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Education and the Ability to Function in the Global System

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Summary

Recent economic changes and their directions and possibilities both in the world and in the Polish economy lead to the identification of several threats and challenges that are fundamental for the population of many countries. It has to be kept in mind that these challenges can be directly transpositioned onto the educational tasks. On the basis of several studies and research it can be indicated that the adaptation of people to the increasing changeability and insecurity developing various social and economic risks in the time of globalisation becomes the main problem. Technological development requires new qualifications and educational abilities. Therefore, the needs of employment may be only fairly fulfilled via, so far used, usually stiff formal traditional systems of massive education and vocational training. Moreover, internationalisation and globalisation processes in the economy lead to the competition increase, that state and national borders are less and less protected from. That results in the occurrence of additional convenience as regards international corporations in their capital, staff and technology localisation strategies depending on the level of the comparative advantage achievable.

Training giving the ability to function in the European and global alliances in case of Poland must be considered both from the point of indicated in the report of the European Commission education tendencies and on account of the set of global challenges. On the basis of the research of European and world experiences it may be noticed that the ability to create innovations as a fundamental factor defining the level of economy and society competition becomes the priority in education. Therefore, in this article attention was focused on the response to the question whether the Polish Education System is prepared to this task and on the search for concrete indicators of changes in education and for concrete programme proposals in education for the needs of technological innovation development.

Global challenges and the directions of educational change for the economic success

Recent economic changes and their directions and possibilities both in the world and in the Polish economy lead to the identification of several threats and challenges that are fundamental for the population of many countries. It has to be kept in mind that these challenges can be directly transpositioned onto the educational tasks. On the basis of several studies and research¹ it can be indicated that the adaptation of people to the increasing changeability and insecurity developing various social and economic risks in the time of globalisation becomes the main problem. Among the fundamental challenges that are to enforce the necessity for the change in the education systems the following are to be named:

- sudden development of technical science and technology;
- processes of economy internationalisation and globalisation;
- increase in the role of small and middle enterprises;
- increase of education costs.

Technological development requires new qualifications and educational abilities. Therefore, the needs of employment may be only fairly fulfilled via, so far used, usually stiff formal traditional systems of massive education and vocational training. Moreover, internationalisation and globalisation processes in the economy lead to the competition increase that state and national borders are less and less protected from. That results in the occurrence of additional convenience as regards international corporations in their capital, staff and technology localisation strategies depending on the level of the comparative advantage achievable.

The systematic growth of importance of private SMEs in the creation of the global product leads to the increase, on the one hand, of entrepreneurship and innovativeness in the economy, and of requirements for employers and employees, on the other. Since, it happens at present that in the situation of increasing insecurity and risk the knowledge and experience already gained are considered not to be useful, traditional education systems become depreciated². Attention must be given to the fact that firstly modern and effective education

¹ See: Mc Rae H.: World in the year 2020. Power, Culture and Welfare - Vision of the Future. Dom Wydawniczy ABC, Warsaw 1996; Naisbitt J.: Megatrends. 10 New Directions Changing Our Life. Zysk and Co. Publishers, Poznań 1997; Kennedy P.: At the Threshold of the 21 Century (fitting for the future).; Puls Publications Ltd, London 1994.

² See.: Galwas B.A.: Remarks upon Society Educational Effort and the Necessity for Long-distance Learning. In: Future world and Poland; op. cit.; pp. 147-151.

costs more and more and secondly that the possibilities of its financing by both the State and the private individuals are not to be rapidly increased³.

Limited means cannot be wasted in the traditional education systems that often fail to ensure the ways in the channels of vocational carrier. All this may result in the occurrence of a serious civilisation decline on a global scale that will be, however, most influential in the poor and underdeveloped countries. On the basis of the few remarks given above, it is clearly visible that these challenges indicate the direction for the development of education. Namely, education must to a larger extent concentrate upon the transfer of abilities of self-dealing and the shaping of the ability of fast self-organisation and enterprising adaptation to the changing conditions and the ways of activity.⁴ Therefore, modernity and entrepreneurship become most important and most difficult challenges for the education at the threshold of the 21st century. This is why in that article the following thesis is put forward: in the light of the European and global challenge context, Poland, remaining behind the leading European and world countries, appearing just before the fundamental reform of the education system should incorporate the concept of **pro-innovative education**. Simultaneously, within the frames of the so-understood education concept there must be some special space devoted to the experts' education who in this piece of writing are referred to as high-tech managers.

