



ISSEK

Institute for Statistical Studies
and Economics of Knowledge



NATIONAL RESEARCH
UNIVERSITY



Research Laboratory
for Economics
of Innovation



Research Laboratory
for Science
and Technology Studies

Observing Science, Technology and Innovation Studies in Russia

HSE ISSEK Surveys

Galina Gracheva
Konstantin Fursov
Vitaliy Roud

Linkages between Actors in the Innovation System
Extended Workshop

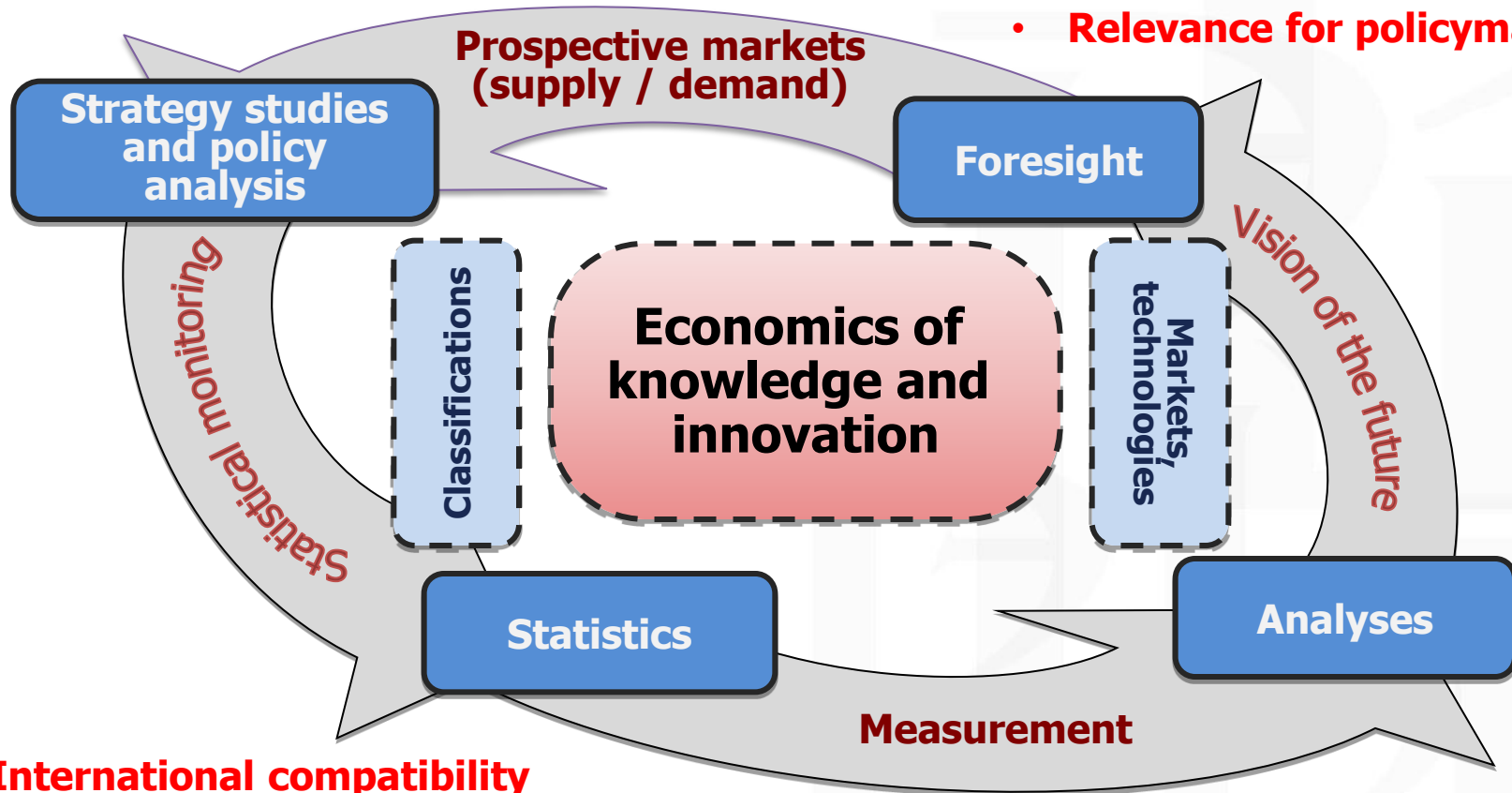
Moscow, 13 June 2012

Outline

- **Observation agenda & scope of STI surveys**
- **R&D and innovation statistics in Russia**
- **Developing approaches for technology measurement**
- **Monitoring of the economy of S&T**
- **Monitoring of innovation behavior of enterprises**

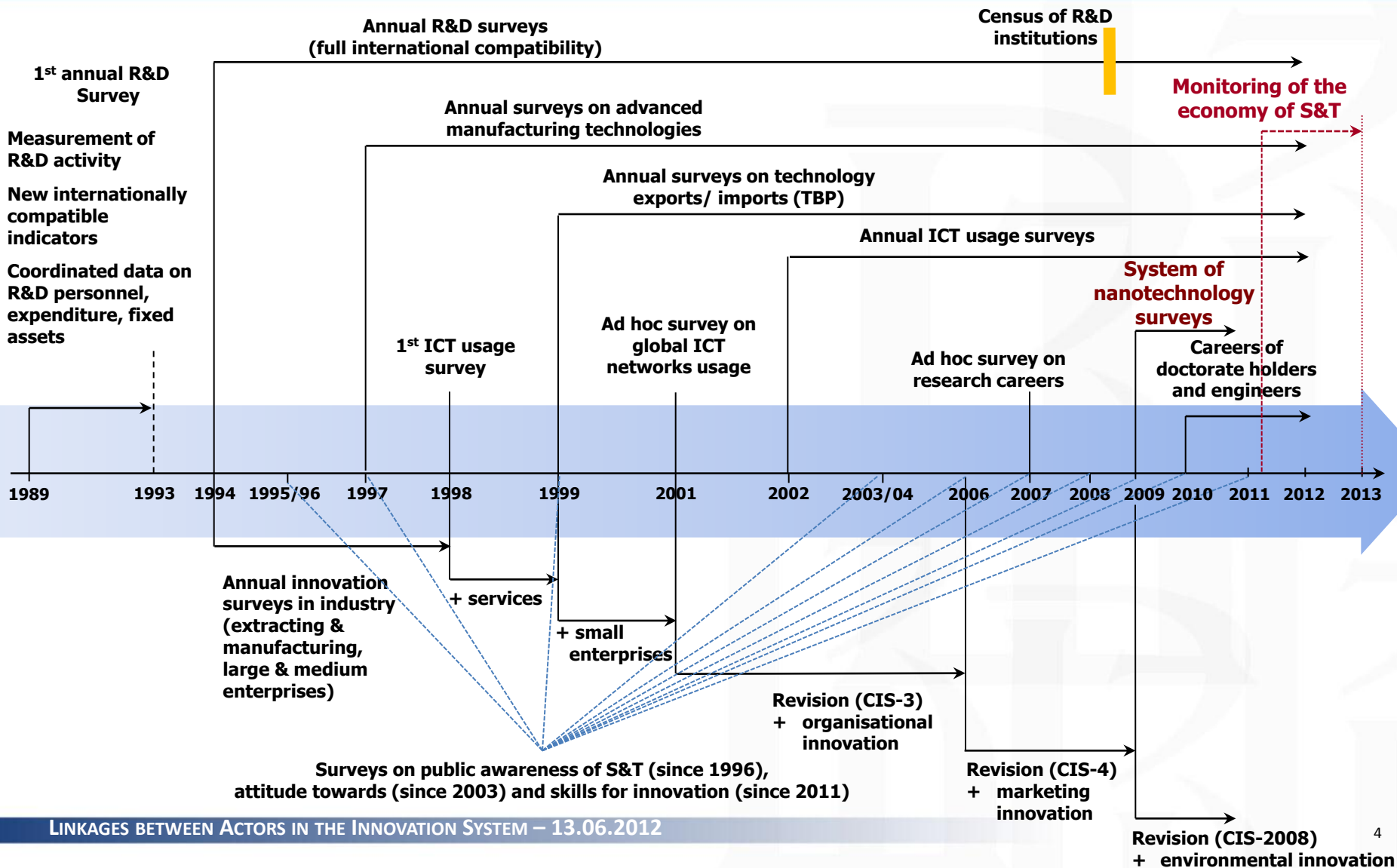
S&T and innovation surveys in Russia: organisation principles

