Various approaches to measuring business innovation: their relevance for capturing social innovation

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Outline

Motivation

Innovation in economics paradigms

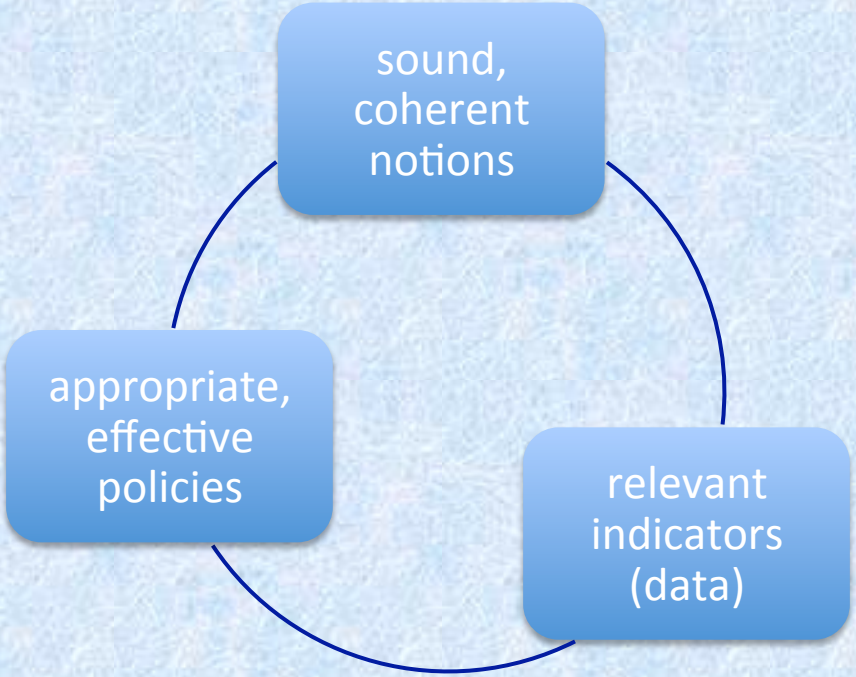
Models of innovation

Measurement of business innovations – relevance for analysing social innovations

Conclusions

Motivation

Holy (unholy?) trinity of theory,
measurement, and policy



Achievements & several severe weaknesses

Different schools (theoretical frameworks) in isolation:
crossing borders $\Rightarrow$ mutual learning?

"From a theoretical perspective, there must be doubts about whether any general theory of innovation is possible." (van de Ven et al., 1999)

Economics of Innovation

Classical economics

Technological, organisational, institutional and market changes – including their co-evolution – were central research themes for classical economists

- Adam Smith (1776)
- David Ricardo (1817)
- John Stuart Mill (1848)
- Karl Marx (various years)

Neo-classical economics

Allocative efficiency is in the centre of their analysis, that is, a short-term issue

Technological, organisational, institutional, and market changes are exogenous variables

Their main new objective was to develop sophisticated models of general equilibrium and by doing so to turn economics into a 'hard science', exemplified by Newtonian physics in the 19th century

Walras (1874/1954, p. 71), for example, perceived "the pure theory of economics or the theory of exchange and value in exchange" as a "physico-mathematical science like mechanics or hydrodynamics" (cited in Clark and Juma, 1988: 206)

Classical vs. neo-classical economics

Two functions of decentralised markets:

- allocation of resources
- transmission of impulses to change

Classical economist had inclined to focus on the latter

"Fundamental dynamic properties such as the relationship between expansion of markets, division of labour, and productivity growth in Smith, or the 'increasing organic composition of capital' in Marx, are examples of a class of propositions argued on the grounds of the *irreversible transformations* originated by processes of what we could call 'dynamic competition'. Moreover, their neglect of explicit microfoundations was justified on the grounds of what we may term a 'holistic' or 'macroinstitutional' assumption about behaviour: it seemed obvious to them that, for example, given an opportunity, capitalists were ready to seize it, or that their 'institutional' function was to invest and accumulate the surplus." (Dosi and Orsenigo, 1988: 14)

