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Innovation surveys: toward international standards

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Presentation outline:

- Needs for innovation data
- Innovation: basic definitions
- Survey procedures: populations, methods and estimations
- Survey architecture
- CIS example
- Innovation surveys in developing countries

Needs for innovation data:

- In constructing innovation indicators, the information needs of policy makers and analysts are a paramount consideration,
- The forces that drive innovation at the level of the firm and the innovations that succeed in improving firm performance are of central importance for policy making,
- Questions on the implementation of innovations, the interaction of different types of innovations, and on the objectives and barriers to innovation are the source of relevant data.

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Innovations: basic definitions

- Definition of an innovation
- Main types of innovation
- Classifying firms by degree of innovativeness
- The impact and outcomes of innovation

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Definition of an innovation:

*An **innovation** is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.*

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Types of innovations:

Four types of innovations are distinguished: *product innovations, process innovations, marketing innovations and organisational innovations:*

- **Product innovation:** introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.
- **Process innovation:** implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.
- **Marketing innovation:** implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.
- **Organisational innovation:** implementation of a new organisational method in the firm's business practices, workplace organisation or external relations.

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Classifying firms by degree of innovativeness:

- The **innovative firm** is one that has introduced an innovation during the period under review. The innovations need not have been a commercial success –many innovations fail.
- An **innovation active firm** is one that has had innovation activities during the period under review, including those with ongoing and abandoned activities. In other words, firms that have had innovation activities during the period under review, regardless of whether the activity resulted in the implementation of an innovation, are innovation active.
- A **potentially innovative firm** is one type of “innovation active firm”, that has made innovation efforts but **not achieved results**. This is a key element in innovation policies: to help them **overcome the obstacles that prevent them from being innovative** (converting efforts into innovations).

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Impacts and outcomes of innovation:

- Impacts of innovations on firm performance range from effects on sales and market share to changes in productivity and efficiency. Important impacts at industry and national levels are changes in international competitiveness and in total factor productivity, knowledge spillovers of firm-level innovations, and an increase in the amount of knowledge flowing through networks.
- The outcomes of product innovations can be measured by the percentage of sales derived from new or improved products.

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Survey procedures: populations, methods and estimations

- Populations
- Methods
- Estimations
- Presentation of results
- Frequency of data collection

Populations:

- ***The target population***

It is recommended that innovation surveys should refer to innovation activities in the business enterprise sector. This sector includes both goods-producing and services industries.

It is also recommended that the target population should include, at a minimum, all statistical units with at least ten employees.
- ***The frame population***

An ideal frame is an up-to-date official business register established for statistical purposes. National statistical offices usually keep such registers.

Survey methods:

- **Mandatory or voluntary survey**

Innovation surveys can be either mandatory or voluntary. If they are voluntary, higher non-response rates should be expected. Low response rates mean a smaller sample than expected and thus higher variance.

- **Census or sample survey**

Resource limitations and response burdens will in most cases rule out a survey of the entire population (census). If sample surveys are utilised, the units should be selected on the basis of a random procedure (random sample surveys with known selection probabilities). Sample surveys should be representative of the basic characteristics of the target population, such as industry, size and region, so a stratified sample is necessary.

Sampling:

- Innovation surveys are in general random sample surveys. The relevant literature offers various sampling techniques, such as the simple random sample technique, stratification techniques, cluster sample techniques and pps-sample techniques. The techniques may even be combined. In the past, stratified sample surveys have proved to lead to reliable results.
- it is recommended that the stratification of random sample innovation surveys should be based on the **size** and **principal activity** of the units.

Estimation of results:

- The results of sample surveys need to be weighted to obtain information that is representative for the target population.
- There are various methods for weighting sampling results.
- The simplest is weighting by the inverse of the sampling fractions of the sampling units, corrected by the unit non-response.
- If a stratified sampling technique with different sampling fractions is used, weights should be calculated individually for each stratum.

Presentation of results:

The presentation of results should contain metadata, including information on the procedure used to collect data, sampling methods, procedures for dealing with non-response and quality indicators. This will allow users to better interpret the data and judge its quality.

Frequency of data collection:

- It is recommended to conduct innovation surveys every two years. However, where this is not economically feasible, a frequency of three or four years may be chosen.
- Theoretical and practical considerations, as well as user needs at the international, national and regional level, determine the frequency of innovation surveys.
- Only a few countries, however, can afford or are willing to run innovation surveys every year.

Survey architecture:

- A. General information about the firm*
- B. Product and process innovations that were introduced*
- C. Marketing or organisational innovations that were introduced*
- D. Basic economic information about the firm*
- E. Innovations with environmental benefits that were introduced by the firm*

CIS example:

1. General information about your enterprise

1.1 In 2008, was your enterprise part of an enterprise group? (A group consists of two or more legally defined enterprises under common ownership. Each enterprise in the group can serve different markets, as with national or regional subsidiaries, or serve different product markets. The head office is also part of an enterprise group.)

