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Skills anticipating in Russian hi-tech industries for curricula development

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Contents

1. Problem statement
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3. «Skills barometers»
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Challenges

Labour market



Education system

1

- There is a gap between the requirements of the labor market and training in the education system

2

- State standards are systematically lag behind the requirements of technology and business processes in industries (especially in high-tech)

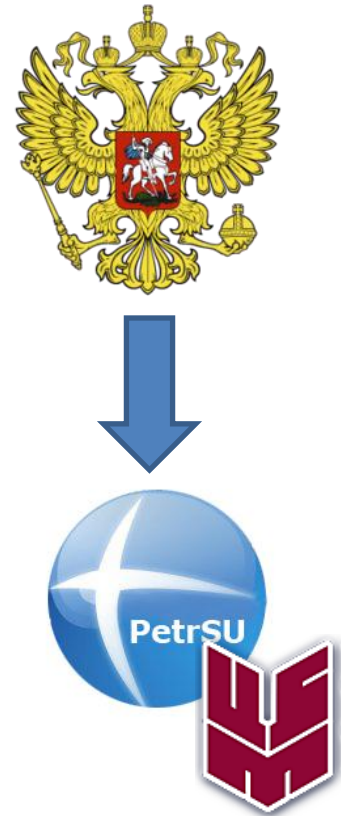
3

- Communication processes to transfer requirements from the business to the education system are not configured

Skills anticipating in Russia

First experience

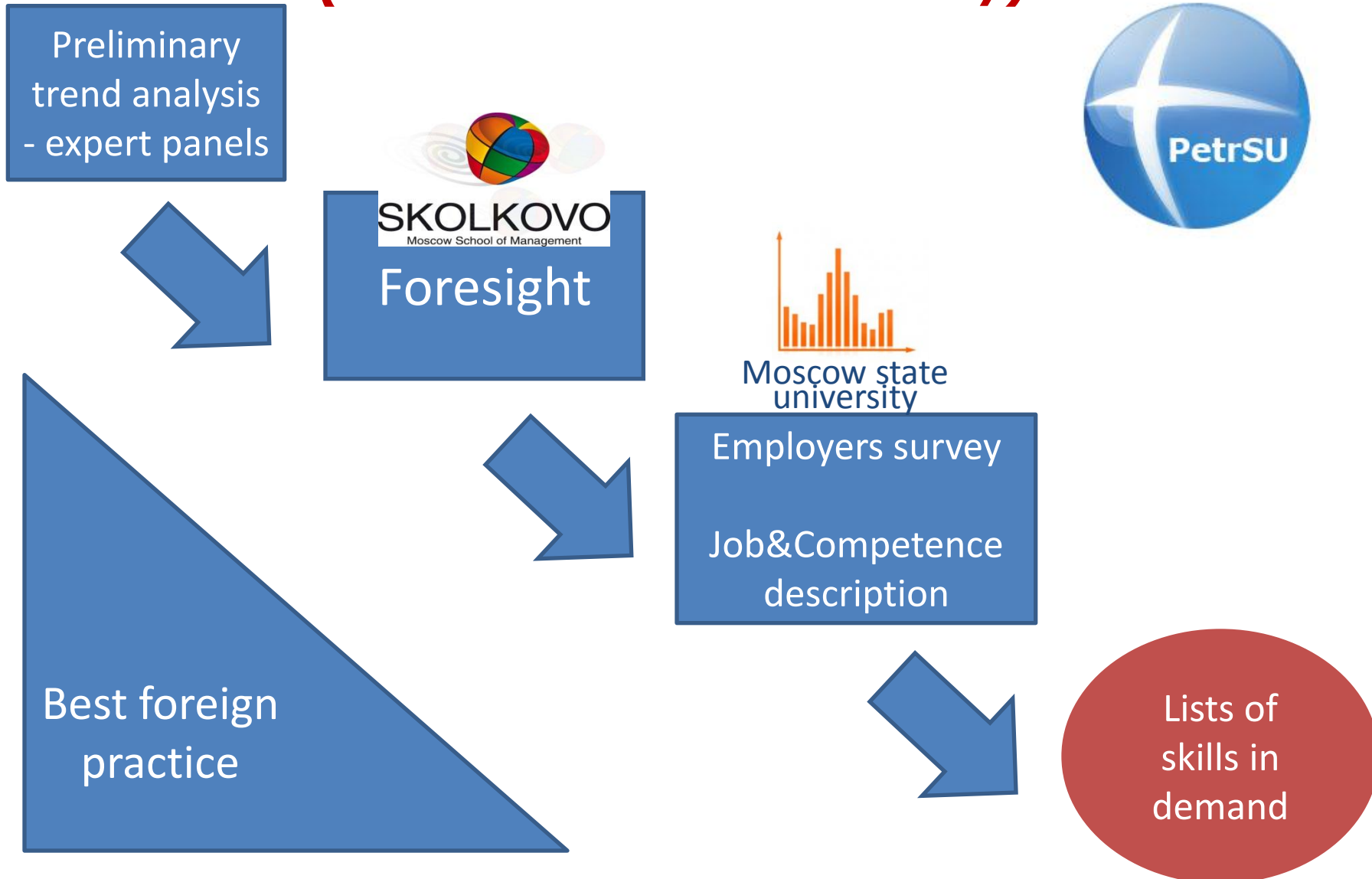
- A large-scale research project “**Anticipating skills demand in hi-tech industries**” (2011-2013)
- Ordered by the Ministry of Education and Science of Russia
- Carried out by Budget monitoring centre of Petrozavodsk State University.



