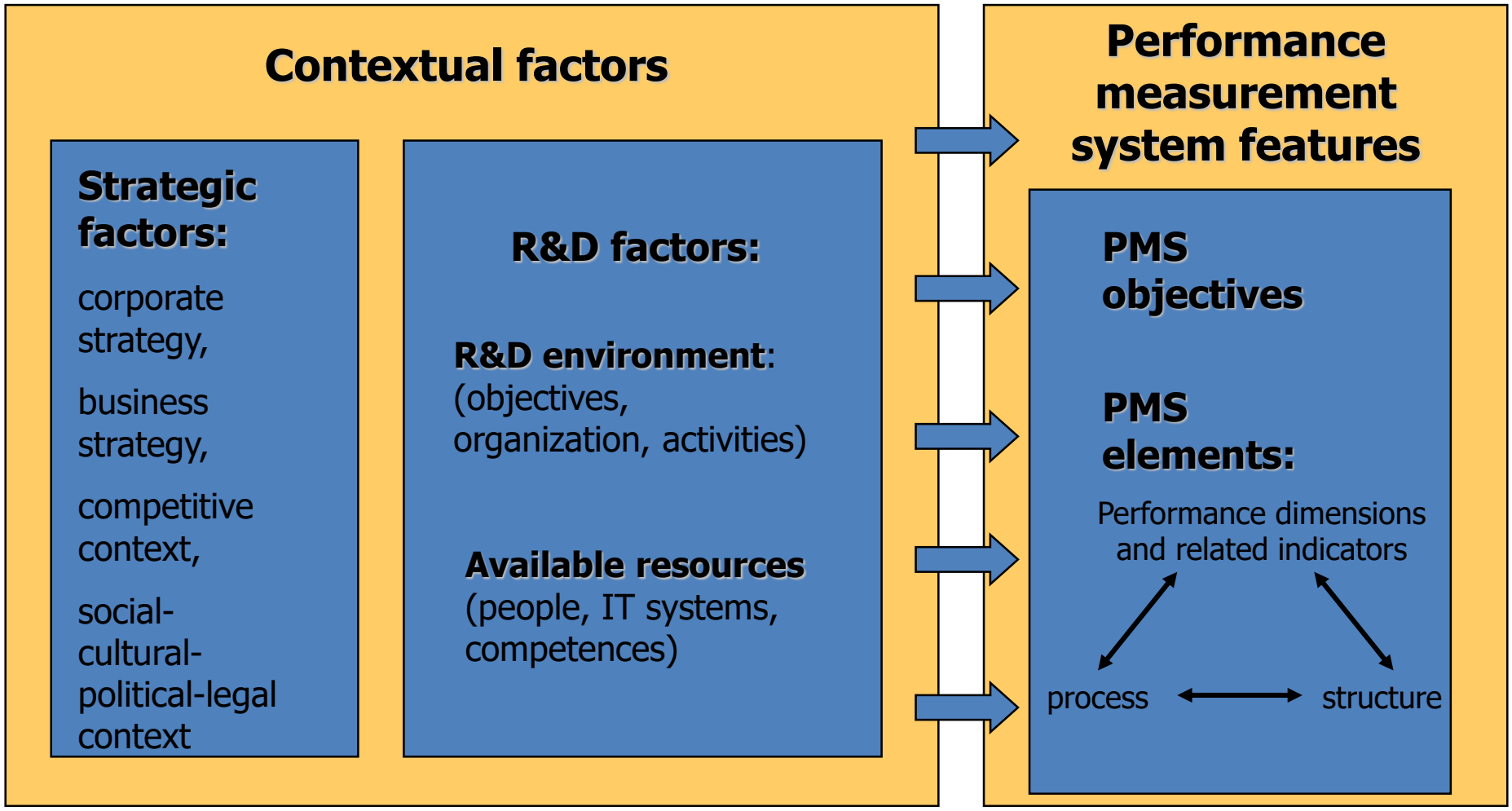
Performance dimensions (or perspectives)

- According to a "Balanced Scorecard" approach, several dimensions of performance can be considered:
  - Economic financial;
  - Market;
  - Learning and innovation;
  - Internal efficiency;
  - Alliances and networks.

R&D performance indicators

- For each dimension of performance, it is possible to identify and use several different indicators:
  - Input, output, process indicators;
  - Quantitative and qualitative indicators;
  - Monetary and non monetary indicators.

Designing the R&D PMS



FINANCING


SALE

Financing RD

- Severe financial constraints exist for R&D and innovation investments («funding gap» for innovation), due to:
  - Information asymmetry;
  - Moral hazard;
  - Results highly intangible (hardly measurable);
  - High uncertainty of returns and nested uncertainty;
  - Appropriability of returns;
  - Gap between private and social returns;
  - Sunk costs.

Sources

- Equity based:
  - Internal earnings;
  - New shares;
- Debt-based that are highly inefficient because of:
  - Fixed returns, which prevent investors from participating to successful results;
  - Information asymmetry;
  - Lack of tangible warranty;

- Equity-based sources seem to be more suitable

Financing instrument	Key features in financing	Remarks
Bank loan	Used as one of the most common tools for access to finance.	Obligation to repay as debt
Grant, subsidy	Used as seed funding for innovative start-ups and SMEs at the seed and early stage.	Complements market failures, financing at seed and initial stage
Business angel	Financing source at early riskier stage and provides financing, advice and mentoring on business management. Tends to invest in the form of groups and networks.	Financing at start-up and early stage
Venture capital	Tends increasingly to invest at later, less risky growth stage. Referred to as patient capital owing to the lengthy time span (10-12 years) for investing, maturing and finally exiting.	Financing at later expansion stage
Corporate venturing	Used by large firms to invest in innovative start-ups with a view to improving corporate competitiveness with either strategic or financial objectives.	Strategic motive
Crowd funding	A collective funding tool via the Internet which makes it easier for small businesses to raise capital at the seed and early stages.	Potential for fraud
Tax incentive	A broad range of tax incentives for R&D and entrepreneurial investments in most countries, *e.g.* Enterprise Investment Scheme in the United Kingdom, tax relief on the wealth tax (ISF) in France, Business Expansion Scheme in Ireland.	Indirect, non-discriminatory

Business Angels

Equity and Venture Capital

- **Public equity:** equity capital from the stock exchange (for companies listed in the stock exchange)
- **Private equity:** equity capital from other institutional sources (for companies not listed)
  - **Venture capital:** focused on new / young companies characterised by:
    - High risk
    - High potential returns
    - Business based upon technological innovation
  - **Buyout:** for financing the acquisition of a company by managers or other companies

Venture Capital: phases

1. Seed
2. Start-up
3. Early growth
4. Growth
5. Cash-out

Corporate Venture

Crowfunding

Lots of failures

Governament

- Governments may help reducing the «funding gap» for innovation (with an «additionality» logic and NOT a «substitution» logic)

- Two main mechanisms for public funding:
  - Direct funding
  - Tax reduction for innovation investment

GPS - Example

https://www.ted.com/talks/mariana_mazzucato_government_investor_risk_taker_innovator