- Sufficient reflectivity of innovation processes
 - Complex approach
 - Relevance for policymaking



- International compatibility
 - Flexibility of data collection
 - Complementarity with other areas of statistics

Scope of S&T and innovation surveys



National R&D surveys

- ❖ **Starting from 1994 data**
- ❖ **Compatible with international standards (OECD Frascati Manual)**
- ❖ **Coverage – all R&D performing units**
- ❖ **General classifications**
 - Sectors of performance
(FM: Government, Business enterprise, Higher education, Private non-profit)
 - Fields of Science (FM: FOS)
 - National Classification of Economic Activities (ISIC / NACE)
 - Regions
 - Types of institutions
 - Ownership, etc.
- ❖ **Scope**
 - R&D personnel
 - R&D expenditure
 - Stock of R&D fixed assets

Backward data series re-calculated according to the Frascati Manual

R&D expenditure

- by type of costs
- by type of activity
- by major field of S&T
- by source of funds
- by socio-economic objective
- by product field

NOTE: total value of projects, e.g. S&T projects

Since 2008: by S&T priority areas

R&D personnel

In head-counts

- ❖ by occupation
 - ❖ by qualification
 - ❖ by field of S&T
 - ❖ by gender and age
 - ❖ flows
- } biennially

Full-time equivalent

- ❖ Full-time R&D personnel in head-counts
- ❖ Part-time R&D personnel (by occupation) in:
 - Head-counts
 - Man-days

$$\begin{aligned} \text{Total FTE} &= \text{Full-time R\&D personnel} \\ &+ \\ &\text{FTE of part-time R\&D personnel} \end{aligned}$$

Innovation surveys in Russia

❖ **Since 1994**

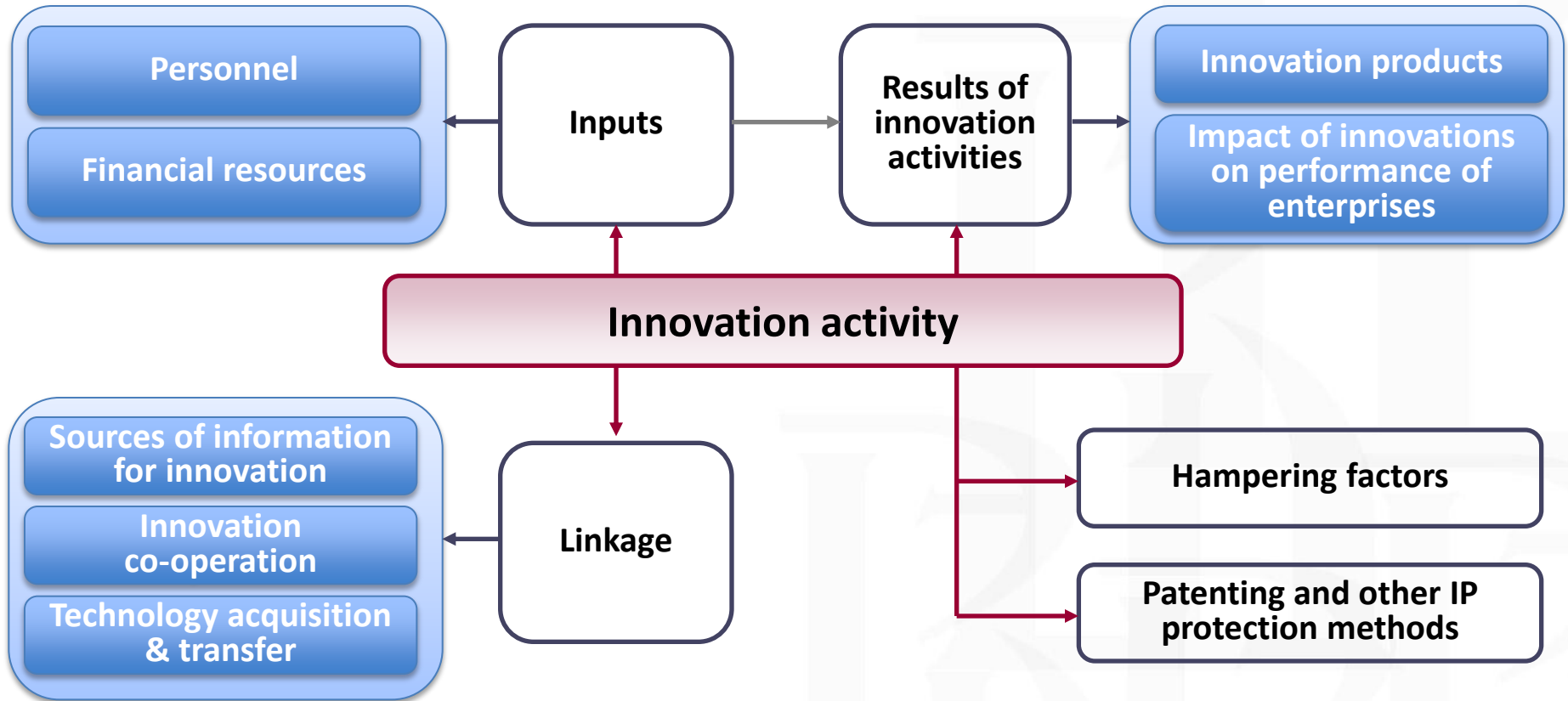
❖ **Compatible with international standards
(OECD / Eurostat Oslo Manual, EU CIS)**

❖ **Key methodological principles:**

- Initial focus on technological innovations; now – organisational and marketing innovations also; since 2009 – innovation with environmental benefits
- Considering enterprises as statistical units
- Classification of innovation activities
- Distinguishing product and process innovations new for a surveyed enterprise

