# Foresight in Development Management of an Industrial Cluster

BOGUSLAW BEMBENEK
*Rzeszow University of Technology, Faculty of Management*
ul. Powstancow Warszawy 8, 35-959 Rzeszow
Poland
bogdanb@prz.edu.pl

## Abstract

*The challenges that a turbulent environment poses to clusters, generate the need for strategic approach towards the formulation of an effective policy of their development. This responsibility rests with various entities, e.g., internal cluster authorities, cluster coordinator, manager and leader, who are responsible for strategic decision-making. Taking into consideration contemporary good practices within the scope of the implementation of foresight in development management, in the paper the main focus was on the characteristics of the significance, usage, utility of this kind of research in terms of strategic thinking and management in a cluster. It was emphasised that this kind of research aims, among others, to provide strategic information, support the process of strategic choice, create new inspiring change projects and implement them in the future. Owing to the fact that Polish experience of clusters with the use of the foresight tool is still in the initial stage of development, in the article there were presented the assumptions and results of technology foresight with an example of the innovative industrial cluster "Aviation Valley". Simultaneously, there was emphasised the significance of the identification of far-reaching technologies and the priorities of the common research and development activity in the light of the potential projections of the future socio-economic development of a cluster.*

**Keywords:** cluster, management, development, foresight, knowledge, technology

**JEL Classification:** L26, L14, L16, M2, O32, O33, O44, P13, P25, R11, R58

## 1 Introduction

Contemporary clusters look different from the way they looked, for instance, in 1980s. They are more of business, and sometimes institutionalised nature. It is caused by the process of clusters' development itself, as well as globalization, glocalization or other socio-economic and technological changes.

In the conditions of a turbulent environment, the decision-makers in industrial clusters, who want to strengthen the competitiveness of this structure, seek newer and newer tools that enable them to create, transfer and use the knowledge. It is very important owing to the fact that in knowledge-based economy, the key source of competitive advantage is knowledge – as an integral part of intellectual capital. Therefore, active clusters implement foresight and identify development tendencies in particular macro-environment spheres – all these endeavours to shape their future more efficiently. The activities undertaken within this scope are of the key significance from the viewpoint of managing their development, since, presently, clusters function in a new stage of market competitiveness, the so-called "imagination competition".

While interpreting cluster development as a process of improving its strategic potential and the position in the environment, it was emphasised that development ensues from entrepreneurship in a cluster and the acquisition of the ability of organisational learning by its decision-makers and other members. Owing to that, a cluster can actively build entrepreneurial ecosystem, providing to itself better development conditions than other organisations of such type.

The main aim of the paper is to determine the advantages ensuing from the use of foresight in development management in industrial clusters. The analysis of the literature along with the empirical research conducted within this scope, constitute the basis for further discussion upon the determinant and the efficient ways of cluster development. The quality research method (case study) that has been applied, as a method of analysing a scientific problem, a form of experimenting compliant with the paradigm of conducting research, provided general reflexive conclusion, including the synthesis of entrepreneurial activities and positive experience in a cluster under scrutiny. The aim of this method, treated as empirical conclusions on contemporary phenomenon in its natural context – was to confront the foresight theory and practice. The scientific character of the case study method is proved by interdisciplinary analyses, holistic treatment of the object and the subject of research, objectivised, rational, organised, systematic and orderly activities, which aim to reach reasonable conclusion. The research was conducted from January to August 2014. Hence, the knowledge gathered and presented in the article determines its theoretical, cognitive and applicable character.

## 2 Strategic Dimension of Development Management in Industrial Cluster

The issues connected to the process of the establishment and the developments of clusters are being analysed more and more frequently by the representatives of various sectors, branches: science, business as well as national, regional and local public authorities. In spite of the active attitude towards the conducted research and analyses, the representatives of those sectors are constantly emphasising the lack of an exact, concise definition of the term "industrial cluster". In the theory and practice of management, this term is described as a spatial and sectoral concentration of a group of cooperating and competing specialised enterprises which are mutually connected by long-term formal and informal relationships with business entities of the sectors of science and R&D, public authorities, business support institutions. H. Popa and L. Pater (2007, p. 347) characterize the industrial clusters as a multi-dimensional networks of organizations made of production/services and sales companies, universities, vocational schools, research and development institutes, banks, government institutions, professional organizations, other non-government organizations etc. which: are potentially long lasting competitive on the national and global market, develop inside the clusters both competition and cooperation relationships (coopetition) between the members (internal stakeholders).