Field of study - hi-tech prioritized industries in Russia

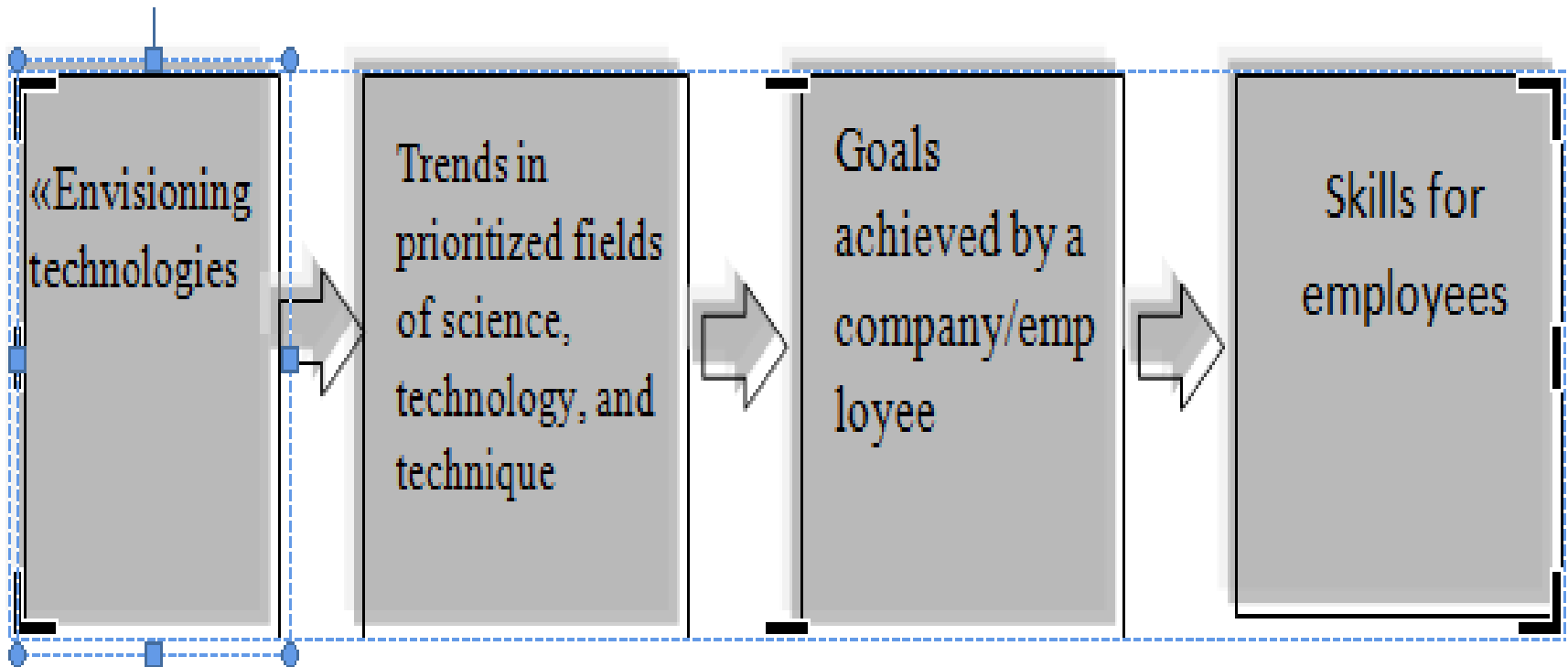
7 hi-tech industries prioritized in Russia	Davos priorities 2012 [World Economic Forum, 2012]
Medicine and healthcare	<i>Personalized medicine, nutrition and disease prevention</i>
Biotech	<i>Synthetic biology and metabolic engineering</i>
Effective management of natural resources	<i>Utilization of carbon dioxide as a resource</i>
Nanotech and new materials	<i>Nanoscale design of materials</i>
Energy efficiency	<i>High energy density power systems</i>
Transport and space systems	-
IT	<i>Informatics for adding value to information</i>

Skills anticipating methodology (for each hi-tech industry)