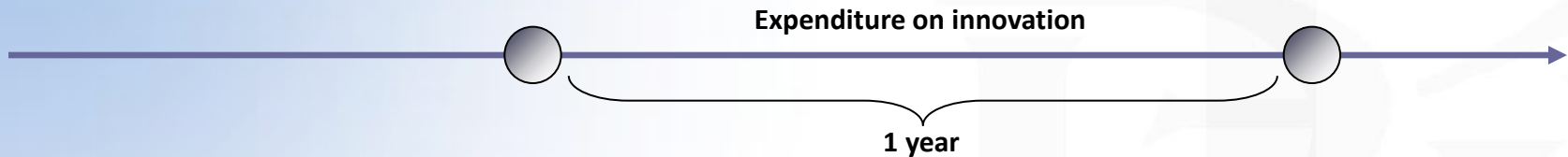
❖ **Annual mandatory survey**

System of statistical indicators of innovation

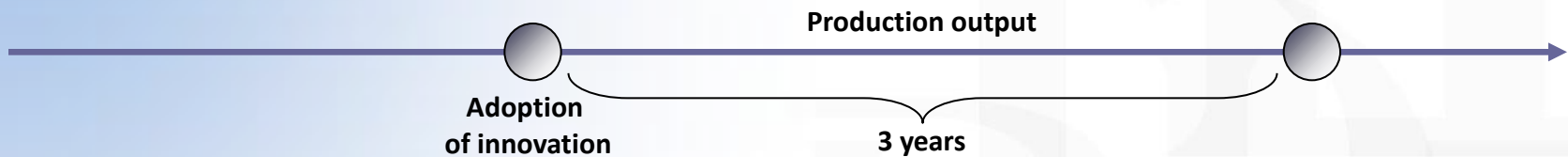


Selection Criteria

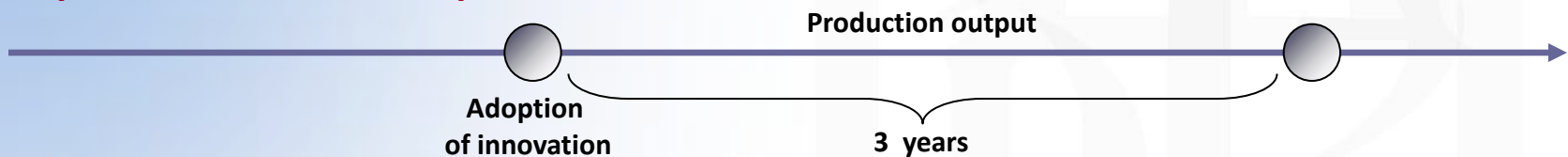
Enterprises engaged in technological innovation



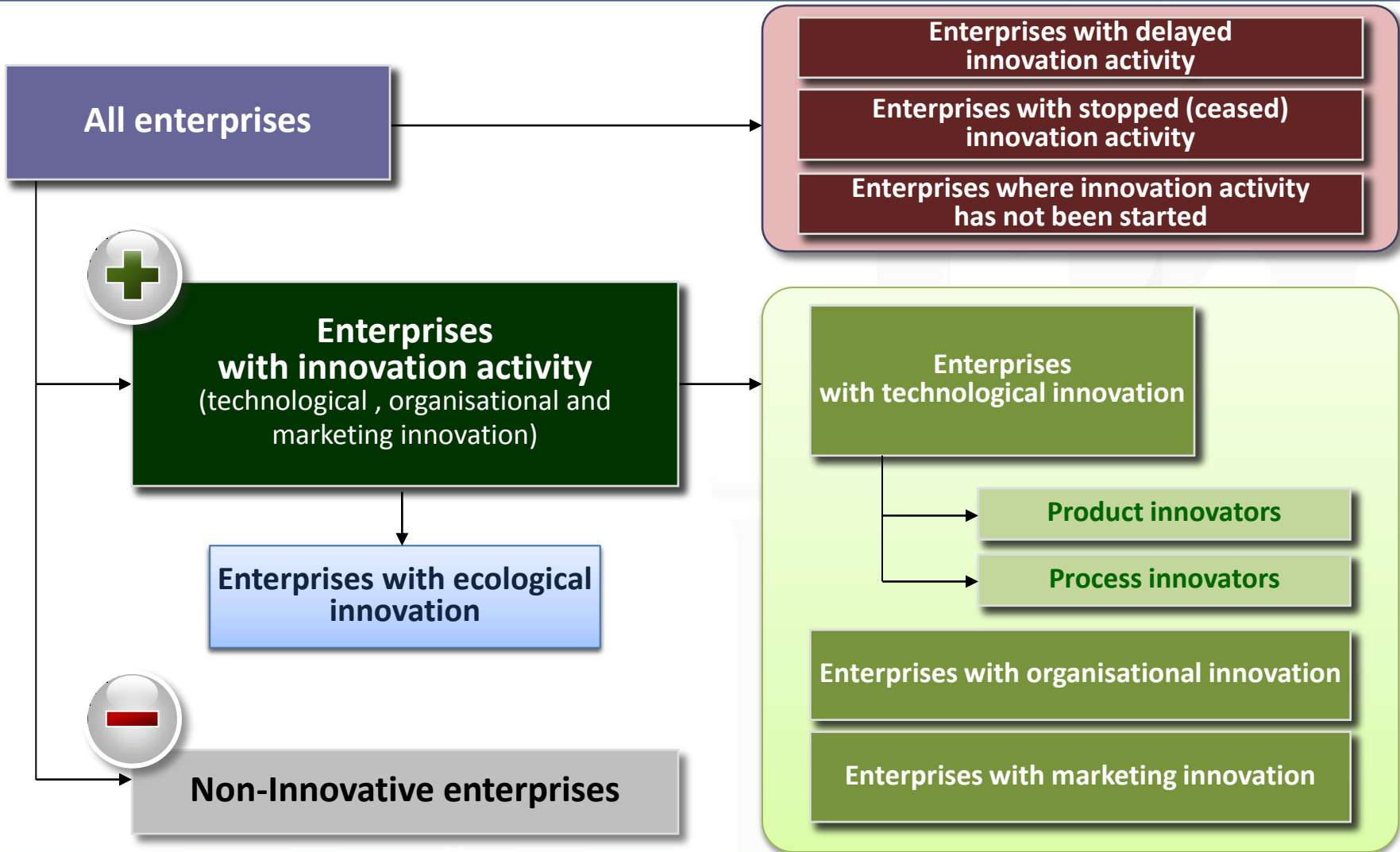
Innovation products



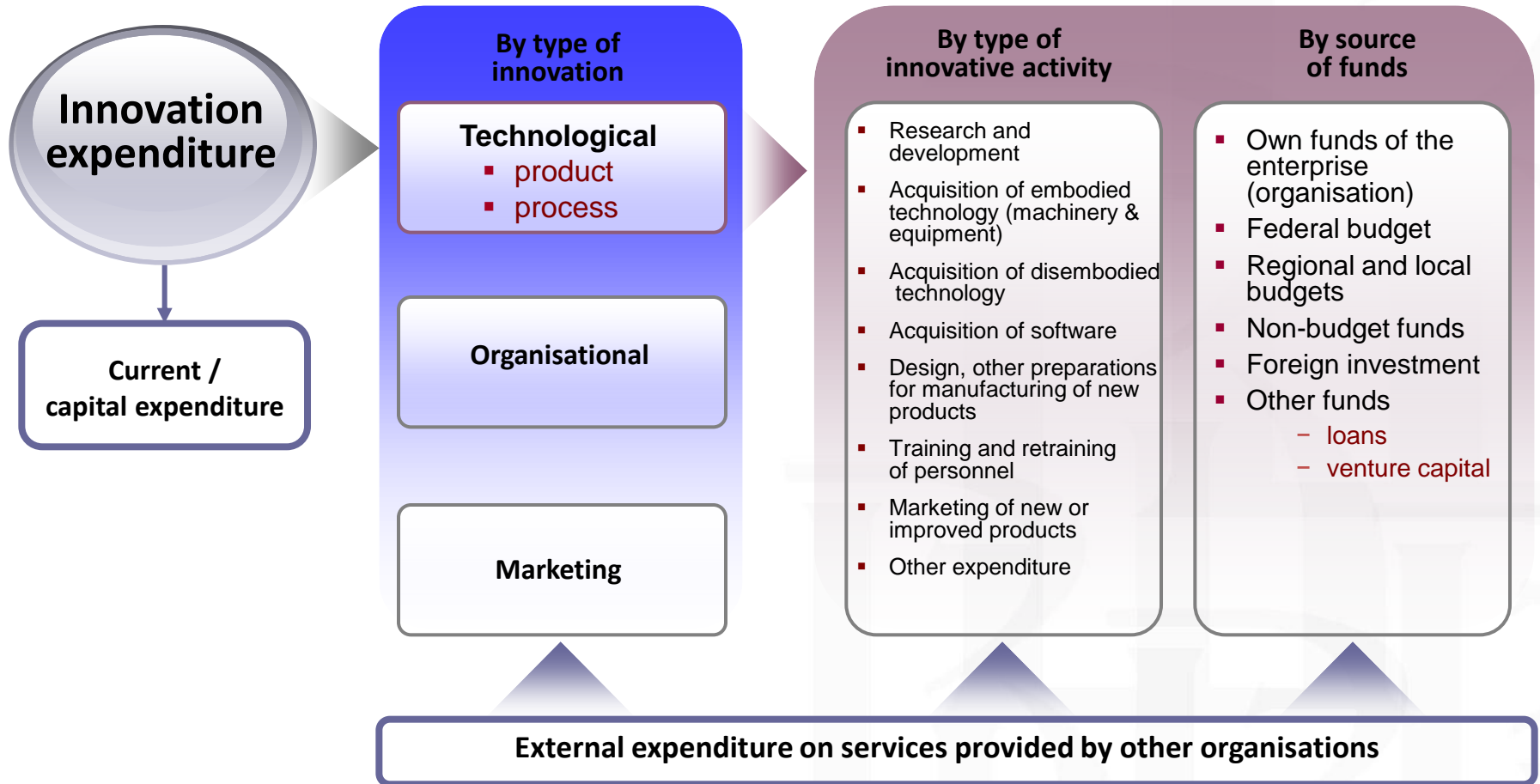
Impact of innovations on performance of enterprises