The result of this cluster cooperation is synergy, efficient realisation of strategic objectives, strong reinforcement of competitiveness and innovativeness, common overcoming of barriers and problems frequently occurring in the environment. Moreover, each cluster member who cooperate can decrease its transaction costs, create positive externalities (by which common needs can be met), decrease their production costs because of more efficient learning processes (since cluster members belong to the same geographical, economic and cultural environment –

entrepreneurial ecosystem), use the advantage of the first market supplier (which can keep the market share due to the economy of scale), use the advantage of better product/services quality and in general increase the added value in the company (Gumilar, et al, 2011, p. 42).

The management of cluster development is a complex informative-decisive process focused on achieving information, on new development possibilities (opportunities, chances) and the continuous attempt to find and implement new solutions (changes), which enable the maximisation of the value and strength of this organisation. Strong clusters are not a substitute for advantages in other dimensions of business environment quality, but companies in strong clusters are often better placed to turn business environment advantages into competitive advantages (Ketels and Memedovic, 2008, p. 379). To assure that the process of cluster development does not proceed in a chaotic manner, it is necessary to prepare a development strategy that is appropriate for the needs and the possibilities of a cluster. Thus, it has to be emphasised that development management, as a sub-process of strategic management, is coordinated by a cluster organisation (animator) and the decisive organs appointed for this purpose, including a manager (facilitator) and a cluster leader.

In the market conditions, a cluster can survive in a long-run and realise its strategic aims only when it permanently develops. Development as a multi-dimensional concept is an implicitly intended as something positive or desirable and means an: event constituting a new stage in a changing situation; improvement, either in the general situation of the system, or in some of its constituent elements (Bellu, 2011, p. 2). According to J. Schumpeter (2005, p. 110) development is a discontinuity of the steady state, a disruption of the static equilibrium leading to an indeterminate future equilibrium; is a change from one vector norm to another in such a way that this transition cannot be decomposed into infinitesimal steps. The notion of development is interpreted similarly by J. Machaczka (1998, pp. 8-15), who the significance of the development of an organisation refers to: the continuous interaction during the process of changes between an organisation and its environment, which should be assessed not only from the viewpoint of the state that has been obtained but also as an object of management (a state that can be shaped and influenced). Moreover, he claims that development can be understood in two possible ways: as closing the development gap (development divergence) or as a process of improving the position an organisation occupies in the environment. The development gap constitutes a serious limitation to the development processes. This gap is a threat to the future performance and even survival of an organization and is guaranteed to impact the efficiency and effectiveness of senior executives and their management team (Coveney, et al., 2003, p. 2). It can occur at a strategic level (strategic gap) or an operative level (operation gap). Operation gap ensues mainly from inefficient use of the possibilities (resources) at the disposal. Strategic gap is connected to the issue of the limits of development gap, which exceed due to the complexity and the dynamics of the changes in a technically-technological area, including the recognition of new possibilities. Bridging such type of a gap requires creative and innovative actions, which significantly differ from the ones that have been realised so far. The use of the possibilities included in operation gap creates the conditions for achieving success and profitability in a short-term perspective, whereas the achievement of these results in a long-term perspective requires actions within a strategic gap (Machaczka, 1998, p. 14-15).

L. Palmen and M. Baron (2011, p. 14) emphasise that the success of cluster development is mainly dependent on economic and social incentives. The former are related to the possibility of maximisation of the profit and concern such factors as: the possibility of gaining profit that ensues from the optimisation of the processes; improvement of productivity and effectiveness, better position on the market and competitiveness; access to qualified employees, new knowledge and technology. The latter comprises: leadership, social capital; the possibility of identification with a broader group which has a good image; the appreciation of cooperence as a possibility of simultaneous competition and cooperation; sharing a common vision and goals, which induce people and organisations to work actively. Another important factor for cluster development is the innovation and the continuous exchange of information by (Boja, 2011, p. 38):
- direct transfers based on technology cooperation or acquisition;
- indirect transfers through workforce migration or by strategic analysis and observation of the competition;
- indirect transfers through spin-off by supporting new businesses based on creative ideas and technologies resulted from research.