Mainstream vs. evolutionary economics

Risk vs. uncertainty (optimisation)

Ahistorical models vs. 'history counts'

- path-dependent, cumulative processes
- learning by doing, using and interacting

Information vs. knowledge (codified, tacit) & skills

- learning capabilities
- many types and sources of knowledge ⇒ collaboration

Representative agents vs. heterogeneity

- learning, path-dependence ⇒ diversity

Linear vs. networked (interactive) model of innovation

- V Bush, 1945: science-push model
- (Say's Law: supply creates its own demand)

"There is no single model of the innovation process: enterprises can differ very significantly in their approaches to innovation." (Smith, 2002)

Models of Innovation

Models of innovation

Linear models

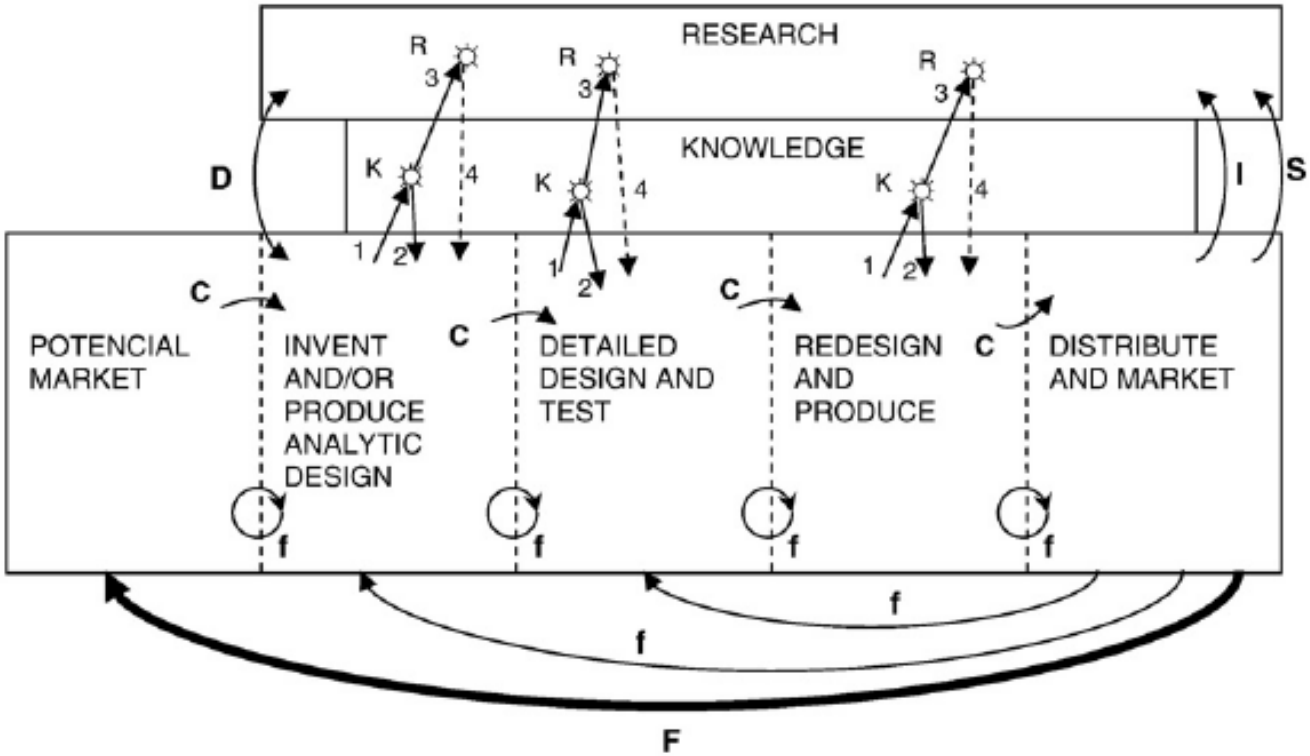
science-push: basic research is the main source of innovation

market-pull: demand is the main source of innovation

Models of innovation (2)

Systemic (or: networked) models

- ‘chain-linked’ model
- ‘multi-channel interactive learning model’



Chain-linked model showing flow paths of information and cooperation.
Symbols on arrows: **C** = central-chain-of-innovation; **f** = feedback loops; **F** = particularly important feedback.