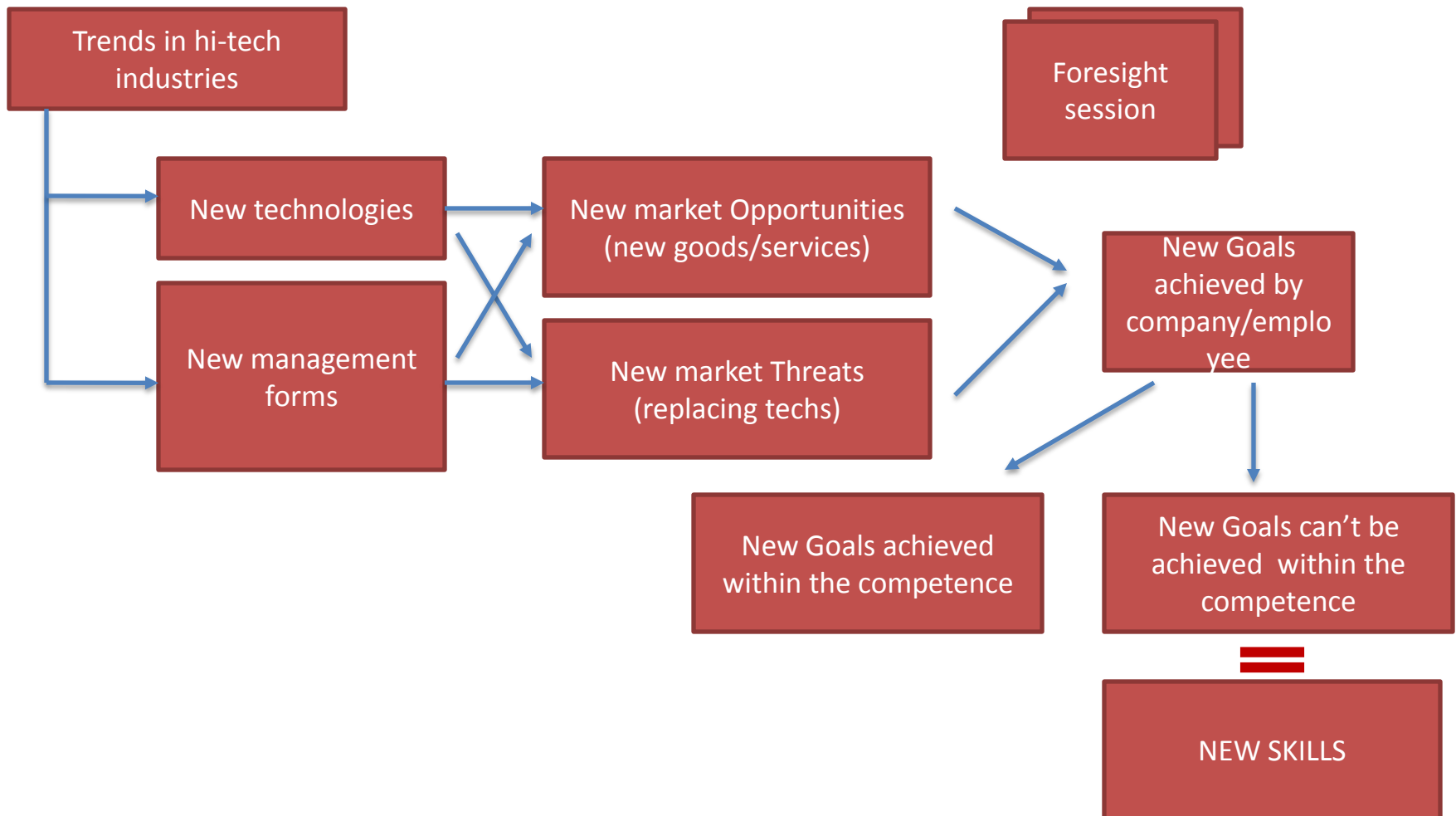


Preliminary trend analysis

“Envisioning technologies” is the core of skills anticipating methodology



Foresight layout



Soft and hard common skills for all 7 hi-tech prioritized industries in Russia

General skills (32 items)

Pillar 1. Analytical work

I Information search:

II Information processing (complex, comparative, situational analysis and synthesis):

III Synthesis

Pillar 2. Organization and Administration

IV The internal organization (ability to self-learning and self-education)

V The external organization:

Pillar 3. Communication (interaction):

VI Leadership

VII Team and interrelationship:

Professional skills (27 items)

Pillar 4. Product and services design

VIII. Assessment of the market and society needs

IX. The design process

Pillar 5. Product and services production

Pillar 6. Implementation \ product and services support



Pillar 1. analytical work

I Information search:

The ability to effectively search information across heterogeneous environments, etc.

II Information processing (complex, comparative, situational analysis and synthesis):

The ability to capture and classification of data , and their use:

Detection of the object material properties and characteristics

Identification of common and distinguishing properties of the objects being compared

Classification of objects by a specified base

Establishing the need or appropriateness of known feature

Selection of information under the task:

Selection of objects to solve the problem

Selection of examples illustrating the general rule

Information and Knowledge Management

Drawing conclusions from the analysis

Formulating a hypothesis

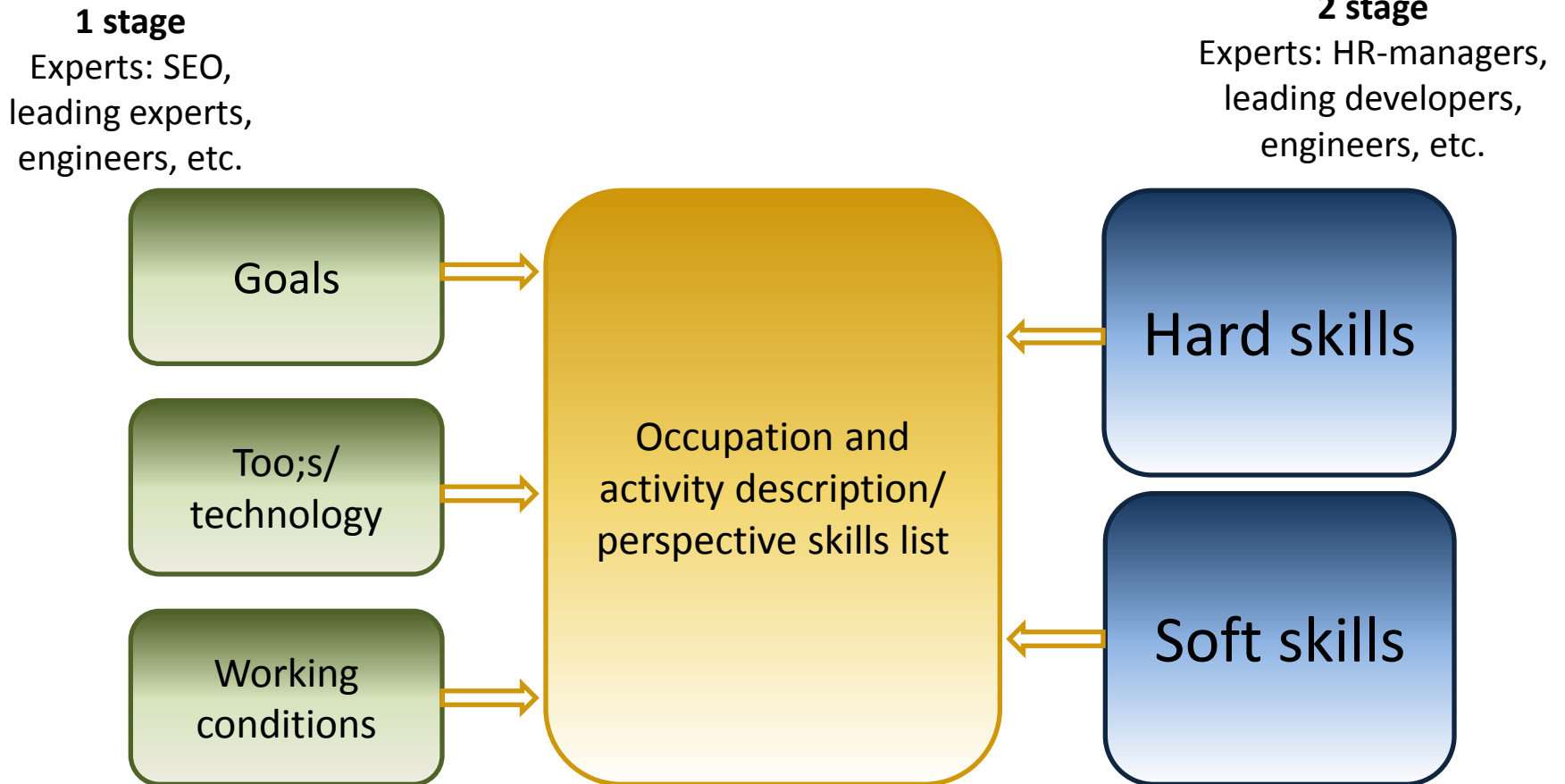
Creation and operation instructions given algorithm