Moreover, the group of internal factors that determine the quality of cluster development comprises: available resources, clusterpreneurs, entrepreneurship of cluster members, active involvement of the partners in the cluster and cluster activities, internationally active companies which are particularly strong in the market and are technological leaders, establishing and maintaining reciprocal trust as a basis, joint network management by all partners to coordinate cluster activities and handle internal and external networking (Scheer and Zallinger, 2007, pp. 3-4). Certainly, within this scope there are other very important exogenous factors, namely: economic and regional policy, cluster policy, competition initiated by other clusters, demand for cluster's offer, a developed network of suppliers, regional innovation system and investment attractiveness of the region of cluster's establishment. The above mentioned examples of endo- and exogenous factors have an influence on the choice of a proper way of development that is appropriate for the needs of a cluster.

Ch. Ketels indicates that clusters develop over time; they are not an economic phenomenon that just appears or disappears overnight (Boja, 2011, p. 41). Cluster development is closely related to cluster's stage of life. Taking into consideration the cycle of cluster's life it can be stated that if a cluster has reached a development level where the main objectives of its development have been fulfilled and there is no more interest and the required "glue" to keep it together, then the cluster can disintegrate, being in its final stage (Gumilar, 2011, p. 46).

One of the contemporary challenges for the decision-makers in industrial clusters, which ensue from increasing awareness of environmental protection, is sustainable development, according to which the members of this organisation should pursue the harmony between economic, social and ecological objectives within the scope of the business activity conducted individually and commonly. Sustainable development which provides societies or their present or future citizens equal access to the environment, as well as economic growth stimulated by economy based on knowledge requires a statistical increase of the quality of technologies implemented in the industry (Dobrzanska-Danikiewicz, 2010, p. 70). The fulfilment of this concept in clusters is most frequently achieved by the activities such as: focusing on the entire cycle of life of a product and planning its re-use, rational management of natural resources, the implementation of energy-

and material-saving production techniques, reduction of pollution, the implementation of eco-innovations. What is indispensable for this purpose is the continuous improvement and the change in the present habits and the way of thinking of this structure's members.

## 3 Foresight as a Tool for Optimizing the Development of Cluster

Industrial clusters, likewise international economic organisations, regional and state authorities, enterprises and R&D units use foresight as a tool that supports decision-making of long-term strategic significance for the creation of development visions. This active anticipation, basing on the identification of potential changes in a turbulent environment constitutes only an element of the entire process of managing knowledge, creating and implementing pro-development future of a cluster. All these things to boost the development of this organisation, maximise the chances occurring in the environment and minimise negative influence of possible threats.

The literature on the subject fails to provide one complex definition of foresight; therefore it is described in many various ways as, e.g.:
- regard or provision for the future, shaping the future through the concerted action of self-sustaining networks of interested groups (Anderson, 1997, p. 666);
- the process - not just a set of techniques - involved in systematically attempting to look into the longer-term future of science, technology, the economy and society with the aim of identifying the areas of strategic research and the emerging generic technologies likely to yield the greatest economic and social benefits (Martin, 1995, p. 140);
- process by which one comes to a fuller understanding of the forces shaping the long term future which should be taken into account in policy formulation, planning and decision-making (Coates, 1985, p. 30);
- a structured, systematic, complex, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at present-day decisions and mobilising joint actions (Gavigan, et al, 2001, p. 3);
- degree of analysing present contingencies and degree of moving the analysis of present contingencies across time, and degree of analysing a desired future state or states a degree ahead in time with regard to contingencies under control, as well as degree of analysing courses of action a degree ahead in time to arrive at the desired future state (Amsteus, 2012, p. 60);
- a behaviour in the sense of three dimensions (present situation - past and future, goal, plan) and two aspects – analysis and time (Amsteus, 2012, pp. 60-61).

An apt observation has been made by A. Paliokaite (2010, p. 10), according to which foresight has its roots in the futures research discipline, where the term "future research" is used as a term to describe the whole range of research conducted to help organizations, individuals, and governments explore, prepare for, and respond to changes in the environment. According to the Polish Ministry of Science and Higher Education foresight is a: a systematic, prospective way of finding information in order to build mid - or long-term development vision, its directions and priorities; process of shaping the society's thinking about the future, in which scientists, engineers, business and public administration representatives take part in setting strategic directions of R&D, with the aim of bringing the greatest economic and social benefit (Nazarko, et al., 2013, p. 20).