Yes In which country is the head office of your group located? ¹ _____
 No

If your enterprise is part of an enterprise group: Please answer all further questions *only* for the enterprise for which you are responsible in Belgium (as identified by its VAT number). Exclude all subsidiaries or parent enterprises.

1.2 In which geographic markets did your enterprise sell goods and/or services during the three years 2006 to 2008?

	Yes	No
A. Local / regional within Belgium	<input type="checkbox"/>	<input type="checkbox"/>
B. National (other regions of Belgium)	<input type="checkbox"/>	<input type="checkbox"/>
C. Other European Union (EU), EFTA, or EU candidate countries*	<input type="checkbox"/>	<input type="checkbox"/>
D. All other countries	<input type="checkbox"/>	<input type="checkbox"/>

Which of these geographic areas was your largest market in terms of turnover between 2006 and 2008? (Give corresponding letter)

* Include the following countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Ireland, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Slovakia, Switzerland, Turkey, Spain, Sweden and the United Kingdom.

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MODULE B. PRODUCT OR PROCESS INNOVATION

2. Product (good or service) innovation

A product innovation is the market introduction of a new or significantly improved good or service with respect to its capabilities, user-friendliness, components or sub-systems.

- Product innovations (new or improved) must be new to your enterprise, but they do not need to be new to your market.
- Product innovations could have been originally developed by your enterprise or by other enterprises.

2.1 During the three years 2006 to 2008, did your enterprise introduce:

	Yes	No
New or significantly improved goods. (Exclude the simple resale of new goods purchased from other enterprises and changes of a solely aesthetic nature.)	<input type="checkbox"/>	<input type="checkbox"/>
New or significantly improved services.	<input type="checkbox"/>	<input type="checkbox"/>

If no to both options, go to section 3, otherwise:

2.2 Who developed these product innovations?

Select the most appropriate option only.

Mainly your enterprise or enterprise group
 Mainly your enterprise together with other enterprises or institutions
 Mainly other enterprises or institutions

2.3 Were any of your product innovations during the three years 2006 to 2008:

		Yes	No
New to your market?	Your enterprise introduced a new or significantly improved good or service onto your market before your competitors (it may have already been available in other markets)	<input type="checkbox"/>	<input type="checkbox"/>
Only new to your firm?	Your enterprise introduced a new or significantly improved good or service that was already available from your competitors in your market	<input type="checkbox"/>	<input type="checkbox"/>

Using the definitions above, please give the percentage⁴ of your total turnover⁴ in 2008 from:

New or significantly improved goods and services introduced during 2006 to 2008 that were **new to your market** %
 New or significantly improved goods and services introduced during 2006 to 2008 that were **only new to your firm** %
 Goods and services that were **unchanged or only marginally modified** during 2006 to 2008 (include the resale of new goods or services purchased from other enterprises) %
Total turnover in 2008 %

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3. Process Innovation

A process innovation is the implementation of a new or significantly improved production process, distribution method, or support activity for your goods or services.

- Process innovations must be new to your enterprise, but they do not need to be new to your market.
- The innovation could have been originally developed by your enterprise or by other enterprises.
- Exclude purely organisational innovations – these are covered in section 9.

3.1 During the three years 2006 to 2008, did your enterprise introduce:

	Yes	No
New or significantly improved methods of manufacturing or producing goods or services	<input type="checkbox"/>	<input type="checkbox"/>
New or significantly improved logistics, delivery or distribution methods for your inputs, goods or services	<input type="checkbox"/>	<input type="checkbox"/>
New or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing	<input type="checkbox"/>	<input type="checkbox"/>

If no to all options, go to section 4, otherwise:

3.2 Who developed these process innovations?

Select the most appropriate option only

Mainly your enterprise or enterprise group	<input type="checkbox"/>
Mainly your enterprise together with other enterprises or institutions	<input type="checkbox"/>
Mainly other enterprises or institutions	<input type="checkbox"/>

3.3 Were any of your process innovations introduced between 2006 and 2008 new to your market?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>
Do not know	<input checked="" type="checkbox"/>

4. Ongoing or abandoned innovation activities for process and product innovations

Innovation activities include the acquisition of machinery, equipment, software, and licenses; engineering and development work, industrial design, training, marketing and R&D when they are specifically undertaken to develop and/or implement a product or process innovation. Also include basic R&D as an innovation activity even when not related to a product and/or process innovation.