K-R: Links through knowledge to research and return paths. If problems solved at node K, link 3 to R not activated. Return from research (link 4) is problematic - therefore dashed line.

D: Direct link to and from research from problems in invention and design.

I: Support of scientific research by instruments, machines, tools, and procedures of technology.

S: Support of research in sciences underlying product area to gain information directly and by monitoring outside work. The information obtained may apply anywhere along the chain.

Fig. 2. The chain-linked model. Source: Kline and Rosenberg (1986), [10].

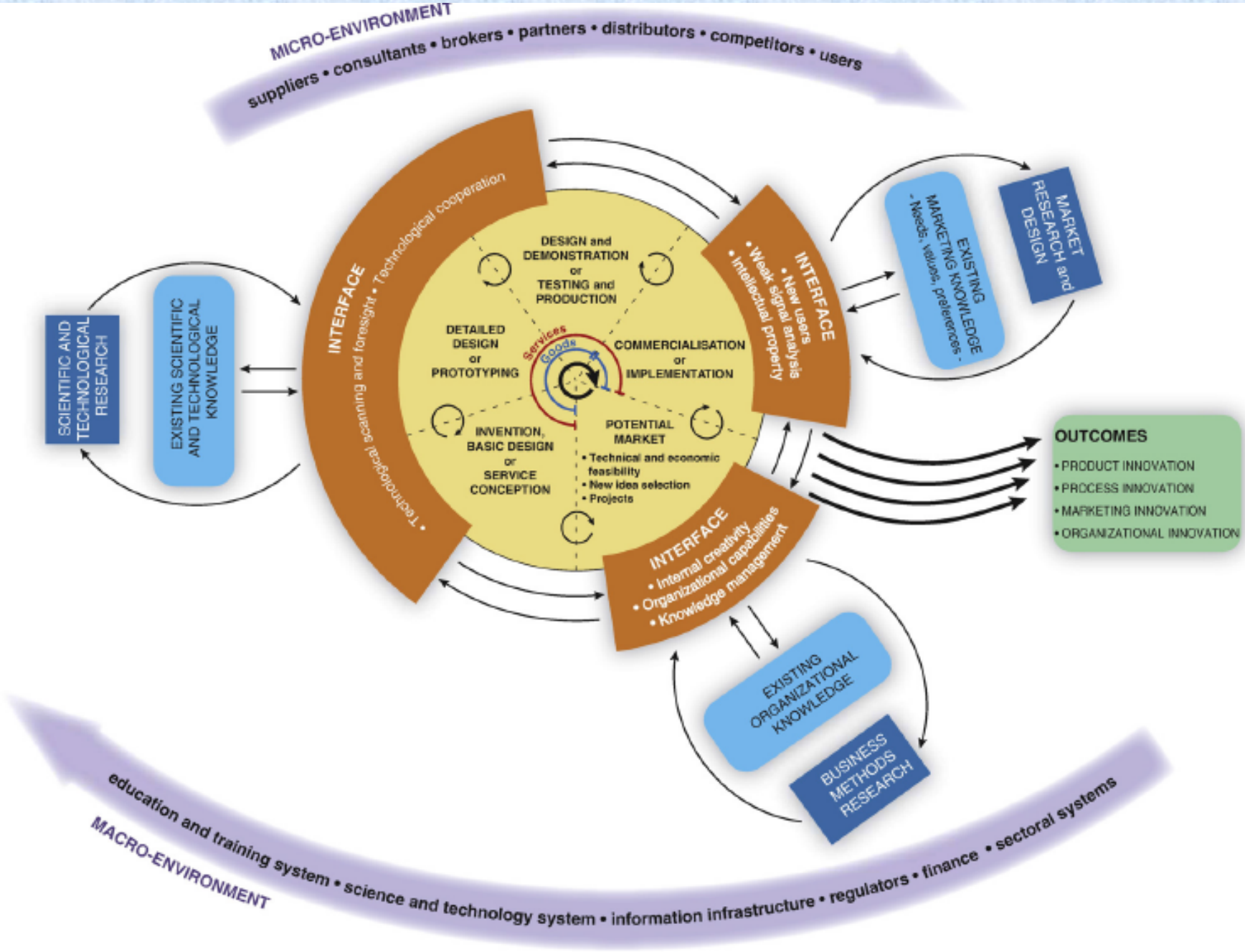


Fig. 3. The multi-channel interactive learning model. Source: J. Caraça et al. (2006), [1] and text.

Measurement of Business Innovations

Selection of indicators

Systematic efforts to measure RTDI since the 1960s

Widely used guidelines: Frascati (R&D) , TBP, Oslo (innovation), Patents, and Canberra (HR) Manuals

Yet, it is not straightforward to find the most appropriate way to assess R&D and innovation performance

R&D: a complex, multifaceted process ⇒ it cannot be sufficiently characterised by 2-3 indicators

That applies to innovation *a fortiori*

The choice of indicators: an important decision; reflects the explicit or implicit views of those experts and policy-makers who have chosen them.

⇒ Indicators are 'subjective' in that respect, but perceived as 'objective' (expressed in numbers)

ST vs. DUI mode of innovation in the EIS

22 indicators used to compile the EIS 2004

"… no harmonised data that could be used to construct measures of *learning by doing and using [DUI]*. We would contend, though, that these limitations of the data reflect the same *bias at a deeper level*. The on-going development of harmonised S&T indicators over the post-war period has resulted from political initiatives at the EU and international levels. The lack of DUI measures reflects *political priorities and decision-making rather* than any inevitable state of affairs." (Jensen *et al.,* 2007: 685; emphasis added – AH)