The foresight research is more than prognosis or prediction, conducted in order to gain more knowledge about things to come so that today's decisions can be based more solidly on available expertise than before (Cuhls, 2003, p. 97). R.A. Slaughter (1995, p. 48), taking into consideration the fact that foresight frequently refers not only to the ability of perceiving the occurrences that will take place in the future but also to using this knowledge in strategic management, indicates the three fundamental meanings of the notion "foresight", i.e., as: an attribute/feature of a visionary or a group, a skill/competence of an individual or an organisation and a process in which the limits of perception of future phenomena are attempted to be broadened.

In the research of foresight type, there are applied qualitative and quantitative methods families such as the: creativity approaches, monitoring and intelligence, descriptive, matrices, statistical analyses, econometrics forecasting, market research, trend analyses, expert opinion, modelling and simulation, logical/causal analyses, roadmapping, scenarios, benchmarking, learning curve, valuing/decision-aiding/economic analyses (Porter, 2010, p. 41). In the research process, there are applied diverse methods from various scientific areas, owing to which this research is of interdisciplinary nature. Foresight, actually, fails to have a standard set of methods, as at each stage of its implementation there is a different environment, different needs, different expectations and different possibilities. However, it ensues from the research that what is very useful within this scope are expert and heuristic methods that base on creativity.

Taking into consideration various aims and motives of foresight's implementation, but also the object and the subject of research or final beneficiaries of the results being achieved – it can be stated that the most popular types of foresight comprise: regional foresight, strategic foresight, technological foresight. U. Higdem (2014, p. 42) indicates that regional foresight in the sense of foresight methods applied to a territorially defined context, however, may denote regional development in the broader sense of the word so that it encompasses economic, cultural, social, and environmental development. It is a regular process of gathering and analysing information concerning the future of a given region and, on this basis, building a long-term vision of the development of this region within the scope of an interdisciplinary expert team. The development vision being prepared in principle has to be conducive to operative and strategic decisions made by policy makers, including the mobilisation of common activities around common objectives. The major initiators of this type of foresight are regional/local authorities.

In economic theory and practice, strategic foresight is most frequently defined as an integrated process of analysing the environment, the process of learning the organisation on the basis of the changes in the environment, the process of creating a development vision. This kind of foresight seeks to gain insight and to make sense of the environment by exploring the turbulent external environment and anticipating changes through horizon scanning, competitor and technology analysis and foresight, through a mental model and by understanding the internal capability and will need to be continuously updated as the external environment changes (Ringland, 2010, pp. 1493-1498). Strategic foresight as a learning process with paramount importance to the capability of a company to innovate continuously, takes place within a broad vision developed with creative managers, evolves by deep understanding of current trends in society/economy and finishes by making use of different "probes" to proactively learn to enact the "likely future" (Saghafi, et al, 2009, p. 1275). According to R. Rohrbeck, H. Arnold, and J. Heuer (2007, pp. 3-4), strategic

foresight deals with the identification, assessment and the usage of weak signals to recognize and give warning about threats and opportunities at an early stage. Hence, its key elements comprise:
- Technology Intelligence deals with the identification, assessment and usage of weak signals and information about emerging technologies and technological discontinuities;
- Competitive Intelligence deals with the assessment of competitors and the identification and assessment of products and services in development or already available in lead markets;
- Political Environment Foresight deals with the identification, assessment and usage of information on legislation, the political environment and on shifts in the political landscape;
- Consumer Foresight deals with the identification, assessment and anticipation of consumer needs as well as lifestyle and socio-cultural trends.

Frequently, this type of foresight, which to a significant extent refers to the in-depth research on the future of an enterprise and its environment, in the literature on the subject is also defined as: corporate foresight, industry foresight, organizational foresight, managerial foresight. Corporate foresight activities, their process and their tools of choice for preparing business for the future, it may be in form of a long-term-strategic vision, ideas for product-innovations or a scenario that is used for communication purposes - are not formalized because of their nature, thus many organizations have flexible form and following up open search systems (Saghafi, et al, 2009, pp. 1274-1277).