Proposals for pro-innovative education of Polish experts

The principle of the pro-innovative education is bound first of all with the development of individual creative abilities and the preparation for participation in innovative organisational cultures, institutions, in which innovations appear. Therefore, the opinion that there are isolated innovative processes that should be identified and to which adequate monitoring procedures should be applied in order to start the stream of innovation, which is understood as 'each idea, practice or material artefact that is perceived as new in a particular environment,⁵ is rejected. The perception of 'novelty' aims, in addition at the distinction of innovation from change: the notion of change does not require that 'perception of novelty'.⁶ Innovative processes (designing, research and development, specification of needs, chance discovery, learning and diffusion) can occur and have effects only in the institutions of specific kind, i.e.

³ See: Kennedy P.: At the threshold of 21. century....; op. cit.; chapter 7; pp. 142-156; Reich R.B.: Work of nations....; op. cit.; passim; Competition borders.; op. cit.; pp. 51-53; Naisbitt J.: Megatrends....; op. cit.; pp. 80-105, Valuable Knowledge, Wprost no. 19, 1999, p.19.

⁴ See.: Pilzer P.Z.; Our welfare without borders.; op. cit.; chapter 6 , pp.. 135-148.

⁵ G.Zaltman, R.Duncan, J.Holbek Innovations and Organisations N. York, Wiley, 1973, p..10.

in the institutions filled with a particular value climate that promotes change and creativity rejecting the stiff hierarchy of the ‘project’ structures and task groups and, additionally, in the institutions active in the social and cultural environment that legalises the identified values. From the point of a broadly understood innovation, as complex, multidimensional and multi-contextual phenomenon⁷, it is clearly visible that within the anti-innovative institution **knowledge, abilities and talents of the participants simply become wasted**. These innovation dimensions can be summarised as follows:

- cognitive component: knowledge that at present most often signifies the necessity for higher education degree;
- economic: investment, cost, risk;
- psychological: creativity, ‘creative destruction’;
- social: acceptance, innovation positioning in the network of social relationships;
- cultural-historical: patterns of social attitude towards innovation, innovation trajectories;
- organisational: innovation positioning in the organisational context (institution), in the context of organisation culture.

The dimensions and the contexts of innovation specified above indicate what degree of quality should be involved in the pro-innovative education. Graduation from the university must constitute the ‘minimal’ condition of such education. Creative participation in the innovative world proves impossible without the fulfilment of this condition. Secondly, higher education (actually in any domain) should be **completed with** the package of knowledge that is the logical consequence of the multidimensional innovation characteristics. In particular, the package should cover the following branches of knowledge:

- a) economics, at least the elements of macro- and microeconomics;
- b) psychology, and in particular, knowledge concerning the structure of personality, motivation mechanisms, regularities in the process of attitude shaping;
- c) elements of general sociology allowing for further orientation in the main issues of structure and dynamics of modern societies (with particular attention given to Europe);

⁶ *ibid.*, p. 158.

⁷ E. Okoń-Horodyńska, National Innovation System in Poland, AE Katowice 1998.

- d) sociology of culture and elements of anthropology, allowing for the understanding of the cultural processes and culture dynamics in modern societies, especially the European ones, (innovation, evolution, processes of diffusion, acculturation, cultural syncretism)⁸;
- e) computing and the use of computers in the designing of multinational systems;
- f) social communication and its instruments.

