Features of forecasting process in modern digital society

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Abstract. Proceeding from a variety of decision-making approaches in the project management sphere, the authors have made a hypothesis that Foresight is the most perfect and effective technology of forecasting the future in modern realities. The following tasks have been set to prove the fidelity of this judgment: to analyze Foresight concept regarding application of this method, to allocate and describe the main stages of Foresight development and to establish regularity and the reasons of bifurcation of this method based on these stages, to prove the need of Foresight application in the modern world especially in the project management sphere. The authors have established two opposite approaches to perception of a complex of actions during the research, which make Foresight so necessary for project management: present-future and future-present. The deep analysis of historical development of Foresight has allowed establishing relationship of cause and effect of this phenomenon. The assessment of compatibility of methods of Foresight in a percentage ratio for successful implementation of the project was carried out on the basis of scientists’ researches. Also, studying of this problem has shown that qualification and creativity are the main criteria for evaluation of efficiency when it comes to use of the whole complex of Foresight methods. This approach allows to optimize and rationalize project activities and to increase the general indicators of efficiency.

1. Introduction
The emphasis is placed in modern digital society on forecasting of economic and social short-term, medium-term and long-term activities of economic entities. According to scientists’ researches [1] the use of technologies of forecasting is not the most optimum and progressive method because this package of measures is not based on a full-fledged research of the internal and external environment.

The purpose of this article is to research development of forecasting methods based on Foresight application as the most relevant way of anticipation of possible ways of development of modern digital society.

Problems of scientific research are as follows:
1. To systematize approaches to definition of the “Foresight” concept based on data on a vector of the information transfer that is necessary for implementation of forecasting actions.
2. To reveal different historical regularities in terms of evolution of scientific views on Foresight.
3. To estimate compatibility of Foresight methods and schemes developed for evident representation of Foresight methods for the purpose of their possible combination.

4. To prove Foresight meaning as the most relevant way of anticipation of possible ways of development of modern digital society.

The general scientific methods of knowledge such as abstract, logical and comparative methods were used while the research was conducted.

2. **Research methodology**

The systematization of approaches to definition of “Foresight” is presented in table 1. At the same time the short and capacious content of definition is given in the column named “formula”, and the direction of the information transfer necessary for holding actions of forecasting is designated in the column named “vector”.

**Table 1. Analysis of approaches to definition of Foresight.**

| No. | Definition | Formula | Vector |
|-----|------------|---------|--------|
| 1   | Foresight is the creative technology of impact on the formed future by means of coordination of civil interests of various layers of civil society and by means of stimulation of their activities in the sphere of key technologies usage [1]. | Technology of impact on the future | Present – Future |
| 2   | Foresight does not mean prediction, it shows a range of alternatives of the future and asks “that if …?” when it comes to each of them [2]. | Range of alternatives of the future | Future – Present |
| 3   | The forecast is the movement of the present to the future. Foresight, on the contrary, is the movement of the future to the present [3]. | From future to present | Future – Present |
| 4   | Foresight is a combination of systematic attempts to glance in the long-term future of science, technology, economy and society for the purpose of identification of zones of a strategic research and emergence of the patrimonial technologies that promise to bring the largest economic and social benefits [4]. | To glance in the future, to bring economic and social benefits | Future – Present |
| 5   | Foresight represents the system of methods of expert assessment of the strategic directions of social, economic and innovative development, identification of the technological breaks that are capable of having an impact on economy and society in the medium and long term [5]. | The system of methods that has an impact on economy in the long term | Present – Future |
| 6   | Foresight is scenario forecasting of social and economic development: possible options of economy, industry and society development may be calculated for 10–20 years to come [6]. | Forecasting of different development scenarios | Present – Future |
| 7   | Foresight in economic science is correlated with much wider concept such as anticipation that gives the advancing display of reality based on knowledge of laws of the nature, society and thinking [7]. | The anticipation that gives the advancing display of reality based on knowledge of laws | Present – Future |
| 8   | Foresight includes actions focused on thinking, discussion and delineation of the future [8]. | Actions, discussions and delineation of the future | Present – Future |
| 9   | Foresight is a systematic reflection of the future and impact on the future [9]. | Systematic impact on the future | Present – Future |
Foresight as the technology of definition of development priorities, interferes with “dispersion” of means and allows to concentrate efforts on the organizations of technological break in key areas [10].

It is possible to draw a conclusion based on the submitted table 1 that there are two basic and opposite models of the information transfer necessary for holding actions of forecasting: “Future – Present” and “Present – Future”. The main difference of these two models is the orientation of the movement of development of a subject of forecasting. In the first case, the support goes on the future that allows considering area of a research, already using achievements that have already been predicted. In the second case, real facts that become the index for further development are presented as forecasting base.