DISKO survey

both DUI and S&T modes of innovation are important in DK

combining DUI and S&T modes improves innovation performance

(Jensen *et al.,* 2007)

The 2002 Innovation Union Scoreboard indicators

	Relevance for R&D- based innovation	Relevance for non-R&D- based innovation
New S&E graduates (ISCED 5a and above) per 1000 population aged 20-29	X	
Population with tertiary education (% of 25–64 years age class)	b	b
Participation in life-long learning (% of 25–64 years age class)	b	b
Employment in medium-high and high-tech manufacturing (% of total workforce)	X	
Employment in high-tech services (% of total workforce)	X	
Public R&D expenditures (GERD – BERD) (% of GDP)	X	
Business expenditures on R&D (BERD) (% of GDP)	X	
EPO high-tech patent applications (per million population)	X	
USPTO high-tech patent applications (per million population)	X	
SMEs innovating in-house (% of manufacturing SMEs)	b	b
SMEs involved in innovation co-operation (% of manufacturing SMEs)	b	b
Innovation expenditures (% of all turnover in manufacturing)	b	b
High technology venture capital investment (% of GDP)	X	

The 2002 Innovation Union Scoreboard indicators (2)

	Relevance for R&D-based innovation	Relevance for non-R&D- based innovation
PCT patents applications per billion GDP (in PPS€)	X	
Capital raised on parallel markets plus by new firms on main markets (% of GDP)[i]	X	
Sales of 'new to market' products (% of all turnover in manufacturing)	b	b
Home internet access (% of all households)	?	?
ICT expenditures (% of GDP)	b	b
Share of manufacturing value-added in high-tech	X	

The Innovation Union Scoreboard 2015

The EIS was renamed as Innovation Union Scoreboard in 2012

IUS 2015: 25 indicators

- 10 are only relevant for R&D-based innovations (S&T mode)
- 4 mainly capture R&D-based innovations
- 7 could be relevant for both S&T and DUI mode
- 4 reflect DUI mode