Enterprises by type of innovation activity

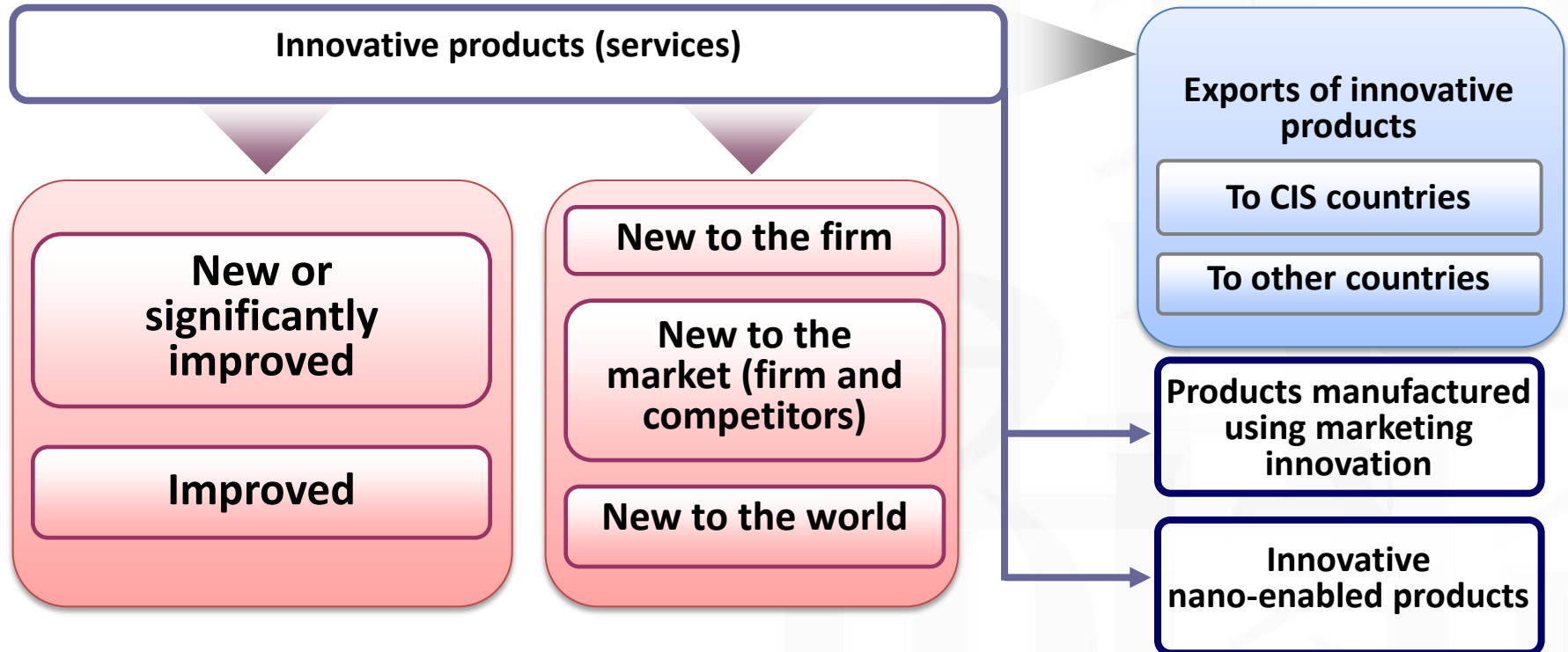


Innovation expenditure



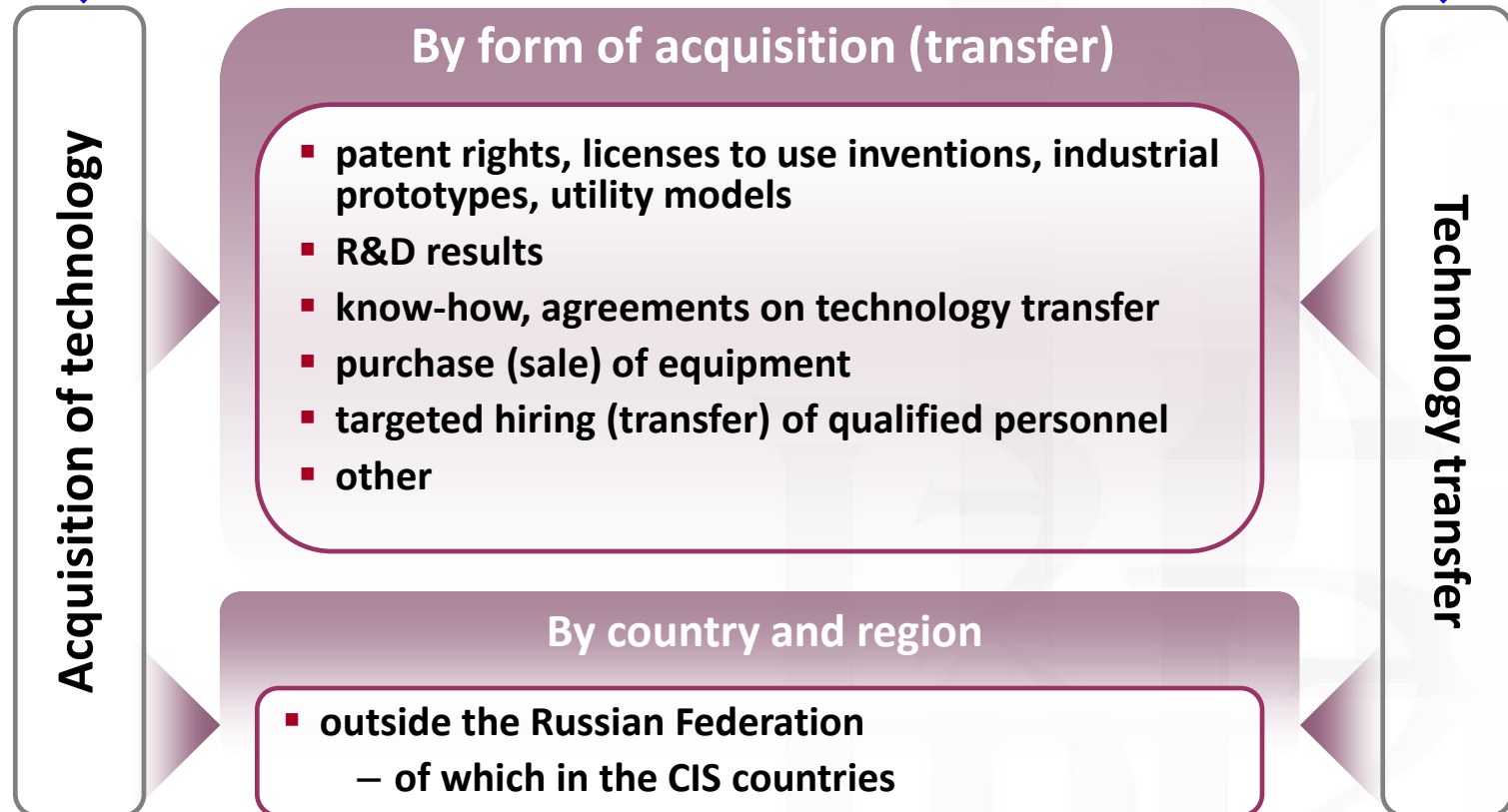
Innovative products

- **Innovative products** are the goods & services that have undergone certain technological changes during the last three years
- **Services** are considered to be **innovative** when their characteristics or modes of use are either radically new or significantly (in terms of quality) technologically improved



Technology exchange

New technologies and software products acquired or transferred by the enterprise



Other measurement issues and indicators

- **Bibliometrics and patent statistics**
 - R&D output, knowledge flows, emerging technologies, etc.
- **Advanced manufacturing technologies in industry (annually)**
 - Development / use
 - By type
- **Technology balance of payments (annually)**
 - By type of transaction & country
- **Public awareness of S&T (biennially)**
 - Perception / attitudes towards S&T and innovation
 - Use of S&T achievements / innovative products
 - Scientific literacy
 - Skills for innovation