Some historical regularities of evolution of scientific views on Foresight (table 2) are the reason of emergence of two opposite models.

Table 2. Stages of Foresight development.

| Stages | Time period | Short characteristic of each stage |
|--------|-------------|-----------------------------------|
| Stage 1 | 1902        | The term “Foresight” was used for the first time by Herbert Wells, while he was performing in the Royal Institution with the lecture called “The opening of the Future” [11]. |
| Stage 2 | 1930s-1940s | After World War I and the Great Depression, the scientific and technological sphere begun to be considered as one of the main factors of formation of public benefit. G. Wells published a series of sketches under the name “An Experiment in Prophecy” where he presented a world picture of 2000s. He managed to predict development of transport, the resettlement of people connected with it from the cities to suburbs, sexual revolution, and weakening of moral foundations, he managed to predict the creation of the European Union as well. In 1932 Wells supported the idea of institutionalizing of the so-called “Foresight departments and professors”. A committee for preparation of the forecast of development of the aviation industry for the Air Force was created In the USA for 20 years to come. |
| Stage 3 | 50s – 60s   | The RAND company developed the first ever systematic tools of the expert analysis: Delphi methods and assessment of mutual influence of factors, game theory, scenarios and so on. The experiments with imitating researches begun to be performed. The conceptual and methodological foundation of Foresight was created during this period. This foundation is still used in many modern forecasting practices. Foresight base consists of effectively organized researches that are vital for implementation of desirable changes. In 1966 Alvin Toffler created the first university course of futurology at the New school in New York. |
| Stage 4 | 1970s       | There was a number of unfulfilled forecasts during the infamous oil crisis, including “Growth limits” [12] and “Accident or new society?” [13]. These failures revealed the limited opportunities of forecasting. “The future does not always appear as a simple continuation of the past”. In the European Union the FAST program (Forecasting and Assessment in the Field of Science and Technology) was created for assessment and forecasting of the scientific and technological sphere based on the results of research called “Europe +30”). In France the Futuribles project was implemented, in Great Britain “The committee for the forthcoming 30 years” (Committee for the Next 30 Years) was created, and Hudson's (Hudson Institute) Institute was formed in the USA from the “gennmated” RAND branch. |
### Stages

| Stages  | Time period | Short characteristic of each stage |
|---------|-------------|------------------------------------|
| Stage 5 | 1980s       | Analysis of different options of the future combined with the possibility of various global and social uncertainties becomes a universal tendency in forecasting researches. The term “Foresight” began to be associated with the scientific and technological sphere at the Sussex university (University of Sussex, Great Britain) in 1983 at the suggestion of specialists of the Center of researches of scientific policy (Science Policy Research Unit, SPRU) [14]. such international initiatives as the "Group on development of global scenarios" (Global Scenarios Group), Millennium Project and Institute of perspective technological researches at the Joint Scientific Center European Commissions (the EU Joint Research Centre Institute for Prospective and Technological Studies, JRC-IPTS) were established. |
| Stage 6 | 1990s       | “Dissemination phase”. The leading state Brazilian company called EMBRAPA that was specializing on researching in the field of food decided to take on to long-term strategic planning approach. The systematicity of the future analysis was given by such important concepts as agribusiness and chains of value creation. The seminars and interviews became a source of necessary information for creation of scenarios. The aspirations of society, the most important of which have been and remain equality, justice and high quality of life, became known during expanded consultations with representatives of various social groups. |
| Stage 7 | 2000s       | Foresight starts to cover more and more different areas, activities of branch funds, scientific, technological and innovative spheres and so on in process of complication of society structure [15, 21]. |
| Stage 8 | 2010s – 2020s (approximately) | The global network of various economic and social relationships that are created by means of establishment of direct interactions between authorities, companies, people, credit institutions by complicated system of IT technologies demands application of specific methods of prediction of the future by experts of various areas. |

Based on tables 1 and 2 it is possible to draw a conclusion that the dissonance that has arisen in understanding of the term “Foresight” has appeared because of completely different techniques of Foresight used depending on current situation. Foresight was adopting both situations of quality and criteria of application necessary for those times at each stage of development of society and spheres of life and activities, in other words it has become capable of changing with the external environment.

In order to avoid wrong conclusions about adoption of administrative decisions at stage 8, in our opinion, it is more expedient to use a method with a basic vector of the direction of the information transfer necessary for holding actions of forecasting “Future–Present”. This criterion will allow achieving the objectives, expecting result, possible threats and advantages that are not always noticeable from an opposite point of view. Proceeding from the analysis of definitions and historical regularities of evolution of Foresight, considering different features of development of digital society with the help of IT technologies, it is possible to mark out two major competences, which need to be owned for effective use of methods of Foresight, being based on the way “Future–Present”. These competences are as follows:

1. Qualification – an ability to find the right decision in the conditions of limited reality taking into account satisfaction of the minimum requirements (according to Simon G A);
2. Creativity – an integral ability to create new on the basis of the obtained information and the available experience by means of heuristic methods.