(next slides, from Havas, 2016)

The 2015 Innovation Union Scoreboard indicators

	Relevance for R&D- based innovation	Relevance for non-R&D- based innovation
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	X	
Percentage population aged 30-34 having completed tertiary education	b	b
Percentage youth aged 20-24 having attained at least upper secondary level education	b	b
International scientific co-publications per million population	X	
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	X	
Non-EU doctorate students as a % of all doctorate students	X	
R&D expenditure in the public sector as % of GDP	X	
Venture capital investment as % of GDP	x	
R&D expenditure in the business sector as % of GDP	X	
Non-R&D innovation expenditures as % of turnover		X
SMEs innovating in-house as % of SMEs	b	b
Innovative SMEs collaborating with others as % of SMEs	b	b
Public-private co-publications per million population	X	

The 2015 Innovation Union Scoreboard indicators (2)

	Relevance for R&D-based innovation	Relevance for non-R&D- based innovation
PCT patents applications per billion GDP (in PPS€)	X	
PCT patent applications in societal challenges per billion GDP (in PPS€) (environment-related technologies; health)	X	
Community trademarks per billion GDP (in PPS€)		X
Community designs per billion GDP (in PPS€)		X
SMEs introducing product or process innovations as % of SMEs	b	b
SMEs introducing marketing or organisational innovations as % of SMEs		X
Employment in fast-growing enterprises in innovative sectors (% of total employment)	b	b
Employment in knowledge-intensive activities (manufacturing and services) as % of total employment	x	
Exports of medium and high-technology products as a share of total product exports	x	
Knowledge-intensive services exports as % total service exports	x	
Sales of new to market and new to firm innovations as % of turnover	b	b
License and patent revenues from abroad as % of GDP	X	

The evolution of the EIS and IUS indicators, 2002-2015

	2002	2003	2004	2005 - 2006	2007	2008	2009	2010 - 2013	2014 - 2015
Indicators reflecting									
only R&D-based innovations	10	9	9	8	7	8	8	10	10
mainly R&D-based innovations	-	3	3	5	5	4	4	4	4
both types	8	9	9	12	12	15	16	6	7
only non-R&D-based innovations	-	-	-	-	-	1	1	4	4
mainly non-R&D-based innovations	-	-	1	1	1	1	1	-	-
Number of indicators	18	21	22	26	25	29	30	24	25

The relevance of EIS/ IUS indicators

The IUS indicators could be useful in settings where the dominant mode of innovation is the S&T mode

In practice, however, both the S&T and DUI modes of innovation are fairly important