4.1 During 2006 to 2008, did your enterprise have any innovation activities that did not result in a product or process innovation because the activities were:

	Yes	No
Abandoned or suspended before completion	<input type="checkbox"/>	<input type="checkbox"/>
Still ongoing at the end of the 2008	<input type="checkbox"/>	<input type="checkbox"/>

If your enterprise had no product or process innovations or innovation activity during 2006 to 2008 (no to all options in questions 2.1, 3.1, and 4.1), go to section 5. [In this version, better to say "Go to Module C" ?]

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5. Innovation activities and expenditures for process and product innovations

5.1 During the three years 2006 to 2008, did your enterprise engage in the following innovative activities:

		Yes	No
In-house R&D	Creative work undertaken within your enterprise to increase the stock of knowledge for developing new and improved products and processes (include software development in-house that meets this requirement) If yes, did your enterprise perform R&D during 2006 to 2008: Continuously (your enterprise has permanent R&D staff in-house) <input type="checkbox"/> Occasionally (as needed only) <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
External R&D	Same activities as above, but performed by other enterprises (including other enterprises or subsidiaries within your group) or by public or private research organisations and purchased by your enterprise	<input type="checkbox"/>	<input type="checkbox"/>
Acquisition of machinery, equipment and software	Acquisition of advanced machinery, equipment and computer hardware or software to produce new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>
Acquisition of external knowledge	Purchase or licensing of patents and non-patented inventions, know-how, and other types of knowledge from other enterprises or organisations for the development of new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>
Training for innovative activities	Internal or external training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>
Market introduction of innovations	Activities for the market introduction of your new or significantly improved goods and services, including market research and launch advertising	<input type="checkbox"/>	<input type="checkbox"/>
Other	Other activities to implement new or significantly improved products and processes such as feasibility studies, testing, routine software development, tooling up, industrial engineering, etc.	<input type="checkbox"/>	<input type="checkbox"/>

5.2 Please estimate the amount of expenditure for each of the following four innovation activities in 2008 only. (Include personnel and related costs)²

If your enterprise had no expenditures in 2008, please fill in '0'

In-house R&D (Include capital expenditures on buildings and equipment specifically for R&D)	<input type="text"/>
Purchase of external R&D	<input type="text"/>
Acquisition of machinery, equipment and software (Exclude expenditures on equipment for R&D)	<input type="text"/>
Acquisition of external knowledge	<input type="text"/>
Total of these four innovation expenditure categories	<input type="text"/>

5.3 During the three years 2006 to 2008, did your enterprise receive any public financial support for innovation activities from the following levels of government? Include financial

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6. Sources of information and co-operation for innovation activities

6.1 During the three years 2006 to 2008, how important to your enterprise's innovativ activities were each of the following information sources? Please identify information sources th provided information for new innovation projects or contributed to the completion of existing innovativ projects

	Information source	Degree of importance			
		High	Medium	Low	Not used
Internal	Within your enterprise or enterprise group	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Market sources	Suppliers of equipment, materials, components, or software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Clients or customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Competitors or other enterprises in your sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Consultants, commercial labs, or private R&D institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Institutional sources	Universities or other higher education institutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Government or public research institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other sources	Conferences, trade fairs, exhibitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Scientific journals and trade/technical publications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Professional and industry associations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tick 'not used' if no information was obtained from a source

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6.2 During the three years 2006 to 2008, did your enterprise cooperate on any of your innovation activities with other enterprises or institutions? Innovation co-operation is active participation with other enterprises or non-commercial institutions on innovation activities. Both partners do not need to commercially benefit. Exclude pure contracting out of work with no active co-operation.

Yes
No (Please go to question 7.1)

6.3 Please indicate the type of innovation co-operation partner by location

Type of co-operation partner	[Your country]	Other Europe ¹	United States	China or India	All other countries
A. Other enterprises within your enterprise group	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Suppliers of equipment, materials, components, or software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Clients or customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Competitors or other enterprises in your sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Consultants, commercial labs, or private R&D institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. Universities or other higher education institutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G. Government or public research institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

¹ Includes the following European Union (EU) countries: EU 15, or EU candidate countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Iceland, Latvia, Lithuania, Luxembourg, Lithuania, Latvia, Estonia, Slovakia, Slovenia, Spain, Sweden and the United Kingdom

6.4 Which type of co-operation partner did you find the most valuable for your enterprise's innovation activities? (Give corresponding letter) _____

7. Innovation objectives during 2006-2008

7.1 How important were each of the following objectives for your activities to develop product (good or service) or process innovations between 2006 and 2008?