Participation in the classes specified should facilitate the acquisition of the ability of phenomena and social processes' analysis that stimulates innovation and result from innovation. The proposed package, (originally) perceived as the completion of studies taken by a candidate for an expert, must always be offered as a whole (graduates of economics, management, psychology, or sociology do not have to study all the disciplines). It seems that the education system should undergo successive changes, since the feature of changeability becomes more and more decisive as far as the modern organisation is regarded. The notion of 'virtual organisation' gained special popularity in the 90s. It was understood as a scheme of agreements made by enterprises, e.g. to promote innovation⁹. An enterprise of clearly defined identity and 'borders' is substituted by the federation of companies, by their net or a structure of *joint-venture* type. Virtual organisations are decentralised (control in the net is divided among several partners) and partner relationships in the net are regulated by agreements. Virtual organisation receives its 'competitive advantage' over other companies mainly from the reaction flexibility to the market requirements. Enterprises involved in the net co-ordinate much part of their activity via the market game. They are based on the game to develop production, distribution and sales of their services or products in the way that is not always easy to copy by the enterprises not involved in the net. As far as innovation itself is concerned, it is impossible to declare from the very beginning whether virtual organisation unambiguously facilitates innovation, since it depends on the type of innovation and on its either systematic or automatic nature. Virtual structure undoubtedly facilitates automatic innovation. However, if innovation is of systematic nature, then virtual structure is not the best solution possible, because free information exchange proves indispensable for that type of innovation; the situation that is most easily to achieve inside and not outside the

⁸ On the basis of the research performed by T. Borkowski under the KBN** grant, Research and Designation of the Desirable Directions of Proinnovative Structures from the Point of the European Integration, Warsaw 1997, leader - E. Okoń-Horodyńska.

⁹ H.W.Chesbrough, D.J.Teece Quelle organisation choisir pour mieux innover? L'Essentiel du Management, June 1997, p.114.

enterprise.¹⁰ Virtual organisation is the product of the era of information society that owns its popularity to the development of new communication techniques and new information processing. Certainly, it is not the last word in the enormous discussion on the notion of pro-innovative structures. While preparing the education programmes for the future experts in the development of innovation, it is the innovation friendly environmental features that must be considered. On the basis of the examples discussed in the research quoted the following features of a pro-innovative institution can be named:

Chart 1
Features of pro-innovative institutions

- an increasing role of knowledge and information with the abilities of their usage by the organisations;
- tolerance for the differences from the point of idea plurality;
- lack of stiff stratification rules - the position of the institution dependant on the demonstrated knowledge and abilities;
- principle of team work in the interdisciplinary groups of project type;
- changeability of the task contents resulting from the institution positioning in the dynamic and multicultural environment;
- flexibility of the organisation structure allowing for the staff dislocation due to the occurring task, project and function changes performed by the institution;
- lack of detailed signification of the ways of the allotted tasks' performance;
- principle of decentralisation and delegation of rights and responsibilities;
- participation and collectivism in the decision making process and management;
- increasing significance of a long-term perspective in management with the maintenance of institution abilities to react to the 'suddenly' appearing problems;
- contact with the staff and the client representing various cultures, various education profiles, various biographies and patterns of life experience.

*Source: Research and Designation of the Desirable Directions of Changes in Proinnovative Structures from the Point of the European Integration, grant KBN**, Warsaw 1997, leader E. Okoń-Horodyńska.*

¹⁰ *ibid.*, pp. 117-118.

Due to the combination of the innovation and structural features of a pro-innovative institution, as discussed above, further conclusions are drawn concerning the profile of the desirable abilities of future experts, and thus of education changes. Chart no. 2 presents these conclusions.

Chart 2

Types of dispositions and abilities useful in pro-innovative institutions.