The SII could be low for an innovation system with

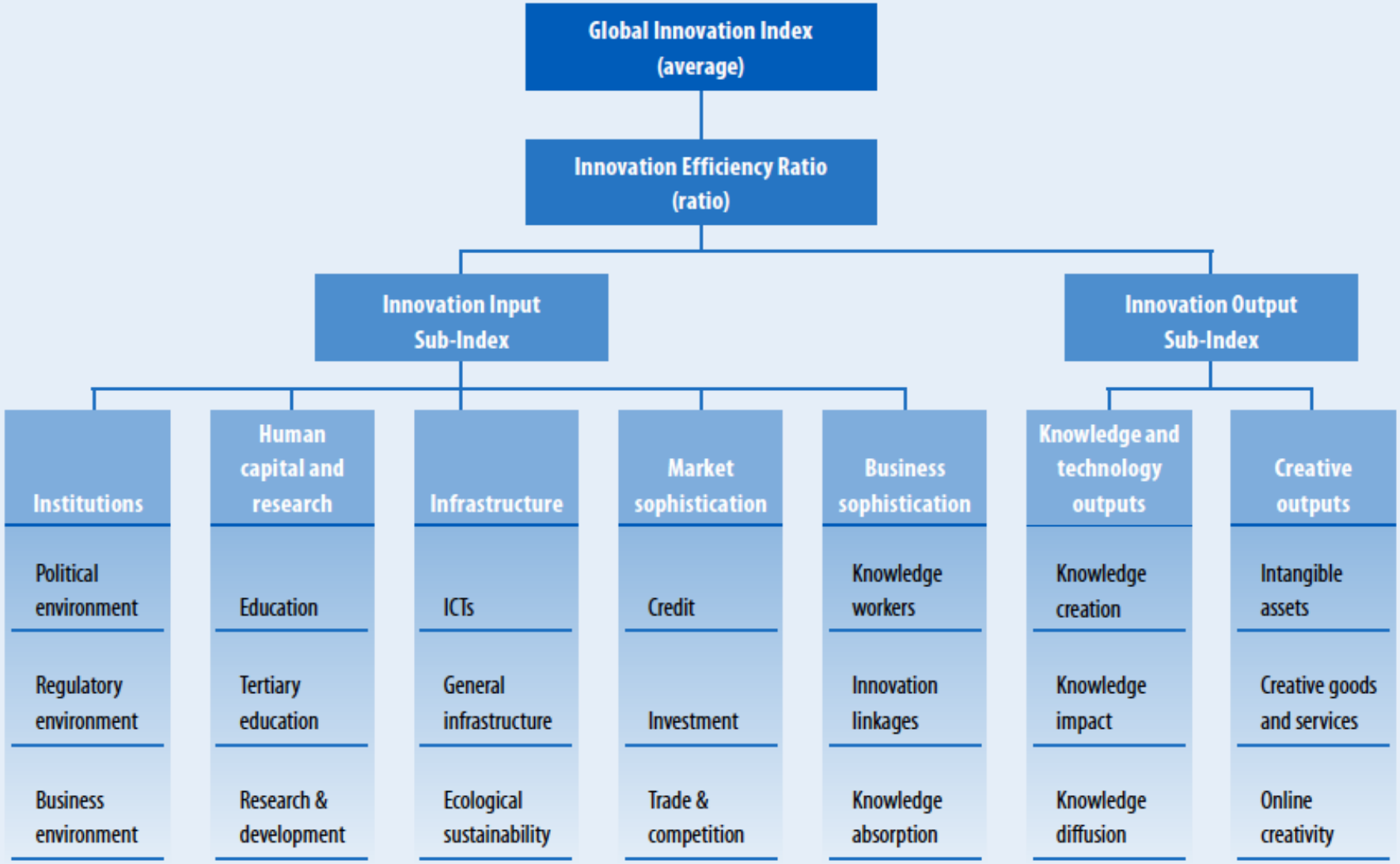
- a low level of innovation activities altogether, or
- a low level of R&D-based innovation activities (while other types of innovations are abundant)