Construction of proof or refutation of a statement

Determination of cause and effect

Schematization of the material studied

“Job&Competence Description” implementation technology



“the problem solved by the employee and
the way he does it”

Example of implementation of “Job&Competence Description”

Occupation - «Database Architect»		
Challenges/Tasks	Tools and Technology	Work conditions
I. Ensuring effective management of user data stores, the quality of the stored data, logic, storage and retrieval.. II. Optimization of the access speed and storage efficiency. III. Search for new media and mechanisms for access to information for a revolutionary new indicators.	I. Computer technologies, portable electronic devices. II. Access to modern computing clusters (supercomputers) or other effective methods of calculation.	I. The traditional office with a small amount of people per unit of space and providing a comfortable environment (adequate lighting, low noise, etc.) or remote work format II. Access to the Internet and other resources needed.

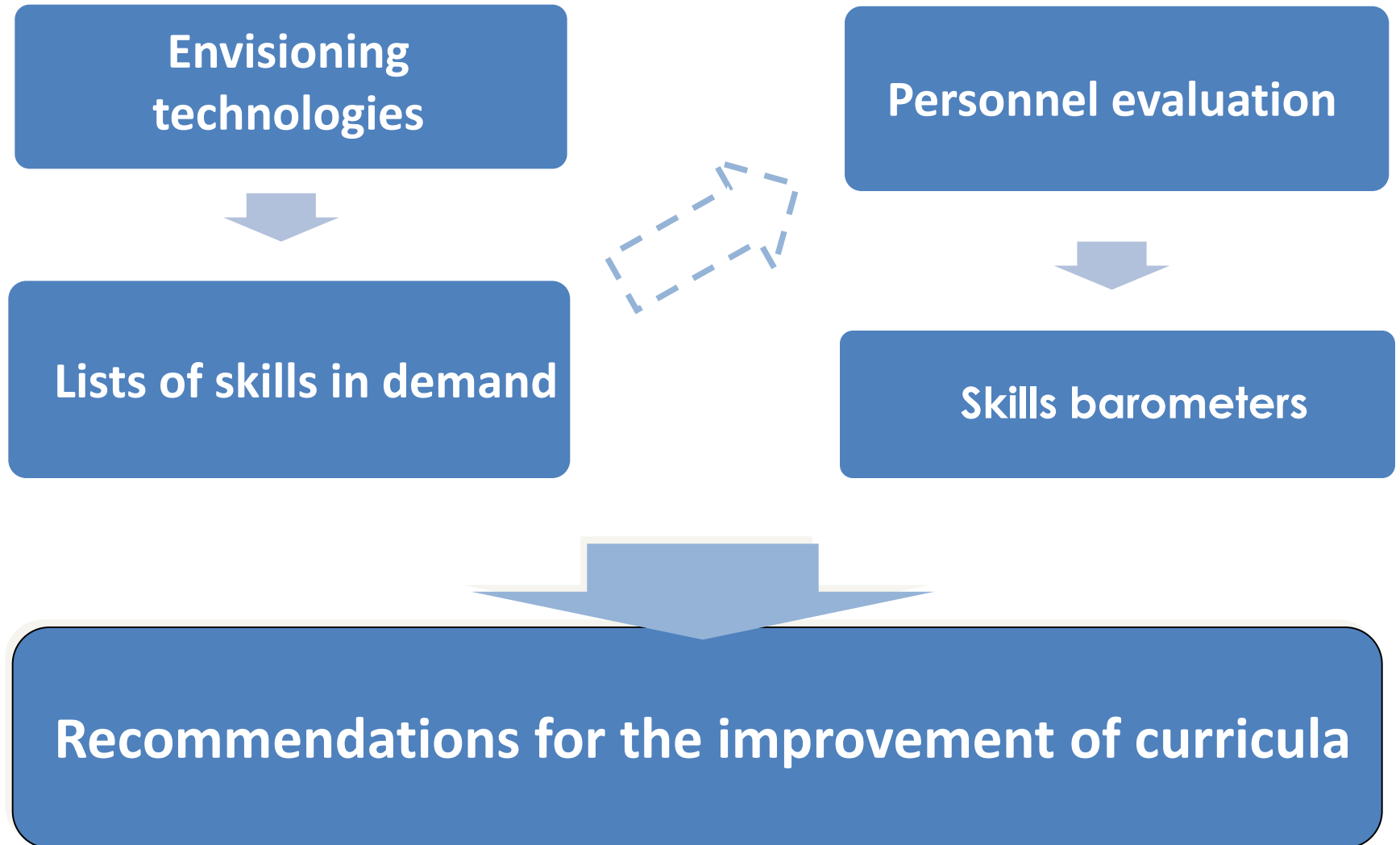
Soft skills

- Analytical thinking
- Structuring
- Organised nature
- Result orientation
- Information search
- Creative thinking
- Learning determination

Hard skills

- Working with algorithms
- The use of mathematical tools
- Fundamentals of systems analysis, design and performance evaluation
- Current models of data assessment
- Modern trends in computer science
- Working with Databases
- “Soft” computing technology
- The integration of software products

Personnel evaluation in line with skills in demand



Best practice: Occupation barometers - Finland

Centers for Economic Development, Transport and the Environment (ELY Centers)

Southwest Finland's Occupational Barometer 2011 / I

The occupational barometer is based on the view of the employment and economic development offices on the development of the labour market situation in the coming half year. The situation concerning some occupations and professions may change quickly. The estimate was done in January 2011.

