Anticipation as a Bridge Between Theory and Praxis

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Abstract
The paper is addressed to people who do not deal with practical activity. Its aim is to draw attention to the necessity of creating anticipating methods that would be useful to apply in practical activity. This activity consists in creating new objects, managing the existing ones and organizing various undertakings. Practical activity takes place within social processes. Therefore, it starts with the analysis of needs and social expectations.
The newly created methods of anticipation are a very important element of the present development of science. They allow omitting partially a probabilistic and statistic analysis of the processes. So, there is a chance to depart from the development of science based on the medieval view of "Ockham's Razor". Here, traditional science of science is a barrier to the development of scientific disciplines. Some of them are more and more distant from the physical and social reality. Scientific research consists in analyzing processes isolated from the surrounding. The results of such research are, of course, correct. Yet, in the reality there are no processes that are independent of one another. Therefore, the research results do not allow determining the synergy effect occurring during the interaction of particular processes. Experts, practitioners, creating new undertakings, handle this problem quite well. Their activities, only in the introductory stage itself, are based on theoretical basics. The results of these analyses identify the area, in which it is necessary to look for a practical solution.
Science of science that is nowadays regarded significant causes the lack of acceptance of the research on anticipation. **Therefore, it is indispensable to develop mathematical basics of anticipation.** Yet, it is necessary for the elements of the created theory not to remind traditional scientific disciplines. It is essential to complement these developmental activities with the attempts to get theoretical considerations closer to practical reality.
Keywords: anticipation, theory, praxis, science of science, interdisciplinary research

1. The essence of Anticipation

The creators of anticipation methods present various proposals how to create the appropriate principles within this subject matter. It is worth quoting the following proposal:

- **Dubois D. M., Leydesdorff L., 2004,** ***Anticipation in Social Systems: the Incursion and Communication of Meaning.*** The International Journal of Computing Anticipatory Systems, VOLUME 15, 2004.

The authors of this work write:

„In social systems, meaning can be communicated in addition to underlying processes of the information exchange...."

„...we argue that the social system can be considered as anticipatory in the strong sense: this system constructs its future by providing the expected information content of the distribution of events with meaning. ..."

In the work quoted above the problem of anticipation of social systems is discussed in a very detailed way.

In order to draw attention to the needs of practical activity it is necessary to quote the following work:

- Zadeh L. A., 1999, ***From Computing with Numbers to Computing with Words – From Manipulation of Measurements to Manipulation of Perceptions,*** IEEE Transactions on Circuits and Systems, Vol. 45, No 1, JANUARY, 1999.

This quotation indicates that there is a possibility of operating the parameters, which can be determined by numbers. As it is known, in practical activity the effectiveness of activity requires applying a great number of parameters that cannot be expressed by numbers.

2. Methodological Problems

At the end of the 19th century and almost throughout the 20th century there came into being many concepts of the philosophy known as Science of Science. The creators were philosophers, who tried to elaborate methodological recommendations, which in their opinion should be applied in all kinds of scientific research. Each of these concepts was widely criticised, mostly by philosophers. Among scholars, who were not philosophers, there was no interest in this issue. At that time, the real behaviour of scholars who had serious and recognised scientific achievements was examined. It turned out that they did not apply in their research any of the methodological recommendations generally regarded as very important. One tendency that was also noticed was the behaviour according to the recommendations of the teacher of this particular scholar.

From the point of view of nowadays newly created scientific disciplines it seems, however, that it is worth looking closer at critical problems of science development expressed in various proposals of "Science of Science" creators.

The author of this paper presented the description of various theories of "Science of Science" in the following work:

- Adamkiewicz W.H., 2004, ***Philosophical Fundamentals of Scientific Models Creation Popularisation of Science of Science.*** Symposium: Anticipative and Predictive Models in Systems Science, Ed.: Lasker G.E., The International Institute for Advanced Studies in System Research and Cybernetics, Windsor, Ontario, Canada.

It contains a brief description of some views existing in "Science of Science". They do not necessarily have to be applied in the present scientific activity. Their knowledge, however, can help determine the general principles in doing scientific research. It

mostly involves avoiding the dangers of diminishing the research scope. Such diminution of the research scope is typical for new scientific disciplines created nowadays. More and more detailed principles of doing research come into existence. Furthermore, the definitions of notions are more and more carefully précised

Until the 1920s scientific activity was understood as the search for truth about the surrounding world in order to establish practical ways of making use of it. Since the 20s the eventful development of science has taken place. Many new scientific disciplines have been developed. They have enriched our knowledge about the world. Yet, the majority of these disciplines do not have any influence on practical activity. There are also such disciplines that deal with the same things but from a different point of view. Yet, they are so hermetically constructed that there is no possibility of comparing the results in order to draw conclusions that would be closer to practical activity. Therefore, there are attempts made to elaborate the methods of realising interdisciplinary research. Within this subject matter the following authors can be mentioned: Ackoff, Boulding, Bennis, Davides, Miller, Wolf, Sanford and many others.

For many generations philosophers have tried to evaluate and justify the purposefulness of doing scientific research. Some of them had a great influence on the development of science. And not only at the time when they expressed their views. It is necessary to start with Ludwig Wittgenstein (1889 – 1951), who was a creator of neo-positivism. He dealt mostly with the problem of the relation between thinking and the really existing reality. He thought that the world consists of facts independent of one another and that it is built from simple, independent of one another, objects. This way of thinking has until now exerted a tremendous influence on the development of the world's science. The precursor of this philosophy trend was also Bertrand Russell. It was nothing new. Wilhelm Ockham (1300 – 1349) in his theory of cognition stated that there exist only individual beings. Thus, it was wrong to multiply beings and deal with each of them individually. This theory is known as "Ockham's Razor" and it allows analysing single phenomena isolated from the surrounding. It had an influence on the contemporary science and this influence can be seen even today.