Type of ability/disposition	Type of education/training indispensable to acquire the ability
Ability to use information (to accumulate, select, process information depending on the didactic needs dictated by the changing types of tasks and projects)	Preparation in the domain of the methodology of social research, techniques of statistic data analysis, techniques of forecasting
Ability to negotiate, communicate and contact with the representatives of various cultures in the function of co-workers or clients	Philological education or a certified knowledge of main European languages Psychology of negotiations, sociology and psychology of communication in organisations, <i>communication science</i> Lecture on the culture of European societies Multicultural management
Ability to create pro-innovative structures supporting individual innovative initiatives (task groups, project management), team work and project work, knowledge of labour principles and employment conditions in the European institutions	Project management, elements of group dynamics, techniques of team building, human resources management. European institutions: lecture considered to be preparation for the vocational practice in the chosen institution
Ability of mobilisation and creative usage of the team potential	Psychology of creativity, training as regards the techniques for creative potential release of teams
Knowledge of strategic management issues	Elements of strategic management, instruments of strategic analysis
Assertiveness, eagerness for constant learning, treatment of work as a challenge to demonstrate one's own creativity and inventiveness	Package of psychological trainings (e.g. assertiveness and creativity trainings)

*Source: Research and Designation of the Desirable Directions of Changes in Proinnovative Structures from the Point of the European Integration, grant KBN***, Warsaw 1997, leader E. Okoń-Horodyńska.*

Education of experts to the needs of the development of innovation in Poland - problem discussion.

At present Polish education system remains under the pressure of the increasing domestic demand for the staff capable to fulfil the requirements of the market economy and the democratic civic society. The pressure is overlapped by the necessity of adaptation of teaching programmes and educational structures to the requirements of the European Union. In the report of the European Commission concerning the fulfilment of the membership criteria in the domain of education by Poland we read: 'before the year 1989 the education quality /.../ was influenced by the country isolation. General level of education was high but the education system itself remained under political control. After 1989 the reform of education allowed for liberalisation of programmes. /.../ The Ministerial strategy of offensive education, whose aim was to receive the European standards by Poland in the nearest 15 years, covers the following main tasks to be taken by the Polish education and training system: (I) the reform of vocational training that shall result in the decisive decrease of vocational high schools, (II) increase in the number of pupils at the secondary schools, (III) increase in the number of students to 20% of the age group 20-24 to the year 1997, /impossible to achieve/, (IV) the differentiation and development of higher vocational part-studies, by means of e.g. creation of institutions of higher vocational schools giving the bachelor degree, (V) the development of long-distance learning to ensure training and allow for the qualification change in all age groups'¹¹. The fragment concerning education ends with a very optimistic conclusion that 'no big problems should be expected in that domain (i.e. in education generally) during the pre-accession period'.¹²

When the issue of new education to meet the innovation requirements is introduced, it is assumed that it is impossible to educate people for the purpose of the development of the innovation economy in separation from the whole economic-social system. Innovation must be learnt from the very beginning, at the lowest educational level, i.e. the primary school, since the acquisition of innovation features is a long-lasting process. There is no separate education system for the purpose of innovation at present and, additionally, it is not planned to be. The sector for the fulfilment of the objectives indicated remains a component only of a

¹¹ AGENDA 2000. Report of the European Commission Concerning the Application of Poland for the Membership in the EU; Monitor of the European Integration, special issue, KIE, Warsaw 1998, pp. 44-45, and also An European Enlarged for Research, European Commission Conference, Brussels, 27-28.06.2001

¹² Ibid., p. 45.

larger whole. It is not in addition meant to propose some destruction variants to the existing education system since it is coherent and extensive. All the more, the started reform of the education system in Poland presupposes the completion of that system with a new component. Therefore, it is meant to concentrate attention on the issues disregarded in the reconstruction of the Polish education system; namely on the problem of the preparation of managers understanding the issue of high-tech, and thus on the education of those that are to manage this resource in Poland. The issue that is introduced at that point is the question - in what way a subsystem can be included in the coherent education system in Poland that could solve the problem of staff preparation for knowledge and technologies' management and the development of innovations in Poland. It has to be underlined that the ability of future managers to notify the value of technological innovations and their commercialisation is directly conditioned by the number of people possessing adequate knowledge in the whole education process. These results are recognised as the preliminary basis for the formulation of suggestions as regards education for the purpose of innovation. Bearing in mind the guidelines of the proposed education reform one has to admit that they are rather in support of the direction proposed in that paper, since they include the necessity of increase in the education quality at the secondary and the higher level in particular. The effect of the general education system, in turn, ensures the increase of quantity and quality of the human potential capable of meeting innovation challenges. It is known and it is also of import that as it was proved by A. Fayol in his theses that managerial knowledge can be learnt, however there are some educational basics indispensable for the specialisations to develop. The modification of the general education system as undertaken is of import in that it ensures the increase of the candidates' basis who are better prepared to study such new specialisations as e.g. innovation management. Discussion on the separation of such specialisation courses as technology, knowledge or innovation management from education remains in no opposition to the educational priorities suggested in the reform. Attention is given to the issue of specialisation, from the point of the subject taken in that article, that is simultaneously not stressed in the process of changes in the whole education system in Poland.