The qualification and creativity may be helpful when it comes to formation of certain requirements for implementation of processes of forecasting. The main methods of forecasting researches are the following: Delphi method, benchmarking, method of expert panels, brainstorming, literary review, future workshops, scenarios of the future and so on [16, 19]. The choice of this or that method depends
on various conditions (existence of these or those resources, competence of the elected experts, etc.). The main condition is to use methods that ensure productive functioning of experts [17, 20]. According to data of the “Global foresight outlook magazine 2007”, the following combination of key Foresight-techniques is the most widespread [18]:

1. If the main chosen technique is the technique of “expert panels”, then it is combined with a “brainstorming” technique in 27% of cases, with “future workshops” in 34% of cases, with literature reviews in 65% of cases and with scenarios in 34% of cases.

![Figure 1. Combinations with “expert panels” technique.](image1)

2. If the main chosen technique is the technique of “future workshops”, then it is combined with a “brainstorming” technique in 32% of cases, with “expert panels” in 64% of cases, with literature reviews in 61% of cases and with scenarios in 41% of cases.

![Figure 2. Combinations with “future workshop” technique.](image2)

3. If the main chosen technique is the technique of literature reviews then it is combined with a “expert panels” technique in 57% of cases, with “future workshops” in 28% of cases and with scenarios in 41% of cases.

![Figure 3. Combinations with literature review technique.](image3)

4. If the main chosen technique is SWOT-analysis then it is combined with a “brainstorming” technique in 52% of cases, with “expert panels” in 66% of cases, with future workshops in 33% of cases, with literature reviews in 70% of cases, with questioning and monitoring in 28% of cases and with scenarios in 42% of cases.
5. If the main chosen technique is Delphi method then it is combined with a “brainstorming” technique in 42% of cases, with “expert panels” in 61% of cases, with future workshops in 25% of cases, with literature reviews in 61% of cases, with key technologies in 28% of cases and with scenarios in 38% of cases.

It is necessary to consider a practice of combination of all the techniques listed in figures 1, 2, 3, 4 and 5 while creating Foresight-research as the process of forecasting in modern digital society. The authors predict an increased probability of receiving target indicators of the forecast using such a combination.

3. Results
It is revealed from the results of a research at stage 1 that there are two basic opposite models of the information transfer that are necessary for forecasting process: Future – Present and Present – Future. The main difference of these two models is the orientation of the movement of development of a subject of forecasting.

The analysis of the obtained data of investigation phases 1 and 2 showed that the dissonance, which arose in understanding the term “Foresight” had appeared owing to the use of techniques of Foresight depending on current situation: Foresight adopted necessary qualities and criteria of application. In other words, Foresight has adapted to changes of the external environment. In order to avoid wrong conclusions about adoption of administrative decisions in the range of 2010–2020 use of a method with a basic vector of the direction of information transfer “Future – Present” is offered by the authors. This criterion will allow achieving the objectives, expecting result, possible threats and advantages, which are not always noticeable by consideration of a situation from an opposite position.

Proceeding from the analysis of definitions and historical regularities of evolution of Foresight in view of the features of development of digital society through IT technologies, two major competences, which need to be owned for effective use of Foresight are marked out being based on the “Future – Present” model: qualification and creativity that promotes formation of certain requirements to implementation of processes of forecasting. The results received at stage 3 allowed authors to predict
an increase in probability of receiving target indicators, when using the developed combinations of Foresight methods.

4. Conclusion
Thus, the authors have systematized approaches to definition of Foresight during the research based on data on the vector of information transfer that is necessary for implementation of forecasting actions. Two models of carrying out a complex of actions, which make Foresight, based on different directions of the vector of information transfer have been established: “Present-Future” and “Future-Present”. The historical regularities of evolution of scientific views on Foresight have been revealed during the authors’ research. The authors have marked out two major competences such as qualification and creativity. These two main competences within the “Future – Present” model are necessary for an effective use of the Foresight methods in the modern digital society. The authors have carried out an assessment of compatibility of methods of Foresight and have developed schemes for evident representation of the Foresight methods for the purpose of their possible combination as well.

5. Directions of further researches
Due to the received results the following directions of the researches representing the greatest theoretical and practical interest can be allocated:
1. Development of methodological tools for an effective use of the Foresight methods in modern economy.
2. Development of ways of quality improvement when it comes to the use of methods of forecasting.

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