

ENVISIONING PERSPECTIVE SKILLS FOR CURRICULUM UPDATING

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Abstract

After the 2008-2009 crisis perspective skills envisioning is on the OECD member-states agenda since the governments want to be sure if the perspective skills expenditures are effective enough [OECD, 2011]. In this concern many of the OECD states have developed national strategies on skills development and currently are increasingly implementing these strategies. In 2011 an overall OECD report entitled «Towards skills strategy» [OECD, 2011] provided authoritative recommendations for the member-states. Among the research methods widely implemented for perspective skills envisioning in the OECD are foresight method [I.Miles, 2010], employers' and experts' surveys (including interview) as well as desk research [Cedefop, 2009; Hendry, 1999]., qualification sociological analysis [Rasmussen, 2006], projection model for knowledge demand in occupations Baronetti [Consoli et al., 2009] etc.

Russia continues undertaking curriculum renewal processes, it is evident that there is a heightened importance attributed to ensuring that students develop graduate capabilities or skills that will enable them to be more productive and engaged citizens. Complying with the existed curriculum not revisited timely, it remains unanswered how to meet the challenge of advanced training and occupation skills development. The point is that curricula are to be oriented for the future, not for the past, i.e. what perspective skills and competences should be expected from graduates. This paper explores various methods applied in perspective skills qualitative projection (employers' and experts' surveys, foresight results). 'Established best practice' can and should be implemented in Russian contexts. Following a preliminary consideration of the origins of 'best practices', we address approaches aimed at re-modeling and reconceptualizing skills (for example, famous tuning-model).

The article deals with the perspective skills models for prioritized hi-tech industries in science, technique, and technology in Russia; it includes both the methodology description and the skills lists themselves. The developed approach is based upon the best Russian and foreign practices, it embraces both the results of experts' and employers' surveys as well as foresight sessions results. The methodology implementation resulted in structured models for both soft and hard skills and became the main predictor for the successful achieving the "future goals". These new skills are to help specialists to overcome new challenges effectively, bring in innovative decisions, and reach out technological results.

The obtained results on structured skills models for prioritized hi-tech industries will contribute to new demands formulated for the vocational education system taking into account the development perspectives of technological innovations. This will contribute to education flexibility, in-demand specialists training, career development backup, labour market complimenting with vacant job places.

Keywords: skills anticipation methodology, hi-tech industries, bridging VET and labour market, research projects.

1 INTRODUCTION

Present-day economic development is characterized with developed economies shifting into innovative society, so called knowledge-based economy. High qualification, unique skills and abilities, capability to implement them in an increasingly changing environment are the main factors not only for productivity, but for state development as a whole. In the "Strategy 2020: new growth model – new social policy" [1] one of the factors for Russia's competitiveness which was underestimated before, titled as a human capital and its high quality. Human capital policy ineffective implementation was conditioned on by a huge gap between labour market and VET. Research have proved that one of the three employees doesn't implement one's knowledge and hard skills [2, c. 53]. Thus, from one point of view, there is an acute necessity in human capital active investment for the national competitive advantage [3, c. 28]. From the other, VET graduates' while entering labour market reveal that their skills turn to be nonperspective with hard skills being in acute demand.

In order to overcome these contradictions, one shall be informed - which skills from the employers' point of view both in current and upcoming periods are perspective, what a graduate shall know/be able, which practical experience a graduate shall obtain in order to achieve the goals. Particularly, the perspective skills lists development in hi-tech industries became one of the main goals of the large-scale research project "Hi-tech skills anticipation" (2011-2013) contracted by the Ministry of Education and Science in Russia.

The research frameworks were limited by technological innovations, in particular, applied key research in prioritized hi-tech areas (PHTA) – IT; biotechnologies; medicine and healthcare; new materials and nanotechnologies; transport and space systems; effective national resources management; energy and energy efficiency [4].

The OECD acknowledged that perspective skills outlining and anticipation has been one of the most important issues for the last years as. In The OECD member-states these goals are achieved on international level. Thus, the «OECD Skills Strategy» [5] appeared in 2010, and the European community got highly interested in it. In 2007 the first ever mid-term skills anticipation was performed by Cedefop «Skills for Europe's future: anticipating occupational skill needs» [6], which is still being implemented by politicians, employers, VET, citizens interested in effective educational trajectory.

2 LOGICAL FRAMEWORK FOR SKILLS ANTICIPATION

Both foresight programme as well as its tool kit development, employers' surveys verification in the framework of technological innovations was implemented taking into account the best foreign practice (UK, Finland, USA etc.). Main methodological instrument for the perspective skills lists development in Russia is the best foreign practice on skills anticipation provided by Cedefop, the ILO, the OECD. The data obtained from highly-qualified Russian and foreign experts' surveys via individual depth interview, group discussions in the form of foresight sessions, both distant and in-person questionnaire surveys – served as the basis.