Technology foresight identifies emerging generic technologies that give the greatest economic and social benefits (Shahkooh, et al, 2009, p. 546). L. Georghiou thinks likewise; he defines this type of foresight as a systematic means of assessing those scientific and technological developments which could have a strong impact on industrial competitiveness, wealth creation and quality of life (Georghiou and Harper, 2011, p. 248; Shahkooh, et al, 2009, p. 546). D. Barker and D. Smith (1995, p. 22) based on the results of own study show that the technology foresight process may be regarded as an enlightened procedure by which R+D, engineering requirements are defined, mutually agreed by all who have some responsibilities for the technology, either as funders, deliverers, or implementers, and the priorities, resources, and salient features of the projects identified (and agreed) as a means to aid the whole process of carrying out the work, and applying the outcomes. Moreover, they consider that the successful technology foresight methods should (Barker and Smith, 1995, pp. 27-28):
- be flexible, capable of generating options and alternatives;
- effectively integrate technology push with business pull;
- guide management decisions on R,D&E by providing information/knowledge in a manner easily understood by all parties involved, including those who are not conversant with technical concepts and jargon, and helping ensure discussions are informed, open, and objective;
- address in a co-ordinated manner the whole range of activities from the holistic strategic level down to relatively small details;
- not be unduly sensitive to the opinions of individual gurus, nor be over-reliant on existing organizational structures and power bases;
- directly address the need to secure buy-in and involvement at all levels, with commitment to implement the outcomes,
- each method needs a basic, essential ingredient of creation – imagination.

Technology foresight processes are supposed to help designing new value networks that are based on the novel combinations of technologies, organisational partnerships and institutional arrangements (Scoen, et al, 2011, p. 235).

An example of a good practice within the scope of the implementation of foresight technology is provided, inter alia, by the industrial cluster "Aviation Valley", located in south-eastern Poland, known for developed aerospace industry, pilot training centres, the concentration of research and development institutions and developed educational and training facilities. This cluster brings together the majority of aviation companies operating in Poland, including manufacturers of aircraft and aircraft components, their suppliers, aircraft research and development and logistics service providers, and educational institutions training future aircraft personnel (Deluga, 2009, p. 25). The majority of the companies, along with the subjects of the sector of science and R&D, business support institutions and other members of this cluster, have their headquarters or a branch in Podkarpacie. Such an organisational solution is conducive to the increase in the number of workplaces in this region and wining new investors. The enterprises of the cluster manufacture not only the components and the units for jet engines, airframes and helicopters for the most important global aircraft producers but also the final products such as the plains: M-28, Bryza, Orka, the helicopters Sokol, SW4, Black Hawk and many light and ultra-light aero constructions (Betleja, 2011). It ensues from the research that the companies that cooperate in the cluster "Aviation Valley" treat their membership in this organisation as a significant factor of the increase in their development potential and competitive position, including an important source of shaping competitiveness (Radomska, 2011, p. 20).

Since 2003, this cluster has been developing according to the Danish model. It is characterised by the position of a strong network coordinator/broker (this role is performed by the Aviation Valley Association), who employ an experienced manager, responsible for cluster management. In this model it is a cluster manager who, being an inspiring and mobilising person characterised by knowledge of contemporary economy and being in the position of great trust among entrepreneurs and other subjects they cooperate with, has to effectively motivate and inspire people to work, develop relations and build partnership based on passion, enthusiasm and trust, display the skill of strategic thinking and management (Loubaresse, 2007, p. 4). The cluster "Aviation Valley", owing to the existence of big companies around which there is anchored the network of suppliers (of goods and services), represents a concentration type of cluster ("hub and spoke"). In this case, medium, small and micro subjects of the cluster are frequently connected to large companies through the supply chain. The hierarchic relations existing between large enterprises and a wide group of the companies belonging to SME create, among others, the possibility of using cost advantages (Boja, 2011, p. 37).