SHORTAGE

Architects, architectural technicians
 Bookkeepers, accountants
 Bricklayers
 Building maintenance workers
 Chefs, cooks, restaurant cooks in charge of cold food
 Children's nursery, nursing
 Cleaners
 Computer operators
 Crane operators
 Dealers of food and movable property
 Dental hygienists
 Dental nurses
 Designers
 Engine drivers
 Engineers and technicians in electric power engineering
 Estimators
 Floor layers and tile setters
 Hairdressers, wig makers
 Hospital nurses
 Housekeepers, stock clerks
 Individual catering managers
 Insulators
 Kitchen workers, restaurant workers
 Laboratory nurses, radiographers
 Nurses, midwife teachers
 Occupational therapists
 Opticians
 Physiotherapists
 Psychologists
 Residential nurses, outpatients, institution based
 Personal care workers
 Psychiatric nurses
 Psychotherapists
 Sales representatives and telemarketers
 Senior social workers and administrative managers
 Social workers working, personal assistants, home based personal care workers
 Social workers
 Special education teachers
 Speech therapists
 Street cleaners, concrete placers, concrete finishers and related work
 Street cleaners, concrete workers
 Truck drivers and drivers of special articulated vehicles
 Veterinarians

BALANCE

Accommodation business managers
 Advertising and marketing managers, designers and researchers
 Architects, construction architects
 Asphalt, red and road construction workers
 Assemblers of engineering works products and metal industry products
 Bakers, pastrycooks and confectionary makers
 Builders, panel process operators/joiners
 Brewing and soft drink industry workers, distillery workers
 Building painters
 Bus drivers and car drivers
 Business executives
 Builders, metal processing workers
 Buyers
 Cans and arcade game managers
 Child day care workers
 Childminders, day care
 Civil engineers and construction technicians
 Class teachers
 Cleaning and forwarding agents, transport planners
 Clerks
 Couriers, delivery service staff
 Cook heads and engine cook
 Deck officers
 Deck officers
 Earth moving machine operators
 Electrical line installers
 Electrical mechanical fitters
 Employees in organizations and unions
 Employment and recruitment service officials
 Engineers and technicians in chemistry and technology
 Executives in organizations and unions
 Financial management planners, cost accountants
 Fire fighters
 Gardeners
 Gendering assistants
 Hairdressers and beauticians, bathing aids
 Housekeepers, household managers, domestic workers
 Industrial painters and varnishers
 Institution workers
 Insurance employees
 Laundry and cleaners shop workers
 Legal clerks, courtiers and experts
 Lifting truck operators
 Machine and engine mechanics
 Mail carriers and mail sorting staff
 Market vendors, door to door salespersons
 Meat service workers and salespersons in cafes, canteens etc.
 Measuring engineers and technicians and cartographers
 Metal casting workers
 Metal working workers
 Office sales representatives
 Other officials in post and telecommunications
 Paramedical assistants
 Plastic workers
 Police
 Precision mechanics
 Preserved (canned) and frozen food workers
 Process operators
 Processed food workers
 Road traffic and transport management
 Sales executives
 Salespersons
 School headmasters and principals
 Security and financial service dealers
 Security guards
 Senior civil servants
 Senior officials in local government
 Service station staff
 Sectors in the garment industry
 Shoemakers
 Shop managers
 Sports and physical education instructors
 Stewards and loading workers
 Tailors
 Timber workers
 Trainers and instructors
 Translators, interpreters
 Travel consultants, travel organisers and secretaries
 Trial lawyers
 University teachers and teachers in other institutes of higher education
 Upholsterers
 Warehouse assistants
 Wholesale and retailers
 Word processor operators, typists
 Youth workers and temperance work instructors

SURPLUS

Advertising designers, coordinators
 Archive clerks and museum employees
 Assemblers of electric, electronic and technical products
 Book designers
 Bookbinders and related workers, finishing room workers
 Builders
 Bookkeepers and accountants
 Chemists
 Chemical products and confectionary makers
 Designers
 Dressmakers, shoe managers
 Dental assistants
 Electricians
 Engineers and technicians in electronics, information technology and telecommunications
 Environmental and other nature protection work
 General construction workers
 General workers, industry
 Researchers in the humanities and natural sciences
 Hand painters
 HR managers, careers officers
 Information officers, press officers
 IT managers, designers, programmers, coordinators
 IT operators, IT support persons
 Janitors, cleaners
 Library clerks
 Life science technicians, laboratory assistants
 Mechanics, mechanics
 Machine tool setters, roller operators and toolmakers
 Mechanical engineering and mechanical engineering technicians
 Medications
 Office coordinators
 Office workers
 Photographers, cinematographers
 Pipe workers
 Plaster, sheet metal workers
 Researchers in the humanities and natural sciences
 Printers
 Researchers in social sciences
 Sculptors
 Stenographers and dictaphone operators
 Subject teachers, lecturers
 Tailors, alter dressmakers and dressmakers working at home
 Technical drawers and other technical fields
 Telecommunications engineers and electronics mechanics
 Textile designers, pattern cutters
 Travel agents, guides
 Visual artists
 Warehouse operators
 Welders, gas cutters
 Woodworking machine setters and setters/operators