Perspective skills lists development for the prioritized areas in science, technique and technologies included the following steps [7]:

1. New technological trends, «future goals» outlining for each PHTA (via documents analysis dealing with Russia and developed countries strategic development, discussions with a wide group of experts);
2. Experts' survey (Russian and foreign representatives of science, business, education) on necessary skills aimed at job duties performing in terms of new technological trends and "future goals» for each PHTA;
3. Preliminary perspective skills lists development;
4. Foresight-sessions organization for each PHTA both for the future development trends and skills lists specification;
5. Both foresight-sessions formalization and verification via leading Russian hi-tech enterprises surveying .

Petrozavodsk State University was the coordinator and the main contractor, co-contractors were Moscow business school SKOLKOVO and Center for testing and development "Humanitarian technologies" under Moscow State University.

The foresight implemented by Moscow business school SKOLKOVO was highly important. By means of implementing the foresight methodology the research is focusing upon each economy's brunch shifting from critical threats and key opportunities to typical operating tasks which might face any enterprise while competing¹.

The foresight methodology implies trends, technologies and formats outlining which could serve as a bases for the long-term recruitment needs development.

Both outlined and defined forecast horizons served as manual for various curriculum design: retraining, further vocational education for a short-term period (3 years), master programmes for the mid-term period (3-8 years) and changes in bachelor and specialists programmes (8-18 years).

¹ Foresight is a systemic, joint processes for the future vision aimed at decision-making quality updating as well as joint activities speed up.

The main criteria for the foresight experts' shortlisting were:

- Experience in administrative office, HR, R&D sectors of hi-tech companies;
- Experience in applied HR tasks;
- participation at company's strategy development.

These three criteria are sufficient for the expertise and recommendations development dealing with staff training in hi-tech industries.

The questionnaire and surveys data from 200 key employers was applied for the further data formalization and specification after the foresight-sessions. The questionnaire was aimed at PHTA description:

- presupposed "future goals",
- products and future technologies,
- demanded specialists in the future.

Employers' surveys in accordance with Job&Competence Description method resulted in both revealing and description of 3-6 occupations directions in terms of each PHTA and 3 horizons (till 2015, 2020 and 2030).

The Job&Competence Description method developed by Center for testing and development "Humanitarian technologies" under Moscow State University is a process of detailed and formalized occupation description in terms of:

- tasks which a specialist might face;
- technologies and instruments defining occupation;
- specialists' working conditions;
- soft and hard skills.

The data resulted from the Job&Competence Description method leads to the description of what task an employee is facing and how an employee is performing it in terms of the above-mentioned 3 forecast horizons. As a result, the obtained skills models are highly detailed and accurate. This implies that it is possible to implement them both in personnel training and selection as well as in efficiency evaluation. Thanks to the implemented methods the perspective skills lists were updated.

3 FINALIZING SKILLS LIST FOR HI-TECH INDUSTRIES

The foresight organization, independent verification and employers surveys in accordance with Job&Competence Description method resulted in perspective skills lists for hi-tech industries development. Experts selected, edited and grouped the "future goals" for each PHTA in Russia as well as defined new tasks taking into account key trends in sectors development.

The "future goals" are critical leading to sectoral structure changes of labour differentiation, technological solutions development and new groups of innovative products appearance. Besides, they determine new demand both in soft and hard skills.

Under the moderators supervision experts selected 12 "future goals" for each PHTA. After that, soft and hard skills specification and detalization became possible. It was determined which skills are still crucial for employers in 2012-2030, and which are not perspective.

During the foresight-sessions experts claimed that soft skills are common for each PHTA.

During the interview participants summed up their own professional and recruitment experience dealing with recruitment needs. The main description instrument acknowledged by all experts unanimously became "new occupations". In this very case, big inter-connected skills clusters applied in professional activities and providing solutions for the crucial issues are implied.

More detailed skills analysis was not attractive for the surveyed employers. Since it was highly crucial to specify skills because of its excessiveness, the project's analysts have decided to describe skills cluster which contribute to accomplishing the variety of tasks. From obvious to expected tasks linked to changes in sector's development vector and new professional tools appearance.

Below is an example of skills clusters for hi-tech industry “New materials and nanotechnologies” resulted from both group and individual interview. Each of the clusters implies future occupations descriptions (by analogy with present-day occupations) and agreed with experts. Key skills in this description are presented as typical operating tasks set in front of the future specialist.