- **Since 2009: Nanotechnology statistics**

Nanotechnology statistics in Russia: major steps and organisation

The Program of Nanotechnology Development
in the Russian Federation until 2015

Team of
experts

Basic definition

Draft national classifications for nanotechnology:
1) Areas of nanotechnology
2) Types of nano-enabled products

Modification of existing surveys

R&D
Survey

Innovation
Survey

Structural
Business
Survey

Survey on
Advanced
Manufacturing
Technologies

Survey on
Demand for
Professionals
(biennially)

Earmarked nanotechnology survey (2010)

Module for manufacturing and sales of nano-enabled goods & services
(quarterly since 2010)

Basis for a register of nanotechnology-related
R&D organizations and enterprises (RUSNANO)

System of nanotechnology statistics

Towards a generated framework on technology measurement

Global challenges

Continual emergence and dissemination of new technologies

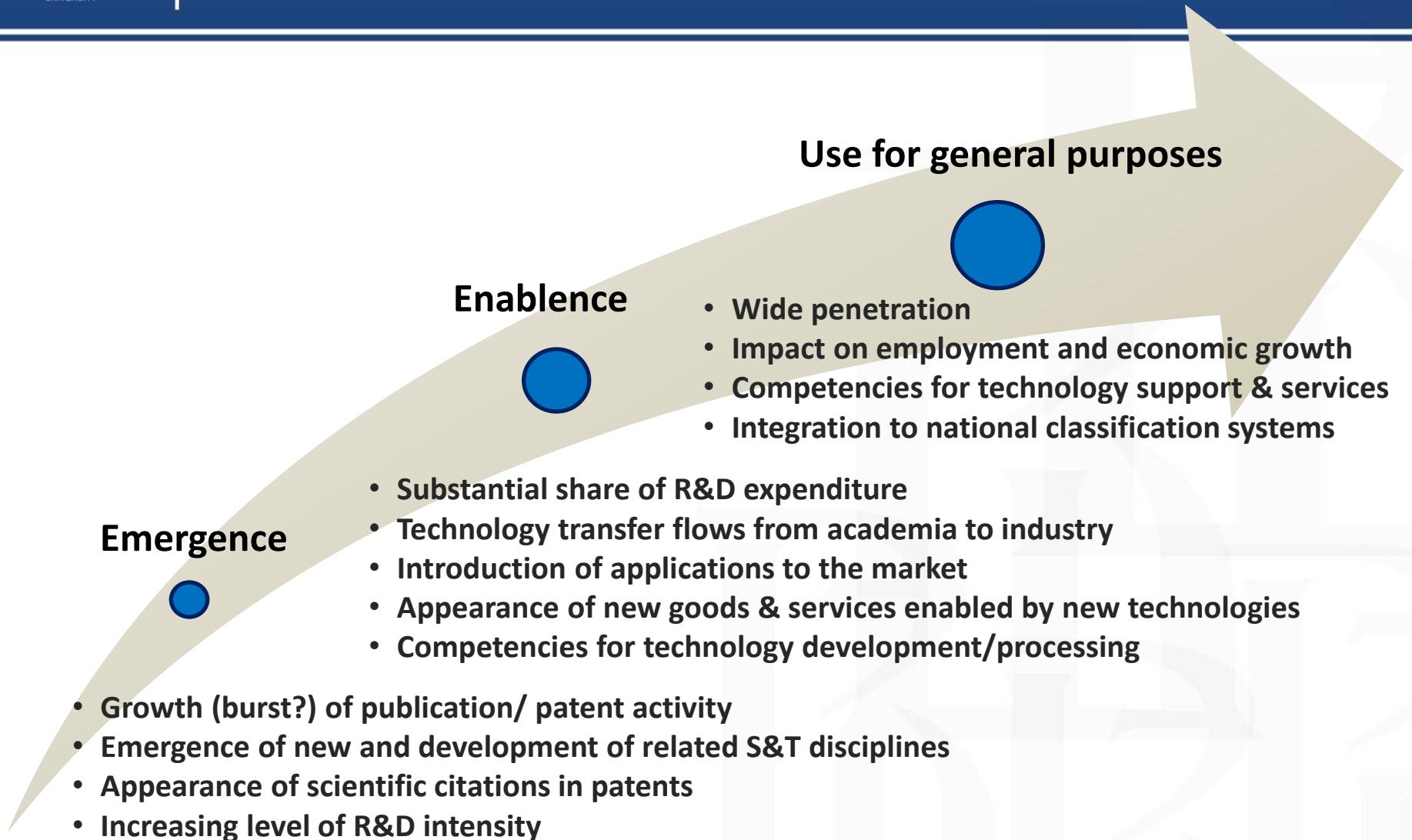
Widespread and increasing interest in monitoring and regulating new S&T areas

OECD-led experience in measuring particular technological developments and innovations (ICT, bio-, nano-)