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 Southwest Finland
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 20100 Turku
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 www.ely-keskus.fi



Ammatibarometri
 Occupational Barometer

Compare Employment and Economic Development Offices | Compare ELY Centre regions | Profile | Map | Evaluation

OCCUPATIONAL BAROMETER OF SOUTHWEST FINLAND, II / 2013

SHORTAGE

Dealers in charge of cold food
 House managers, stock clerks
 Kitchen workers, restaurant workers
 Laboratory nurses, radiographers
 Local welfare workers, personal assistants, home based personal care workers
 Pharmaceutical assistants
 Pharmacists
 Photographers, cinematographers
 Security
 Physiotherapists
 Psychologists
 "Practical nurses, outpatients, institution based personal care workers"
 Psychiatric nurses

IN BALANCE

For animal caretakers
 Fur animal producers
 Gardeners
 Gendering assistants
 Gendering managers
 General workers, industry
 Glaziers
 Goldsmiths and jewelers
 Hairdressers, beauticians, bathing aids
 Hand painters
 Home aids, home helps
 Housekeepers, household managers, domestic workers
 Institutional assistants and waitresses
 Institutional assistants / managers
 Institutional workers
 Insurance employees
 Insulators
 Laundry and cleaners' shop workers
 Leather products industry workers
 Legal assistants, courtiers and experts
 Lifting truck operators
 Machine and engine mechanics
 Mail carriers and mail sorting staff
 Management of HR issues
 Market vendors, door to door salespersons
 Metal coating workers
 Metal drawers and extruders
 Mill workers
 Millwrights
 Moisture, moisture
 Nurses' school teachers
 Office caretakers
 Office sales representatives
 Other workers
 Ore and metal furnace operators
 Organizational employees
 Planning engineering and architectural work
 Other commercial work
 Other food industry work
 Other handicraft and leather work
 Other officials in post and telecommunications
 Other sales work
 Other security, protection and emergency work
 Other services work
 Other tasks in administration and office work
 Other tasks in advertising and marketing
 Other tasks in economics, designing and accountancy
 Other tasks in financial building
 Other tasks in IT work
 Other tasks in metal, mechanical engineering and structural metal work
 Other tasks in retail and financial service business
 Other tasks in sales
 Other training work
 Other wood processing work
 Port extraction
 Real estate management
 Precision mechanics
 Preserved (canned) and frozen food workers
 Process operators
 Processed food workers
 Professional fishermen
 Programme officers
 Psychologists
 Road and tram transport service work
 Rubber traffic and transport management
 Sales executives
 School headmasters and principals
 Security and financial service dealers
 Security guards
 Service station staff
 Shoemakers
 Shop managers
 Special insurance employees
 Special educational institution instructors
 Steel beam, concrete placers, concrete finishers and related work
 Stewards and loading work
 Textile workers, blasters
 Tailors, alter dressmakers and dressmakers working at home
 Technical drawers and other technical fields
 Technical workers and other technical fields
 Train crew and station guards
 Trainers and instructors
 Translators, interpreters
 Travel guides
 Other technical work
 Truck drivers and drivers of special articulated vehicles
 University teachers and teachers in other institutes of higher education
 Warehouse operators
 Welders, gas cutters
 Writers and authors

SURPLUS

Engineers and technicians in electric power engineering
 "Engineers and technicians in electronics, information technology and telecommunications"
 Information officers, press officers
 IT managers, designers, programmers, consultants and experts
 IT operators, IT support persons
 "Labourers in other construction trades"
 Life science technicians, laboratory assistants
 Machine tool setters, roller operators and toolmakers
 Measuring engineers and technicians, and cartographers
 Mechanical engineering and mechanical engineering technicians
 Technicians
 Mechanic/industrialists
 "Office workers"
 Designers
 Pipe workers
 Plaster, sheet metal workers
 Police
 Printers
 Researchers in other fields of natural science and the humanities
 Researchers in social sciences
 Salespersons
 Secretaries
 Senior civil servants
 Senior officials in local government
 Sectors in the garment industry
 Subject teachers, lecturers
 "Telecommunications engineers and electronics mechanics"
 Travel agents, guides
 Travel consultants, travel organisers and secretaries
 Warehouse operators
 Welders, gas cutters
 Woodworking machine setters and setters/operators

The occupational barometer is based on the view of the employment and development offices on the development of the labour market situation in the coming half year. The situation concerning some occupations and professions may very quickly. The estimate was done in May 2013.
 *Great lack or surplus of jobseekers

Personnel evaluation – skills barometer



SHORTAGE

the competence is **in demand**,
but **not developed** enough
among the particular group of
employees

BALANCE

the competence is **in demand**
and **developed** enough among
the particular group of
employees