It is practically observed in the Polish economic life that managerial staff originating from the groups of well-educated engineers and economists even often can neither prepare the necessary economic analysis of the company nor define the company position on the market, nor verify the effectiveness of the technologies applied. They do not find the link between the

application of the top technology and the new quality of company management or the quality of life. That gives rise to the need for managerial staff training specialised in the issues of attitudes and pro-innovative solutions' creation. It is assumed that that task cannot be fulfilled via the training courses only but it is desirable that specialists should be formed during the post-graduate or doctoral studies in popular higher schools. All the more, the preparation of Poland for the full membership in the European Union in case of science and technology requires:

- substantial increase in the educational effort of the society and serious improvement of education and science financing;
- enlargement of the scientific elites, substantial increase of the cultural role and science understanding by the society;
- further development of innovation infrastructure with the simultaneous application of the European experiences in that domain;
- bondage of adequate institutional and legal changes with the objectives given above;
- adaptation of education and science systems in Poland to the European standards, with the usage of the issue of scientific-technological co-operation with the European Union as an element of the preparation strategy for the Polish membership in the EU.

The requirements indicated result from the more and more observed needs in the domain of the appearance of new method of knowledge generation. The features of this method may be defined as follows:

- generation of knowledge in the context of its particular application;
- generation of knowledge useful for the industry or the government, or society in general;
- generation of knowledge occurs always within the frames of constant negotiations; knowledge will not be generated unless interests of various entities are taken into account;
- interdisciplinarity or transdisciplinarity.
- heterogeneity, differentiation of organisational forms of knowledge creation, i.e.
 - increase in the number of places in which knowledge is generated;
 - functioning of the communication networks linking these places;
 - simultaneous differentiation of the research domains considered in these places onto the specialties and a new linkage and reconfiguration of these sub-domains that shall give the basis for the occurrence of new forms of useful knowledge.

As a consequence, the development of the socially dispersed knowledge system shall be of threat to the majority of existing institutions bound with the generation of knowledge:

- increased responsibility for the society;
- change in the interpretation way and effect dissemination, in the selection of issues and research priorities;
- enlarged system of quality control;
- traditional notification of the scientific research results is done on the basis of the review concerning the work of particular people. Further questions are to be added to the intellectual criteria:
 - *is the solution if found able to survive on the competitive market?*
 - *is it to be profitable?*
 - *is it to be accepted by the society?*

The guidelines introduced are formed on the assumption that a different treatment of technical-technological issues and the ones connected with *modern technology* or *high technology* in particular than the present one is necessary. The *high-tech* model shall be generated in a particular country. In order to achieve that - particular institutions and groups of people of specific features and qualifications that could participate in the generation of such a model preserve and develop it, are necessary. The features were named above; at this point one concrete category of specialists, *high-tech* managers is introduced. Such studies prove to be specially necessary within the present conditions of challenges due to the European integration allowing for the usage of accumulated knowledge and finances in Europe, however on condition that abilities to use these capacities are developed. Another domain in which the needs for qualified high-tech managers occur is the example of special economic zones, in which foreign capital via direct investment introduces, in concord with the law, high or even top technologies that require adequate maintenance and management.