Social innovations can certainly rely on R&D-based technological innovations

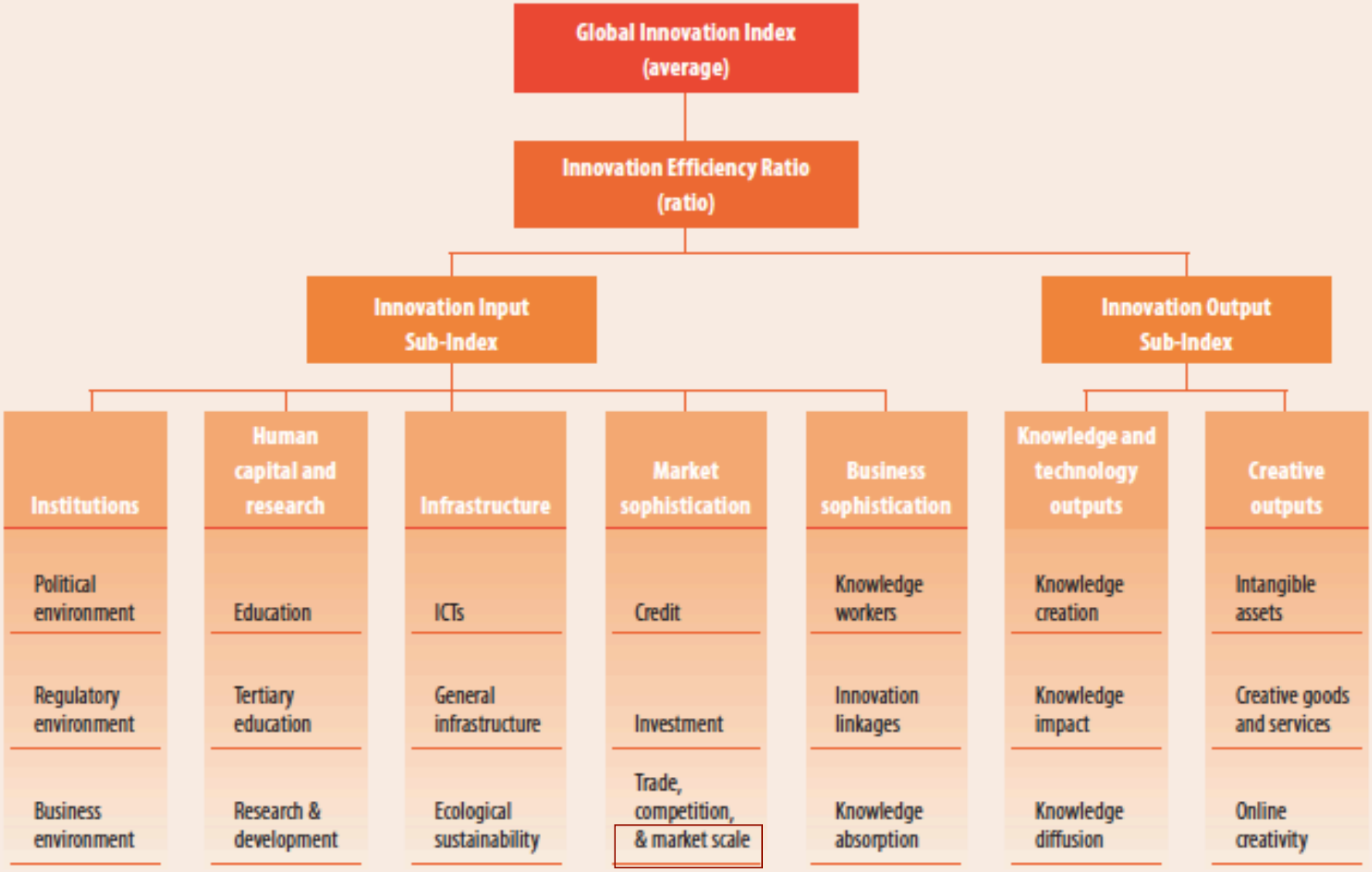
Yet, their essence tends to be organisational, managerial and behavioural changes

The IUS indicators do not capture these types of changes

Framework of the Global Innovation Index 2014



Framework of the Global Innovation Index 2016



The relevance of GII indicators

A remarkable effort

- a broad coverage of countries
- 81 indicators in the 2014 edition, 82 in the 2016 one

Yet, severe weaknesses concerning business innovation activities

- a non-negligible mismatch between the 'headline' notions (pillars and their sub-pillars) and the actual components (indices or indicators) selected
- R&D and innovation are conflated

A strong bias towards R&D-based (S&T mode) innovations, and thus the DUI mode is eclipsed

GII indicators are not highly relevant, either, to measure social innovations

Further Methodological Issues

Social innovations are …

New solutions that simultaneously meet social needs – more effectively than other ones – and create new social relationships or collaborations

Solutions for exclusion, deprivation, alienation, lack of wellbeing; leading to significant human progress and development

Changes in the cultural, normative or regulative structures (or classes) of society that enhance its collective power resources and improve its economic and social performance