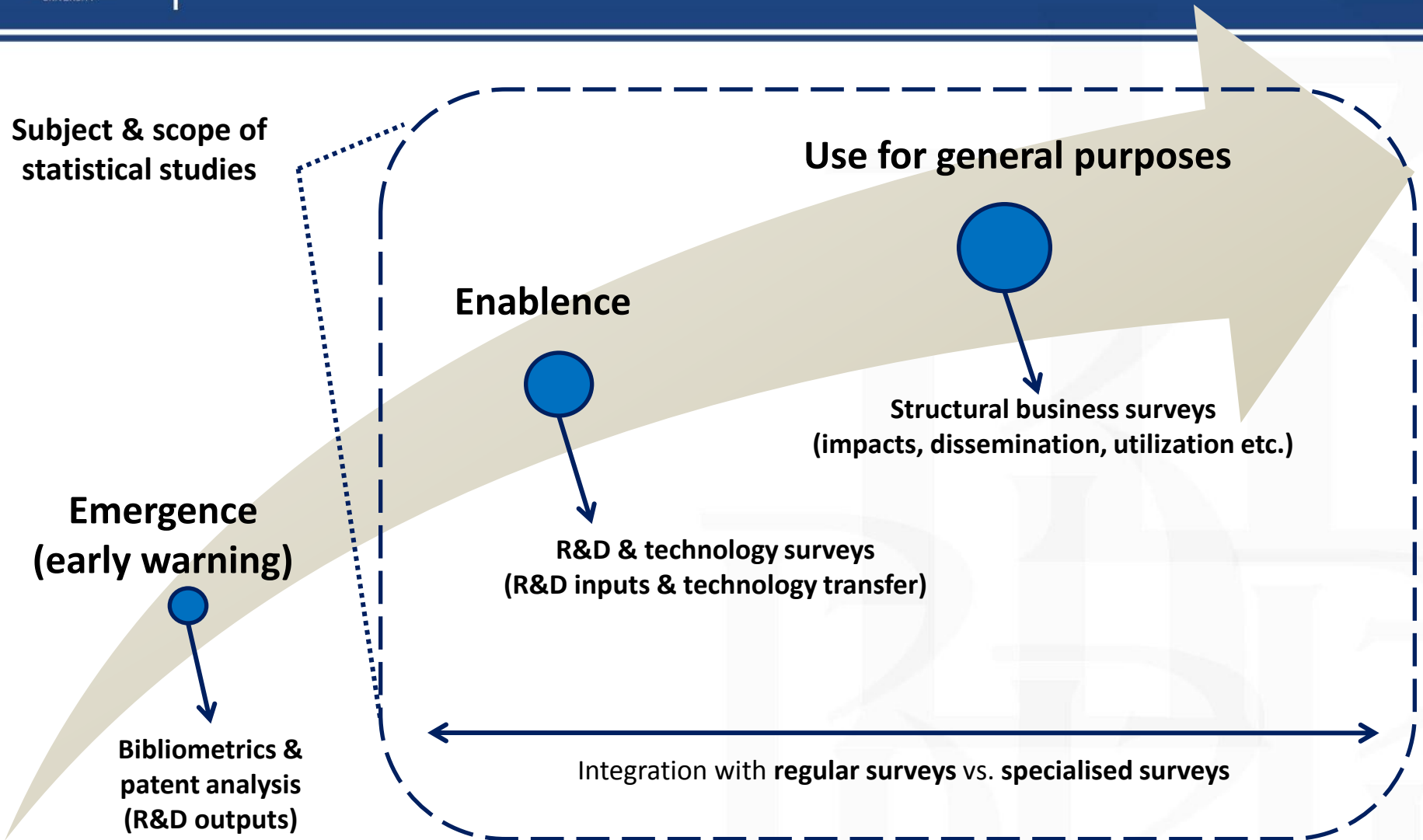
Proposed conceptual framework for measuring emerging, enabling and general-purpose technologies (EEGPT)