The programme directed at the people with higher education of engineering and economic degree in particular in the domain of organisation and management or law is worth special attention among several differentiated programme requirements ensuring education for the development of innovativeness of the Polish economy. This programme would be included under the name HIGH-TECHNOLOGY MANAGERS.

From the pedagogical point of view the studies for HIGH-TECHNOLOGY MANAGERS should cover the following issues:

- ◆ identification and verification of technical and technological solutions from the point of their usefulness in the programme of the company development. Within the frames of so-understood study block the acquisition of knowledge to create innovative imagination is

indispensable, i.e. monitoring and understanding of fundamental research, acquisition of that research results, ability of inventions and their consequences' research. The acquired knowledge must result in the creation of a vision for the application and implementation of the analysed research results, for the definition of long-term programmes of the invention application and for invention transformation into a concrete product or process;

- ◆ identification and search for market open to technological innovations; i.e. the block is meant to teach an ability of acquisition and turnover of high-tech products, (the elements of industrial marketing) that is connected with the necessity of the acquisition of an ability of technological position diagnosis of a given product on the market, the anticipation of the position of a given product on the market and the ability to define /on the basis of the research/ new possibilities for the appearing technology;
- ◆ diagnosis of the technical, organisational and economic condition of the company and the verification of new technology absorption; it is the verification ability to decide which enterprise and in which period is able to use the oncoming new technology, human resources or capital in its various forms that is meant at that point. Verification is also essential to define the organisational changes, the capital changes, the management changes and the human resources changes that are in possession of the company so that abilities to absorb new technologies arise in the company;
- ◆ creation of organisational and capital formula and search for *high-tech* projects' financing sources. The acquisition of the ability of partners' search that possesses the capital necessary for innovative enterprises is essential at this point. That requires a reliable identification of potential partners, an ability to search for /economically/ interesting projects, negotiations of useful forms of subcontracting and strategic alliances. The ability to develop pro-innovative business principles is of particular value at that point.
- ◆ identification of social and ecological threats and creation of institutional infrastructure mitigating the effects of high-tech. The application of new technologies, and of top technologies in particular gives rise to the appearance of a group of pioneers within the institutional gap that protects against the negative effects of new technology. These effects may be of economic nature /lack of acceptance, a short maturity period, unfavourable relationships between expenditure and effect/, and of social or ecological one. The task of new technology managers is to be able to fill the gap of uncertainty that the new technology brings with. It is necessary to achieve that ability of verification of the threat level that new technologies can bring and to develop the ways of mediation and the

identification of the conditions necessary to fulfil so that such threats could be avoided. The ability mentioned is of much significance for the acquisition of social acceptance of new technologies; the implementation of *high-tech* is always susceptible to failure and economic losses without that ability.

Every indicator defined for the acquisition of a new ability involves the situation in which a graduate is able to implement /organise/ oneself partner connections in the phases of the project of technological innovation in an enterprise and, in addition, to participate to some extent in its implementation and sell the product that occurred within this period on a profit basis. However the challenges suggested above, indicating the necessity for changes in the system of higher education in Poland that give rise to the society that understands the importance of technological innovation development acceleration, designate some guidelines for the change design in the system of higher school management, namely:

- at present the basis for functioning of most scientific institutions, both the universities and the research centres is the model of knowledge generation that is based upon the disciplinary distinction. Within that structure research problems and methods of their solution are designated, competencies are divided and results are verified.

The question left unanswered is: what kind of influence in the domain of economic efficiency may be expected from the science divided into separate disciplines?

The question may be indirectly answered via the prism of consequence that the structure of higher schools is and their functioning that consists in the fact that their development is intellectually stimulated by the inner needs of institutions and higher schools and not by the economy;

- modern economy requires from the organisational structures of higher school to be capable of high changing in the complex and temporary nature of problems of economic and social life. That means:
 - research groups should be less institutionalised; people should create temporary workgroups or solution networks that could fall apart when the problem is solved or redefined, e.g. matrix structures,
 - research planning and organisation should ensure the groups the ability of knowledge generation on a global scale and in dispersion, e.g. organisation of research-development works done in a former industrial organisation, working on a competition basis;