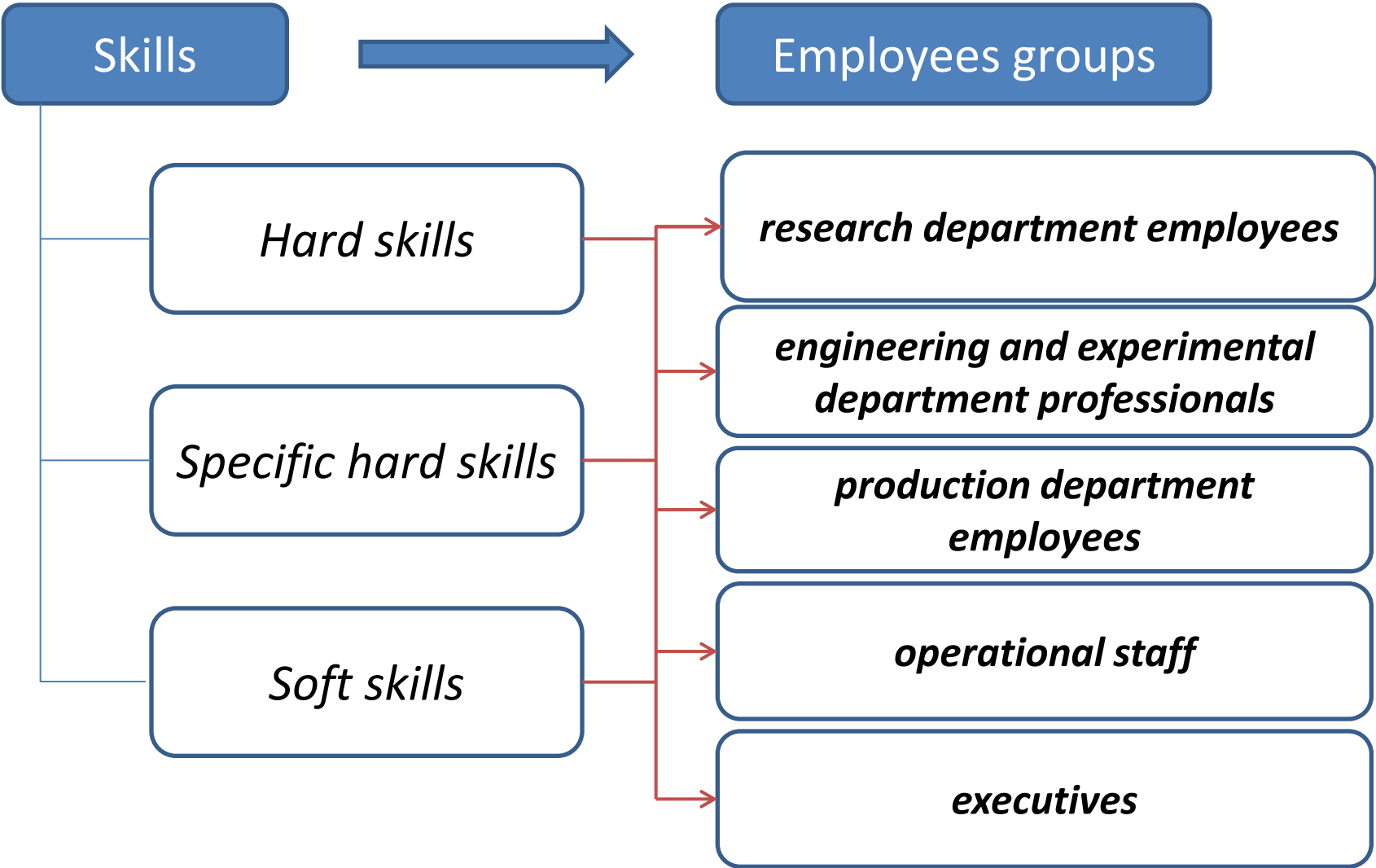


SURPLUS































the competence is **developed**
enough among the particular
group of employees, but **non-**
demanded at the enterprise



Skills evaluation matrix



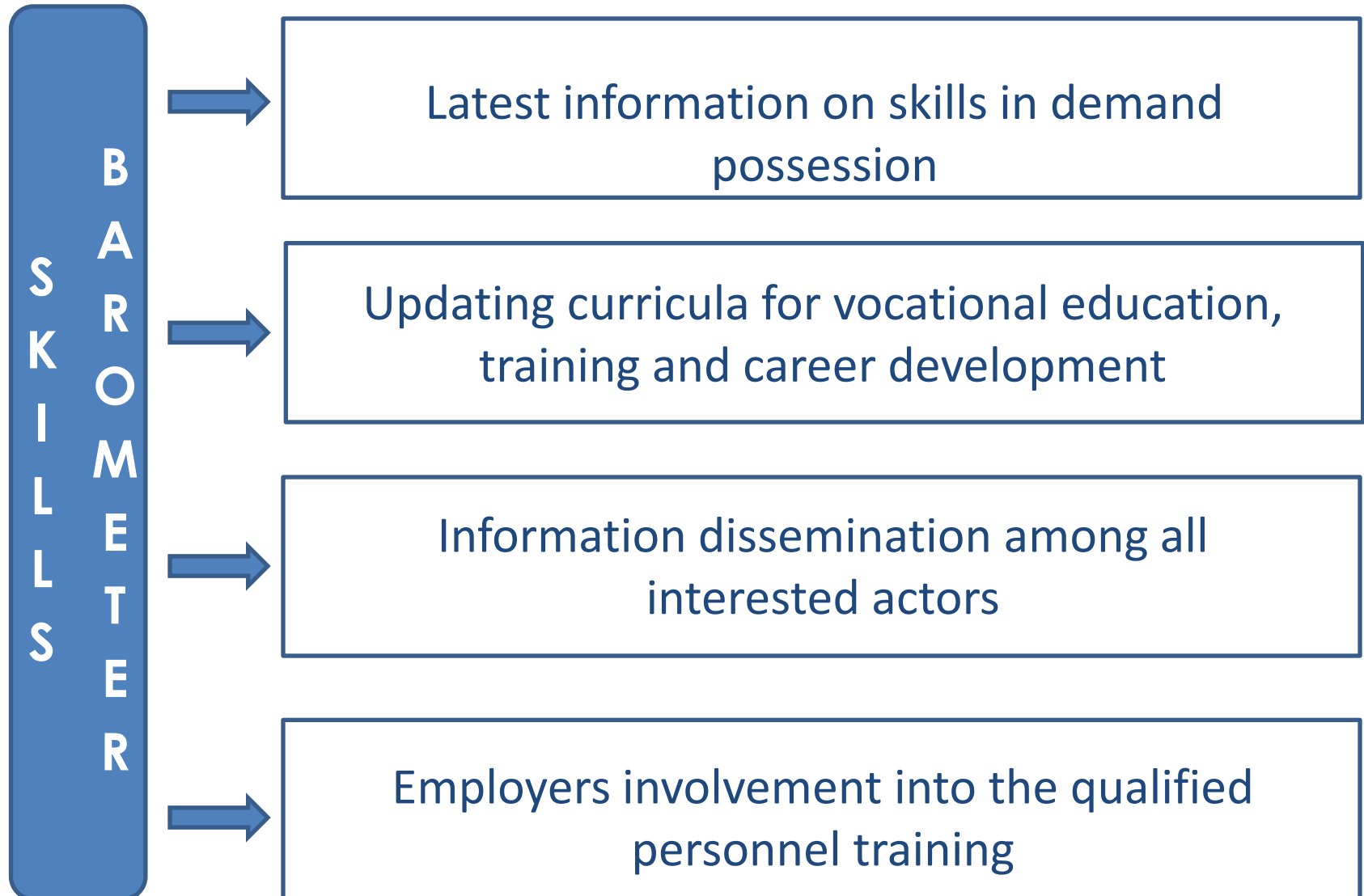
Fragment of a skills barometer: “medicine and health” industry