⇒ The unit of analysis is different in the above definitions

“Levels” of SI

i) Incremental: goods (products and services) that „address social need more effectively or efficiently” (Nicholls et al., 2015: 3)
It covers both incremental and radical innovations

ii) Institutional: „harness or retool existing social and economic structures to generate new social value and outcomes” (ibid: 4)
Structural changes; not ‘rules of the game’! (North, 1990)

iii) Disruptive social innovation “aims at systems change” (ibid: 3) changes in power relations, social hierarchies, and cognitive frames
An overarching term with a rather ‘wide arch’ – but could be a good starting point for more detailed empirical analyses

Disentangle different (relevant) units of analysis when studying SI

Subject (or level) of change
The degree of novelty

Subject of change	Incremental change	Radical change(s)	Relevance for SI
Goods products and services	A more convenient, less noisy horse-driven carriage	Animal-powered vehicles → automobiles	Relevant
Processes production or delivery	A better organised, more efficient assembly line	Automation of certain tasks at an assembly line	Could be relevant in some cases
Organisations internal structure: units and their connections; behaviour and rules, routines, management and financial methods, business models guiding behaviour/ operations	A reorganised (better managed, more productive) firm	Workshop → factory; Fordist mass production → lean production; R&D units of large firms (19th century)	Relevant, with some amendment; besides business organisations, several other types, including 'hybrid' ones need to be considered

Disentangle different (relevant) units of analysis when studying SI (2)

Subject of change	Incremental change	Radical change(s)	Relevance for SI
Markets	Better connected regional markets in a given national economy	New markets discovered and 'conquered' to obtain inputs and sell outputs (Far East, Americas, Africa, …)	Relevant, with crucial amendments: how to serve the previously unmet needs of people, what other changes are needed?
Technology systems	More efficient electric lighting systems	Gas lighting → electric lighting; manual household devices → electric ones	Relevant if re-interpreted as a set of socially, organisational-ly, and economically interconnected social innovations
Techno-economic paradigms	A given paradigm becomes more efficient, more widely accepted due to various types of improvements	Shift from a certain paradigm to a new one	Could be a relevant starting point to refine the notion of "disruptive social innovations" (Nicholls et al., 2015)

Further observations and caveats

In real-life cases the borders are often blurred between incremental and radical change, e.g. the 'bottom-of-pyramid' (BoP) markets

Technological changes are only viable when the business model and several aspects of management and marketing methods are changed at the same time and aligned with each other

BoP: perception of a large group of previously 'unserved' people as a new 'market segment', adaptation of pricing, marketing and sales methods to these new opportunities, …

Further observations and caveats (2)

Difficult to establish the degree of novelty of a given social innovation

new to a certain community, region, country or the world?

To what extent is it important? Usually intellectual property rights are not an issue for social innovators

Yet, social status – being inventive and obtaining recognition for that – might play an important role: could give impetus to initiate or be involved in certain social innovation projects

It is an empirical question to establish the role of prestige (respect and thus higher social status of social innovators) in SI endeavours

Further observations and caveats (3)

Difficult to identify whether a given social innovation is an 'isolated' new solution or an element in a set of interconnected social innovations, affecting several groups of people or an entire community at the same time, occasionally leading to the emergence of new social structures, norms, institutions, behaviour, value systems and practices at a higher level of aggregation (sub-national regions, nations or supra-national regions [for example, the European Union])

Techno-economic paradigms: could be a useful guiding principle in SI analyses, namely the interconnected-ness of technological, organisational and business model innovations, together with the emergence of a new, widely accepted 'common sense'

Conclusions

Neither IUS, nor GII indicators can capture social innovations

Several notions used to analyse innovation in economics could be useful to analyse social innovations as they

- stress important features
  - e.g. degree of novelty: IPR vs. prestige?
- identify types of innovation (leading to a taxonomy?)
- differentiate among various units (level) of analysis

Measurement issues

Be aware of the differences between measuring

(a) social innovation activities (efforts) themselves

(b) the framework conditions (pre-requisites, available inputs, skills, norms, values, behavioural patterns, etc.) of being socially innovative, and

(c) the economic, societal or environmental impacts of social innovations

Thank you!

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CrESSI

Creating Economic Space for Social Innovation

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