If your enterprise had several projects for product and process innovations, make an overall evaluation

	High	Medium	Low	Not relevant
Increase range of goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Replace outdated products or processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enter new markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increase market shares	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve quality of goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve flexibility for producing goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increase capacity for producing goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve health and safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduce labour costs per unit output	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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10. Basic economic information on your enterprise

10.1 What was your enterprise's total turnover for 2006 and 2008? Turnover is defined as the market sales of goods and services (Include all taxes except VAT?).

2006	2008
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

10.2 What was your enterprise's total number of employees in 2006 and 2008?*

2006	2008
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

1. During the three years 2006 to 2008, did your enterprise introduce a product (good or service), process, organizational or marketing innovation with any of the following environmental benefits?

	Yes	No
Environmental benefits from the production of goods or services within your enterprise		
Reduced material use per unit of output	<input type="checkbox"/>	<input type="checkbox"/>
Reduced energy use per unit of output	<input type="checkbox"/>	<input type="checkbox"/>
Reduced CO ₂ footprint (total CO ₂ production) by your enterprise	<input type="checkbox"/>	<input type="checkbox"/>
Replaced materials with less polluting or hazardous substitutes	<input type="checkbox"/>	<input type="checkbox"/>
Reduced soil, water, noise, or air pollution	<input type="checkbox"/>	<input type="checkbox"/>
Recycled waste, water, or materials	<input type="checkbox"/>	<input type="checkbox"/>
Environmental benefits from the after sales use of a good or service by the end user		
Reduced energy use	<input type="checkbox"/>	<input type="checkbox"/>
Reduced air, water, soil or noise pollution	<input type="checkbox"/>	<input type="checkbox"/>
Improved recycling of product after use	<input type="checkbox"/>	<input type="checkbox"/>

2. During 2006 to 2008, did your enterprise introduce an environmental innovation in response to:

	Yes	No
Existing environmental regulations or taxes on pollution	<input type="checkbox"/>	<input type="checkbox"/>
Environmental regulations or taxes that you expected to be introduced in the future	<input type="checkbox"/>	<input type="checkbox"/>
Availability of government grants, subsidies or other financial incentives for environmental innovation	<input type="checkbox"/>	<input type="checkbox"/>
Current or expected market demand from your customers for environmental innovations	<input type="checkbox"/>	<input type="checkbox"/>
Voluntary codes or agreements for environmental good practice within your sector	<input type="checkbox"/>	<input type="checkbox"/>

3. Does your enterprise have procedures in place to regularly identify and reduce your enterprise's environmental impacts? (For example preparing environmental audits, setting environmental performance goals, ISO 14001 certification, etc.)

- Yes: implemented before January 2006
 Yes: Implemented or significantly improved after January 2006
 No

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The characteristics of innovation in developing countries:

- The sector of small and medium-sized enterprises (SMEs) is very significant
- A number of exogenous systemic factors shape the innovation landscape in developing countries, such as: macroeconomic uncertainty; instability; physical infrastructure (lack of basic services such as electricity or "old" communications technologies); institutional fragility; lack of social awareness about innovation; risk-averse nature of enterprises; lack of entrepreneurs; existence of barriers to business start-up; lack of public policy instruments for business support and management training
- Developing countries' economies rely significantly on informal practice. Informality is not a favourable context for innovation
- Many enterprises in developing countries operate in unusual economic and innovation environments owing to the existence, and in some cases prevalence, of state-owned enterprises (China) or massive parastatal enterprises (some Arab states), where a lack of competition sometimes discourages innovation or drains local markets of innovative potential

Innovation measurement in developing countries:

- Innovation measurement in developing countries has to produce results comparable to those obtained in developed countries that use the *Oslo Manual* in order to enable benchmarking and construct a coherent international system of innovation indicators
- The problem of measuring incremental changes, which may not result in “new or significantly improved” products or processes
- Another pending issue is related to the scope of innovations, since concepts such as “new to the market” may have different interpretations in environments with less developed infrastructure.

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Principal adaptations:

- In developing countries, the incorporation of ICTs in enterprises has frequently been limited to sophisticated “front-office” applications (such as Web page, call centre, e-mail or digital brochures and catalogues). However, it is considered that the main impact on the enterprise’s performance can be obtained by implementing ICTs to support or automate critical activities or processes (“back-office”).
- From the point of view of human resource management, it is particularly important to collect information on actions taken by firms with regard to training, including the resources involved.

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Methodological issues for developing country contexts:

- It is particularly important to involve national statistics offices (NSOs) in innovation surveys, even if such surveys do not constitute a high priority in the national statistical programmes of some developing countries.
- Statistical systems in developing countries frequently lack the necessary information about firm performance (such as data on sales, investments, exports), only have outdated data or cannot provide data in a suitable form for statistical analysis. In such cases, a number of basic variables can be included in the innovation survey in order to enable analysis of the relationship between actions taken by firms for innovation and market performance (competitiveness).