Skills	Executives	Professionals (higher vocational education)	Professionals (secondary vocational education)
Hard skills			
Knowledge of modern fundamental and empirical research methods			
Knowledge of fundamental mathematics, physics, chemistry			
Results anticipation and process models development skills			
Knowledge on how to adhibit crude drugs, pharmaceuticals, biopharmaceuticals and nutritional supplements effectively			
Working knowledge of modern equipment			
Ability to apply statistical and applied mathematics methods and software in order to solve computational diagnostics and forecasting problems			
Soft skills			
Decision making			
Respect/understanding			
Motivating others			
Authority delegation			

Fragment of a skills barometer: executives

EXECUTIVES	BIO	ICT	MED	NANO	ENVIR	TRANS	ENERGY
Hard skills							
Information technology							
Handling information							
Basic knowledge of the subject area							
Standards							--
Soft skills							
Adaptivity/flexibility							
Self-discipline							
Information search							
Attitude to further education/training							

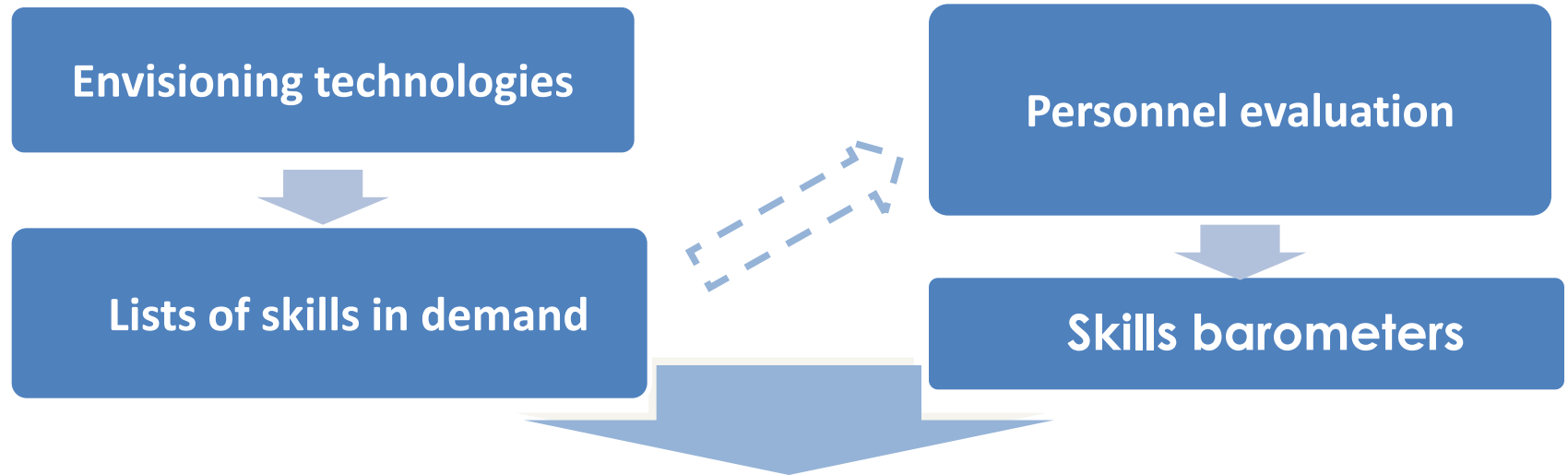
Applying skills barometer



Applying results - 1



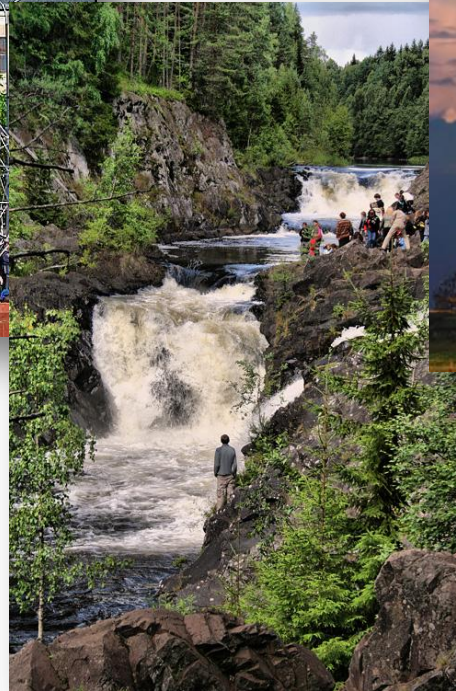
Applying results - 2



Curricula development:

1. Federal state educational standards adjustment
2. Curricula adjustment
3. Training new skills based on existing subjects
4. Introducing new subjects in curricula

THANK YOU



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