3.1 Skills clusters for hi-tech industry “New materials and nanotechnologies”

Nanotechnologies life cycle designer. Specializes in designing equipment, technological process’ new materials, end product under its full cycle (from development till utilization) taking into account materials living; able to work with 3D and 4D virtual simulation on nanolevel; defines security indicators for the end customer and ecosystem.

Modular solutions integrator. Engineer -executive, organizing nanotechnological solutions attracting specialized research and technological teams in physics, chemistry, material engineering, simulation etc. The main skill is in ability to connect labour market demands with developers’ skills, and after that perform technologies’ shift from the laboratory into mass production.

Nanobioengineers. Specializes in nanotechnologies and new materials development linked to living systems – human/animal/plant; is able to design equipment, diagnostic systems for preventive medicine and chirurgia, also working with viruses as with a target-nanoitens – pharmaceuticals, diagnostic probes, microchirurgia, desoxynucleic acid redesigning.

Architecture «active environment» / «smart environment». Specializes in environments and materials designing aimed at the settled goal or diagnosing independently environment/human with further transformations aimed at the goal achievement. Engaged in materials and devises design with a huge spectrum of given property reacting to biological (temperature, pressure, diseases activation, fatigue); emotional (joy, sadness, anger); environmental (sun, rain, cold weather) characteristics.

Qualitative data obtained under Job&Competence Description method lead to a description of what task an employee is facing and how an employee performs it. As a result, soft and hard skills models were developed in terms of perspective occupations. In Tables 1-2 occupation directions are presented in terms of Job&Competence Description method for hi-tech industry “Biotechnologies”. After each occupation directions description skills models are presented.

3.2 Perspective occupations directions description and skills models for hi-tech industry “Biotechnologies”

Table 1 – Stems cells specialist

Horizon	Tasks	Tools and technologies	Working conditions
Mid-term (till 2020)	Stems cells analysis, also in pathology. Cells-based therapy. Gene-cell based therapy. Gene engineering. Patients’ diagnostics and consulting.	Gene engineering modes. Tissue and cells transplantation methods. Fixed facilities. Molecular and cells technologies.	Laboratory for molecular and cells biology. Laboratory for GMP standard. Clinic and polyclinic department.
Long-term (до 2030)	Tissue engineering Regeneration therapy		

Table 2 – Skills model for Stems cells specialist

Soft skills	Hard skills
<p>DATA SEARCH: constant curiosity, wish to know more on things, people, problems. Data search implies more efforts in data search and not believing in word</p> <p>-CREATIVE THINKING: ability to challenge the existed approaches, to suggest new, more effective solutions, intuition and new opportunities implementation, ability to explore. New, nonstandard approaches implementation to problem solutions.</p> <p>SELF-ASSURANCE: belief in own abilities to perform job duties, choosing the more effective approach, self efficacy despite tasks complication, belief in own decisions accuracy.</p> <p>- LIFELONG LEARNING: constant learning and skills development, others' support and aspirations encouragement in learning and development.</p>	<p>Ability to apply basic skills in accordance with major</p> <p>Ability to apply research methodology and handle research</p> <p>Ability to work with info and special literature</p> <p>Ability to implement modern technological processes</p> <p>Ability to provide industrial security and productivity standards</p> <p>Ability to handle modern equipment</p> <p>Ability to apply computer technologies</p> <p>Ability to apply foreign languages</p> <p>Knowledge in system biology, cell biology, molecular biology</p> <p>Knowledge of basic biomedical disciplines: physiology, microbiology, virology, immunology, general pathology, molecular pharmacology, general and medical biophysics, general and medical biochemistry, medical cybernetics, molecular biology, medical nanobiotechnology</p> <p>Knowledge of development factors for deceases, biochemical, molecular-biological mechanisms for pathological processes development in human tissues and cells</p> <p>Knowledge of basic technological and technical solutions in cell equivalents processing for tissues and organs</p> <p>Knowledge of methods in bio medical technologies</p> <p>Knowledge of contemporary evaluation methods, preventive measures, diagnostics, socially important deceases treatment in new molecular-bio technologies</p> <p>Ability to project the results, create processes' models</p>

The Job&Competence Description method resulted in 36 perspective occupations description in terms of 3 forecast horizons. A structured skills list (hard and soft) for each occupations is presented – about 15 for each occupation. Occupations descriptions in terms of its tasks (or duties), knowledge, skills, individual characteristics together with elaborated soft and hard skills models are providing detailed and objective presentation of a current/perspective occupation from the employers' and labour market point of view.

The research results dealing with perspective skills unveiling in hi-tech industries for each of PHTA lead to demands updating for VET taking into account technological innovations perspectives for each prioritized hi-tech area till 2030. This will make VET produce perspective employees, guarantee graduates' employability and fill in job vacancies.

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