The cluster "Aviation Valley" develops according to particular phases of a model cluster. It ensues from the research that presently, it is in the phase of maturity. This assessment is based on: the efficiency of the development strategy realisation, the number of the members of this structure, which amounted to 120, the quality and quantity of the commonly realized projects of R&D and investment type, the activities aiming at cluster's integration and cluster's brand. The above mentioned phase of this cluster's life cycle indicates that non-market, informal relations between cluster members are conducive to knowledge diffusion, and the number of cluster members is stable. The major development direction of Aviation Valley is the alteration of south-

eastern Poland into a leading European aerospace region, which will provide various products and services within the scope of aerospace industry for the most demanding clients. Within the framework of such a development direction, the key, strategic objectives of this cluster comprise: the increase in the level of internationalisation and cluster's international competitiveness, the development of the qualifications of cluster members, building a chain of sub-suppliers, the development of new technologies that are important for aerospace industry, the improvement of information and knowledge flow, the increase in the market significance of cluster's brand and region's brand (*www.dolinalotnicza.pl*). The aerospace cluster, as a cluster of advanced technologies characterised, by a high level of innovativeness, is the initiator, inter alia, of the establishment of Polish Aeronautical Technology Platform and The Centre of Advanced Technology "AERONET - Aviation Valley". The consortium that came into being associates the majority of technological universities in the country. It is orientated towards: conducting specialised research and the implementation of new technologies and products, the value of which is of strategic significance for aerospace industry (Olszewska, 2012, pp. 9-10).

In 2006, as a result of positive experience of the cooperation of the representatives of business and science in the cluster within the scope of the R&D projects' realisation, another, two-year research project of technology foresight type was initiated – it was financed from EU funds. According to cluster's authorities, the need of the time for the project realisation ensued directly from the situation of the aerospace industry, problems and challenges that were identified, including growing competitiveness on the international market, increasing requirements as regards flight safety and restrictive environmental protection policy. The first stage of the work within the framework of foresight consisted in a detailed SWOT analysis. On this basis there were identified the key strengths and weaknesses of the local aerospace industry as well as the chances and threats that ensue from the functioning on the international market. This analysis also enabled more precise determination of the aim of foresight, i.e. the determination of the forecast for the next 15 years within the scope of the anticipated development directions of material technologies, particularly the ones that (*www.dolinalotnicza.pl*): are more necessary from the viewpoint of the plans of the development of Polish aerospace industry; appear to be more useful in the production of aerospace products in the future, have greater chances of the application on the basis of the assessment of market trends in the selected groups of aerospace products; have greater possibilities of the development and the implementation by the industry.
Moreover, the ones that are considered indispensable comprise (*www.dolinalotnicza.pl*): the evaluation of the costs and the profits connected to the development and the implementation of new technologies and investments for manufacturing basis; the assessment of the potential demand for specialised engineer-technical and executive personnel for the implementation and the maintenance of production.

In technology foresight, there have taken part a wide group of stakeholders, including acknowledged experts from aerospace industry and the leading scientific and research centres, who specialize in material technologies for the industry in question. At the first stage of the project there were gathered factual data that were necessary for further anticipation work and the identification and comparison of the current state of the leading technologies in the companies of the cluster with the key solutions that are applied in the world. At this stage the experts performed a range of comprehensive analyses of the market and the trends within the scope of the afore mentioned technologies. The 1000 technologies that were identified were subsequently

systematised and divided into two groups: the technologies implemented in the companies of the cluster and the ones that are known and applied in the world, however that have not been used in Polish aerospace industry so far. The next stage of the realisation of the research was the draft of a Delphi questionnaire (Delphi Method) on the basis of a group of 56 experts, who represent the science, business and business environment institutions, and who identified strategic – from the viewpoint of the development of cluster's companies – most perspective technologies. They also determined which one should be developed in the cluster since they have the greatest chances for the subsequent implementation in the adopted period of anticipation (15 years). Eventually, as a result of the research and the analysis that was conducted, there was created a list of the key technologies – on the basis of such criteria as: significance for the cluster, the availability of a qualified personnel, the chance that a technology will become Polish speciality in the industry, the need for support from public funds. Social consultation that constituted an important stage of foresight, in which there were engaged a number of key stakeholders connected to aerospace industry, confirmed the very positive appraisal of the quality of work within the scope of the identification of these technologies. Technology foresight also indicated the scenarios of development that are crucial from the viewpoint of the creation of cluster's competitiveness: the creation of a group of research laboratories for aerospace industry; research and development on the basis of the best and geographically the closest research and development units; the development of R&D units working for the centres of improvement of cluster's companies.