Lacking knowledge

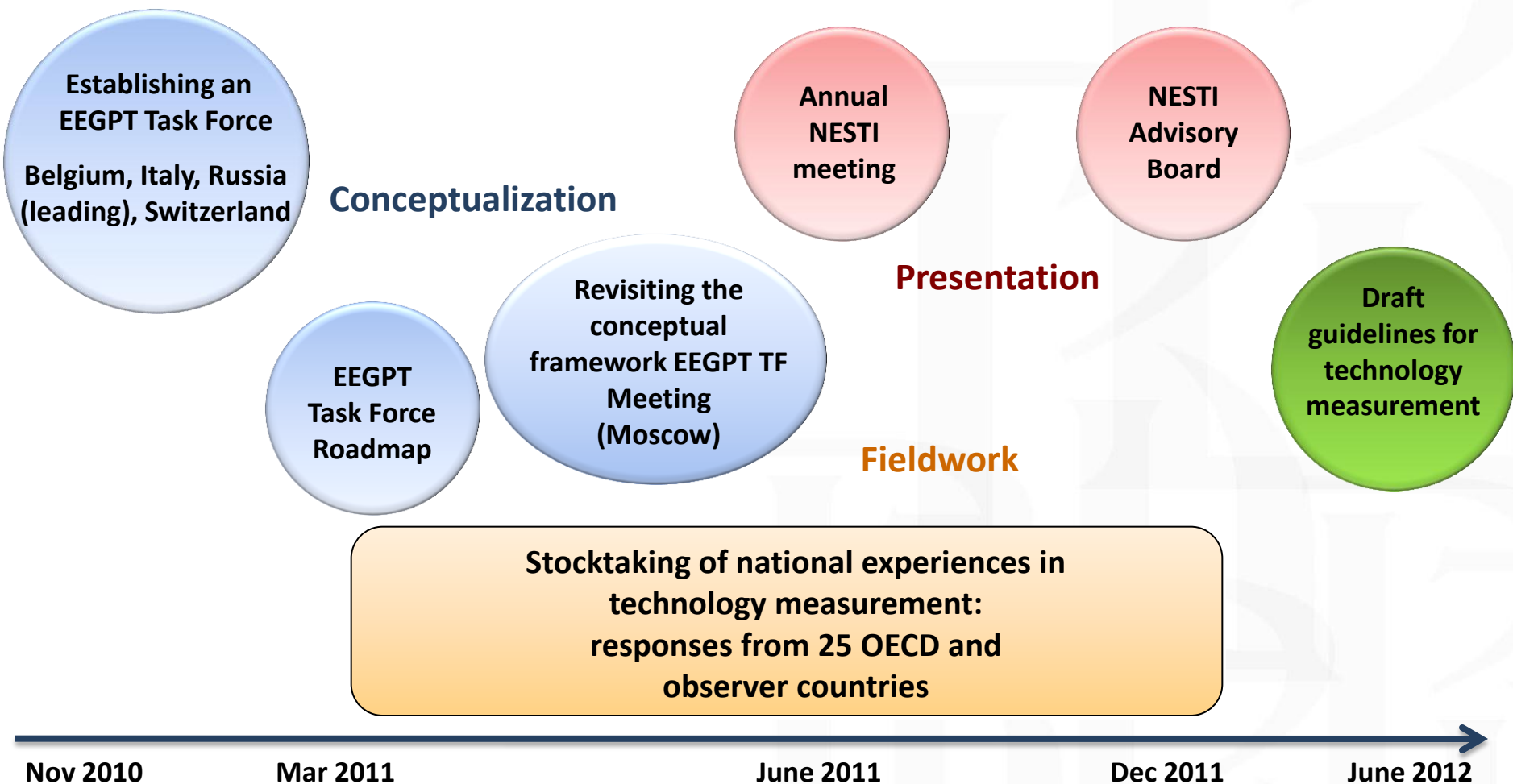
EEGPT: criteria for distinction



Conceptual framework for statistics on EEGPT



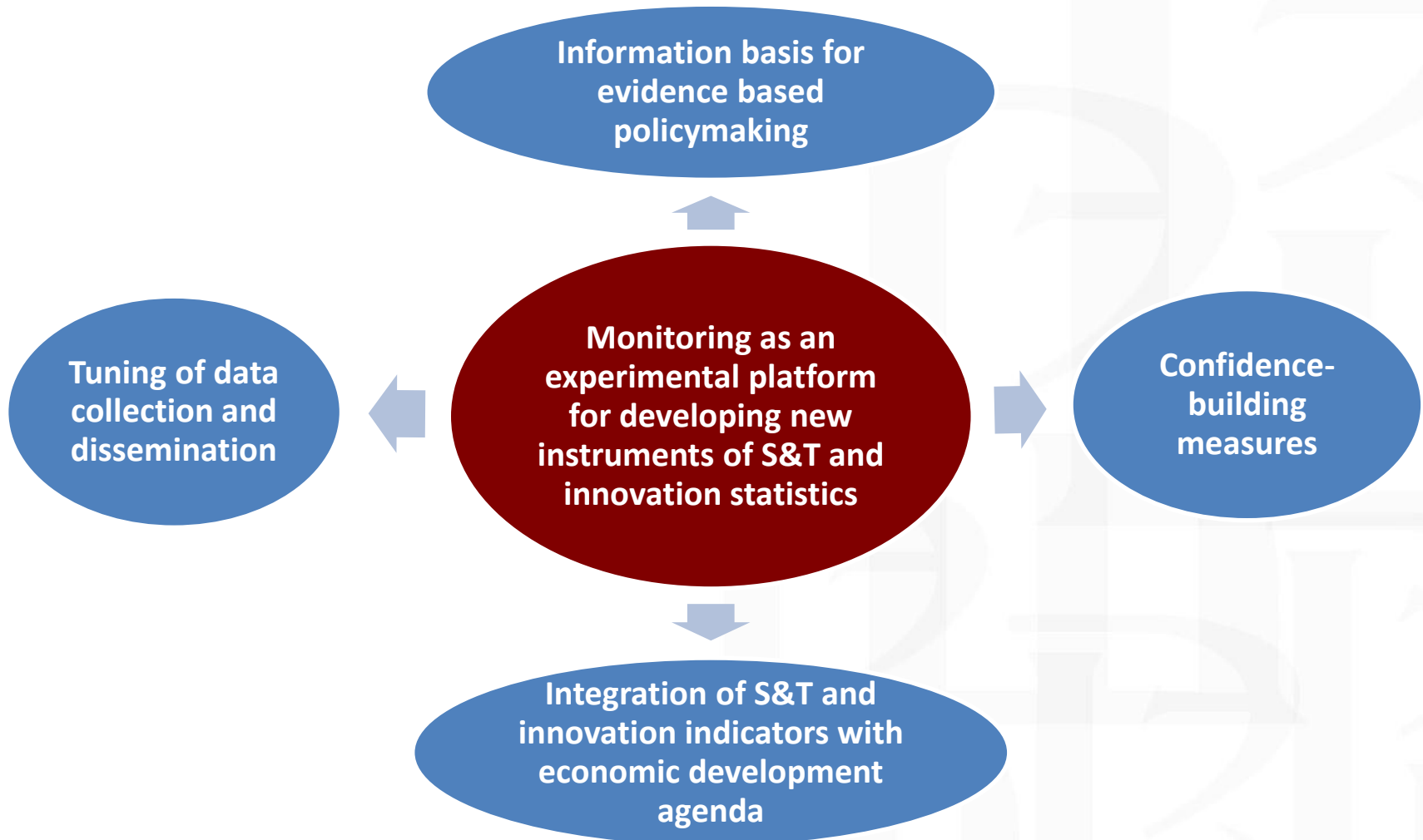
NESTI EEGPT Task Force: participants and timeline



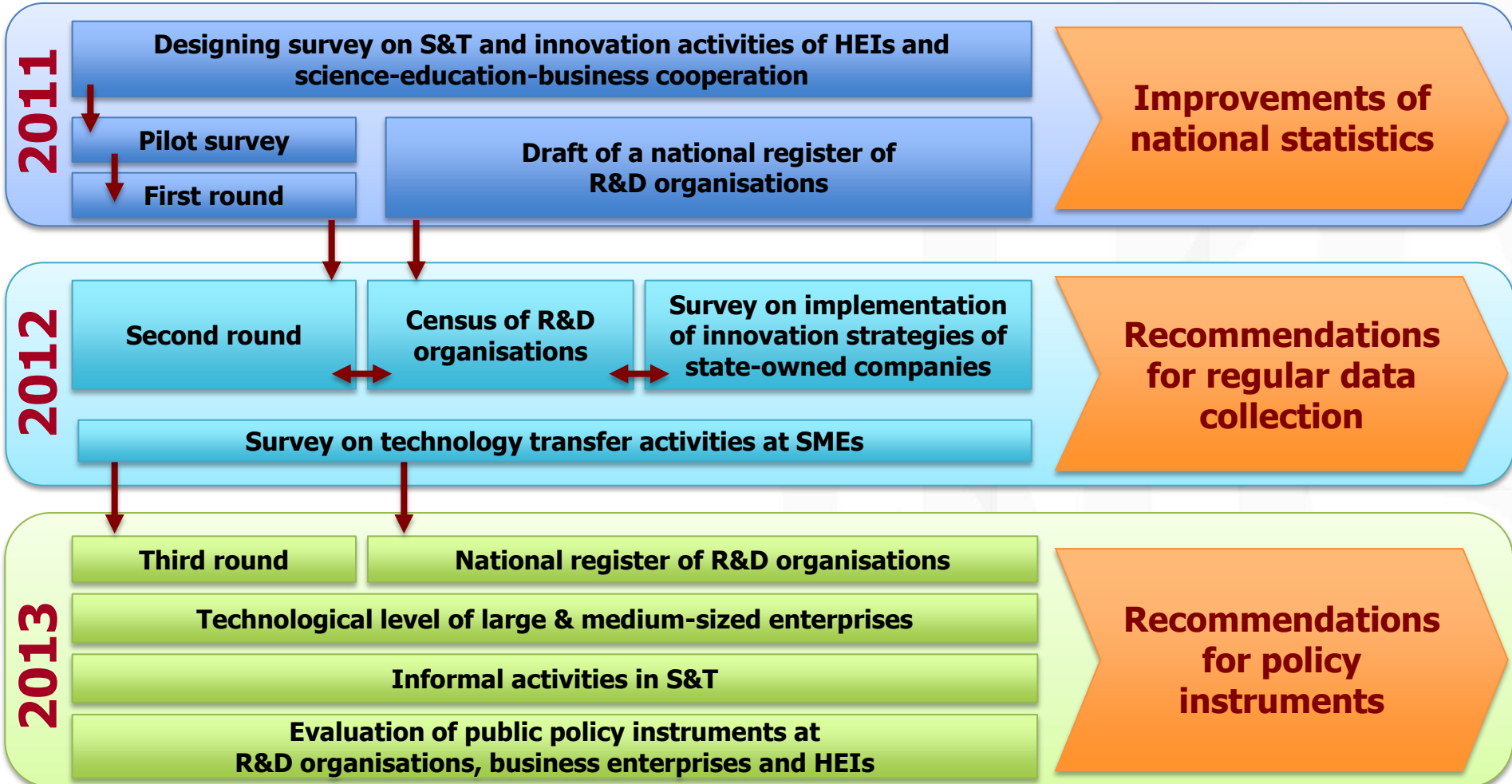
HSE ISSEK monitoring surveys

- ❖ **Economy of S&T**
- ❖ **Innovation activities of actors of NIS enterprises**
 - **Enterprises:** in the framework of European Manufacturing Survey (15 countries)
 - **Research performing organisations**
- ❖ **Knowledge-intensive business services**
- ❖ **Careers of doctorate holders/ Know INNO**
 - In the framework of a OECD/Eurostat/UNESCO Institute of Statistics project (30 countries)
- ❖ **Innovative behavior of population**
- ❖ **Global technology trends**
- ❖ **Economics of education**
- ❖ **Business climate in industry and services**
 - 600 largest enterprises (monthly); construction; retail and wholesale trade (quarterly); investment activities – 10000 industrial enterprises (annually); IT services, health and other services sectors