- the number of places in which scientific research of reliable value may be done shall constantly increase; they should be dispersed to enforce the situation in which knowledge gains some competitive features and the borders among disciplines and institutions shall disappear, whereas the exchange of scientific careers is to develop; transdisciplinarity;
- the change of criteria of the scientific-didactic staff verification is required:
higher schools must enlarge the range of their participation in the process of knowledge generation and transform into a partner in the innovation process, both in a particular country and on an international scale; such changes shall modify the comprehension of outstanding features among the scientists, their aspirations and the importance of the input into particular domains and responsibilities to institutions;
- massive higher education must be ensured as a preliminary condition for the further popularisation of an ability to generate and apply knowledge in the society;
- higher schools should become more open and able to co-operate with many entities allowing for the exit of inside scientists and entrance of people from the outside; with such a development of events, in case they reach an adequate scale, new trajectories of career and new systems of payments are to be considered; that is one of the bigger challenges for the existing structures;
- an increasing openness of higher schools shall reduce the bureaucracy tendencies for centralisation.

The decentralisation policy should presuppose the initiatives motivating openness and rewarding the units that can use the existing means thanks to the increase of their activity range in the best way

- The creation of ‘slim’ centres employing a few administrators, with the budget enough for the stimulation of the networks of innovators, working in the units connected with various institutions, agencies and companies, becomes indispensable.
- The extension of structures mediating in the processes of dispersed knowledge generation proves indispensable.

More entities get engaged and not all of them remain in possession of sufficient expert knowledge. Mediation shall require new abilities. Within the frames of organisational structures new centres ensuring access to dispersed knowledge should appear. That significantly changes the role of traditional centres of scientific-technological information.

- The construction of new plateaux of dialogue for the partners in the process of dispersed knowledge generation within the frames of the university structures is indispensable. Within the phase of „strategy for science development’ academic scientists were of key value in the process of scientific policy designing. Their role became limited. Larger interest groups interfere and that leads to the opposition on the part of scientists. The adaptation to that change will be a serious task to take up by both the universities and the institutes of the Polish Academy of Sciences.
- New innovation policy requires different institutions. New abilities to create and design organisational and capital solutions enabling higher schools to co-operate with various partners of the innovation process are necessary. That concerns e.g. institutions financing innovations, but also e.g. district pro-innovative structures.

Conclusion

Training giving the ability to function in the European and global alliances in case of Poland must be considered both from the point of indicated in the report of the European Commission education tendencies and on account of the set of global challenges. On the basis of the research of European and world experiences it may be noticed that the ability to create innovations as a fundamental factor defining the level of economy and society competition becomes the priority in education. Therefore, in this article attention was focused on the response to the question whether the Polish Education System is prepared to this task and on the search for concrete indicators of changes in education and for concrete programme proposals in education for the needs of technological innovation development. The response to the question whether the Polish education system is able to meet the European priorities in the domain of education must be affirmative on account of the domestic potential of higher education, i.e. Polish universities and higher schools are undoubtedly appropriately prepared to perform the mission of expert preparation in *some /subsequent/* range. It is **the general or technical higher education**, certified via an adequate MA or MSc that is to be **the fundament of expert education. That task should be implemented by the national innovation system** in co-operation with foreign systems. Higher education - giving knowledge in the domain of one primary discipline and the disciplines related - **must be later completed by means of post-graduate studies**, lasting at least two years, whose thematic structure should correspond to the requirements formulated a priori and whose main objective is to supply knowledge and abilities useful in pro-innovative institutions. The third

component of education must include domestic and international trainings, vocational trainings and practices complementing the university knowledge and giving the future expert the concrete vocational experience in innovative institutions. It is important that all the forms of education, giving access to the stream of information, are used; the form of open and distance learning in Poland (e.g. via Internet, multimedia technologies) requires particular acceleration. These forms should be of such a system construct, consisting of several ‘threads’ of various lasting times, that shall enable students and course trainees to choose general and specialised educational trajectories in any period but with the same objective - education for the purpose of innovation.

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