According to the experts, an optimum direction of the development of cluster's research infrastructure should be the integration and the consolidation of the existing laboratories that are used commonly by qualified teams of workers from science and business sectors that closely cooperate and efficiently share the acquired knowledge and information (*www.dolinalotnicza.pl*). A measurable effect of the realisation of technology foresight in the Aviation Valley was also the signing of an agreement between Polish Aeronautical Technology Platform and The National Centre for Research and Development on the creation of a national sectoral programme of scientific research and the development work concerning innovative technologies for aerospace industry, worth about EUR 120 million – called InnoLOT, which corresponds to the European programme CleanSky (Holub, 2012, p. 158).

However technology foresight in the cluster under scrutiny referred mainly to the systematic process of creating the estimation concerning the properties of new technologies, paths of their development and their potential influence on the changes in the future. It regarded also the vision of economic potential of the region owing to the fact that aerospace industry is its growth pole and "smart specialization".

In conclusion, it has to be stated that the results of technology foresight achieved in Aviation Valley not only contributed to the development of knowledge of new technologies, development tendencies in aerospace industry and the development of cooperation network but also enabled the decision-makers of this cluster to achieve the knowledge that is crucial from the viewpoint of development management in this organisation and to harmonise the activities undertaken by a number of various stakeholders for the benefit of technological development of the industry (the government and its branches, scientific and industry environments, cluster members), including the detailed criteria for financing innovative research and development projects.

## 4 Conclusion

The popularity of the research of foresight type in the world is conducive to their implementation in clusters – also as a tool serving the anticipation of the future. However, one has to be aware of the fact that foresight is not aimed at displacing the processes and functions such as prediction, and strategic planning from the practice of cluster management. They still constitute an important component of strategic management, fulfilling their own specific role, which is not mutually exclusive with perspective thinking orientated towards the identification and the creation of a realistic vision and potential future, including potential problems, development tendencies, uncertainty and risk. K. Cuhls (2003, p. 93) argues, that foresight is not planning, but foresight results provide information about the future and are therefore one step in the planning and preparation of decisions. Thus, foresight is not a concept that replaces other, known and so-far applied methods of anticipating and creating the future, but constitutes an example of a tool that supports the decisive process. As a complementing/supporting tool that bases on knowledge and intuition of various groups of stakeholders, it proves to be very valuable, in spite of the fact that it itself fails to provide ready patterns of innovative development strategies. Foresight in management cannot define strategy, but it can help condition strategy, policies of the cluster to be more appropriate, more flexible, and more robust in their implementation, as times and circumstances change (Cuhls, 2003, p. 96). Through the provision of alternative scenarios of cluster's and its environment's development in a long-term perspective to cluster decision-makers – foresight can prove the key element of the process of strategic management, contributing, inter alia, to strategic reorientation.

Foresight is a creative process that requires integration of lateral and linear thinking that is characterised by holistic perception of a given object and its environment, a considerable methodological flexibility, orientated towards and engaging a wide group of stakeholders who are considered the key ones from the viewpoint of foresight. According to M. Godet (1986, p. 136), the future is not written or given but it is created. Thus, foresight as a multidimensional process of creating the culture of thinking strategically about the future, a complex tool for building new and favourable reality, and also "a strategic early warning system" that warns in advance of the dynamically changing environmental conditions, enables better understanding of the market, more efficient creation of new trends and needs and also taking the chances/opportunities that are created by a turbulent environment in a much faster manner. It provides cluster decision-makers with important information on the present and future environment, which increases cluster's ability to react properly and efficiently, and to prove maximum activity in the area of strengthening its competitiveness. The indicated, some of the benefits of foresight can only be gained through active participation: because foresight is mainly about building networks and stimulating action, a cluster or a community can only properly gain the benefits by going through the process itself (Anderson, 1997, p. 676).

Foresight generates an added value for a cluster the moment the vision of the future that has been built faces full engagement of internal and external stakeholders. It requires the integration of the common ideas of the future, the creation of a proper organisational culture in a cluster the foundation of which is organisational learning, trust and partnership. Polish experience of foresight is still small as compared with such countries as: Japan, the USA, France, Germany, Australia, Canada, Sweden, the UK. Nonetheless, it is important that Poland joined the group of

the countries in which the culture of strategic thinking of foresight type performs an important role in planning the development of regions, industries and also business entities, including industrial clusters.

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