Monitoring of the economy of S&T



Monitoring of the economy of S&T: structure



Monitoring of the economy of S&T: coverage

	Characteristics of R&D sector								
	R&D				Technology transfer		Technology use	Innovation	Research infrastructure
	Inputs			Outputs	Internal	External			
	HRST	Machinery & equipment	Financial sources						
R&D organisations		M		M	M	M	M	M	M
HEIs	M	M	M	M	M	M	M	M	M
Large and medium enterprises		M		M	M	M	M		M
Small enterprises	M		M	M	M	M	M	M	M
State-owned companies	M	M	M	M	M	M	M	M	M
Informal activities in S&T	M		M		M	M			

- Topics covered by regular statistical surveys
- Topics beyond regular statistical surveys
- M** Topics covered with the Monitoring survey

Expected results

- ❖ **STI indicator system**
- ❖ **Updated national register of R&D organisations**
- ❖ **Data bases on S&T and innovation activities of HEIs and science-education-business cooperation**
- ❖ **Set of specialised surveys:**
 - **technology transfer activities at SMEs**
 - **innovation strategies of state-owned companies**
 - **technological level of large & medium-sized enterprises**
 - **informal activities in S&T**
 - **evaluation of public STI policy instruments**
- **Recommendations for national statistics, data collection and policymaking**

Monitoring of innovation behavior of enterprises: key facts

- **Objective:** to extend the CIS-type indicators of innovation
- Framework of European Manufacturing Survey
- **Sample:** 2000+ companies, interviews with top managers
(1000 manufacturing/1000 services)
- **Rounds:** 2009, 2010, 2012 (in progress)

European Manufacturing Survey: highlights

- International consortium of 15 countries coordinated by ISI Fraunhofer, Germany:
Austria, China, Croatia, Czech Republic, Denmark, Finland, France, Germany, Italy, Netherlands, Russia, Slovenia, Spain, Switzerland, Turkey
- Data collection every 3 years
 - (...2006, 2009, 2012 in progress)
- Notable papers:
 - [Trends in production relocation and backshoring activities – Changing patterns in the course of the global economic crisis](#), Kinkel, S. et al: International Journal of Operations & Production Management 32 (2012) 212-245.
 - [The relevance of service in European manufacturing industries](#). Lay, G. et al.: Journal of Service Management 21 (2010) 715-726.
 - [Innovation paths and the innovation performance of low-technology firms – An empirical analysis of German industry](#). Kirner, E. et al: Research Policy 38 (2009) 447-458.
 - [Organizational innovation: The challenge of measuring non-technical innovation in large-scale surveys](#). Armbruster, H. et al: Technovation 28 (2008) 644-657.

EMS: areas of focus

- Process innovation in manufacturing
 - Innovation in the Low Tech sectors
- Offshoring/backshoring of production and R&D activities
- Servicisation of manufacturing
- Green technologies in manufacturing

Key features (1)

- Advanced indicators of process innovation

2.1 Which of the following technologies are currently used in your factory?

No	Technologies used in your factory	Yes	First used (year) ¹	Extent of used potential ² (l=low; m=medium; h=high)	Principal aim of utilization			
					Increase quality/precision	Improve costs/productivity	Increase flexibility	Product innovation
Automation and linkage								
<input type="checkbox"/>	Seamless integration of digital product design/engineering with machine programming (CAD/CAM)	<input type="checkbox"/>	19/20	<input type="checkbox"/> l <input type="checkbox"/> m <input type="checkbox"/> h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Industrial robots/handling systems in manufacturing and assembly	<input type="checkbox"/>	19/20	<input type="checkbox"/> l <input type="checkbox"/> m <input type="checkbox"/> h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	(Process)integrated quality control (e.g. by laser, ultrasonic waves, machine vision systems)	<input type="checkbox"/>	19/20	<input type="checkbox"/> l <input type="checkbox"/> m <input type="checkbox"/> h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Non-financial measures of innovation effects

12 Please answer the following questions on the production of your main product (your main line or group of products).

Which is the average manufacturing lead time of your main product?
(Manufacturing lead time: from receipt of order (at shop floor) until it's ready to ship) approx. work days or hrs.

What is the average time span between receipt of customer's order and delivery (delivery time)? approx. calendar days

What is the percentage of orders delivered on time (according to confirmed time of delivery)? approx. %

What is the percentage of products or semifinished products that have to be scrapped or reworked because of quality problems? approx. %

Key features (2)

- Measuring product-related services

4.1 Which of the following product-related services do you offer to your customers?

	No	Yes		No	Yes
Design, consulting, project planning (incl. R&D for customers)	<input type="checkbox"/>	<input type="checkbox"/>	Installation, start-up procedure	<input type="checkbox"/>	<input type="checkbox"/>
Technical documentation (setup, operation, service)	<input type="checkbox"/>	<input type="checkbox"/>	Training	<input type="checkbox"/>	<input type="checkbox"/>
Software development	<input type="checkbox"/>	<input type="checkbox"/>	Maintenance/repair (incl. Teleservice)	<input type="checkbox"/>	<input type="checkbox"/>
Leasing, renting, finance	<input type="checkbox"/>	<input type="checkbox"/>	Operation of the product/equipment at/for the customer (Build/Operate/Transfer models)	<input type="checkbox"/>	<input type="checkbox"/>

4.2 If you offer product-related services, please estimate their share of the total turnover in 2008.

Share of total turnover of services in 2008 <u>directly</u> invoiced	approx. <input type="text"/> %	Share of total turnover of services in 2008 <u>indirectly</u> invoiced (via product price)	approx. <input type="text"/> %
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- Linking to general business strategy

10 Please rank the following competitive factors in order of significance for your factory.
(Please rank from 1 to 6, 1 being the most important, please do not assign equal importance to any factors)

Product price	Product quality	Innovative products	Customization to customers' demands	Adherence to delivery times/ short delivery times	Service
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ISSEK monitoring survey: questionnaire structure

General
Economic
Characteristics

Innovation
Strategy

Linkages with R&D
Performing Organisations

Perception of Innovation
Policy

Characteristics of Production/Service
delivery Processes

Technology level and
Organisation Culture

Green technologies/Energy
Efficiency

Statistics of Innovation:
Cognitive Study

ISSEK monitoring survey: research agenda

- **Strategies of innovation behaviour: motives, factors of efficiency**
 - Complementarity of innovation and business strategies
 - Barriers and stimulus for innovation activity
 - Non-financial effects of innovation
- **Innovation policy: evaluation of coverage and companies' perception**
- **Networking and innovation in Russia**
 - Science and business link
 - Knowledge base for innovation
 - Openness of innovation
- **Servicisation of manufacturing**
- **Green growth/energy and resource efficiency**
- **General purpose technologies and advanced organisational concepts: diffusion and effects**



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To be continued in the next
sections...

Thank you!

gagracheva@hse.ru

ksfursov@hse.ru

vroud@hse.ru