The main creator of neo-positivism was, of course, Ludwig Wittgenstein. His ideas were developed by "Vienna Circle". The following people belonged to it: M. Schlick, R. Carnap, Ph. Frank, H. Hahn, O. Neurath and others. The philosophy of neo-positivism is very complex. One of the basic assumptions was the thesis that the whole knowledge about the world must be based on experience. Only natural sciences can give knowledge. The example for all the sciences should be physics, whose language should be applied for all empirical statements.

After the World War II, neo-positivism stopped being the obligatory methodology. It was, however, still developed. Especially by: R. Carnap, K. Popper, C.G. Hempel, E. Nagel and others. Karl Popper must be also mentioned. **It is important to look closer at his criticism of taking into account history in scientific research. It concerned mostly social sciences. This way of thinking made life of politicians, who take**

present decisions without being aware what negative effects the same decision had in the past, much easier.

On the turning of the 50s and 60s of the 20th century in "Science of Science" a new trend appeared. It was based on total criticism of neo-positivism. Its important creators were among others: T. Kuhn, I. Lakatos, P. Feyerabend, J. Agassi, S. Toulmin, N. R. Hanson, E. Mc Mullin. The criticism concerned mainly two features of neo-positivism. Firstly, it based the development of the whole scientific knowledge solely on experimental examinations and secondly, it neglected the knowledge of history of science development. As far as experimental examinations are concerned, it was proved that there are no possibilities of making an experiment, which would be independent of the theoretical views of a researcher. It was also proved that no law of science corresponded to this criterion. On the basis of real practice of scientific research realisation it was stated that there are many theories, which do not comply with the experimental results to a significant degree. Such a theory is still regarded obligatory until the formation of a new one. Within this subject matter Karl Popper, a neo-positivist, proved that instead of the principle of confirming experimentally a theory, the principle of looking for a possibility of refuting experimentally this theory should be used ("falsificationism").

The creators of the new views, mentioned above: T. Kuhn, I. Lakatos, P. Feyerabend, J. Agassi, S. Toulmin, N. R. Hanson, E. Mc Mullin and many others, do not agree on the essence of "Science of Science". Lakatos suggested the approach more similar to the scientific reality. He introduced the notion of scientific research programme. This programme consists of "Hard Core", "Protective Belt" and the set of methodological rules. The research programme develops when the theoretical level exceeds the observational (empirical) level.

S. Toulmin draws attention to a series of real problems occurring in the development of science. He claims that during the development of knowledge the rational norms of activity themselves change. The task of science is to explain the essence of this process. It can be achieved, in his opinion, only by examining a historic development of the problem.

P. Feyerabend takes a more radical wing in the methodology of science. He criticises the thesis of a deductive possibility of justifying particular theories. He thinks that almost all theories are based on different principles. Therefore, there does not exist a possibility of comparing them. He also criticises the thesis of exchangeability of scientific definitions. According to him, definitions used in various theories do not have the same meaning. This is so, because the meaning of the definitions results from the essence of each theory itself. Hence, they are incomparable. In his second book, P. Feyerabend attacked the status and prestige of Western science. He claims it has a suppressing, authoritative and anti-social influence on the present society. In spite of the fact that science has a supreme reign, it shows, in P. Feyerabend's opinion, great aggressiveness in defence of its position. Its potential criticism is suppressed ruthlessly and critics are harassed and made fun of.

3. The impact of Science Development on Practical Activity

The results of scientific research are made use of in different ways in practical activity. It depends on the popularity of a given scientific discipline among people taking various decisions. Most extensively they are used in economic sciences and management sciences. These are widely known disciplines. The basics of economics and management are taught during various kinds of studies. Both these disciplines develop, however, not in the systems way. There come into existence especially many methods of analysing the real reality. Practical use of these methods of analysis very often depends on the views of analysts and decision-makers. The effects of the application of such methods are often tragic. Various crises occur, which later on people try to cancel with the use of newly elaborated ideas how to improve the world. The most significant drawback of the present development of economic and management sciences is the lack of understanding the influence of the present development of technical sciences and technology on the economic development.

4. The Necessity of Doing Interdisciplinary Research

For creative practical activity it is indispensable to be able to make use of not only mathematics, but verbal definitions of the parameters, which must be taken into account in the creation process. It would be, therefore, good if scholars created such definitions because they are fluent in determining problems precisely. The linear development of science effectively hinders that. Most scientists still describe their achievements within single disciplines. The lack of interest in participating in interdisciplinary research results from the present organisation of a scientific, professional career, which is characterised by an individual character. Generally speaking, it is possible to say that interdisciplinary research is still treated as improper from the point of view of interdisciplinary science. Therefore, this subject matter has been given up. Big discussions on this subject stopped in 1970s. Yet, it does not mean that serious interdisciplinary research is not carried out today.

The tendency of interdiscipilinarity should be a consequence of a historic change of social functions of science and its direct participation in solving problems, which mark the presence and the future of mankind. The search for a more complex structure of relations and methods of interdisciplinary research is carried out extensively within the systems approach. It is worth adding that in practical activity there always appears a necessity of the cooperation of different disciplines of knowledge. While creating new undertakings it is impossible to avoid contacts with social sciences: economics, management sciences, sociology and others. These disciplines are characterised by internal differences. There are also serious differences between various research centres and scientific schools. It is therefore important to realise the range of hindrance for practitioners. Irrespectively of various opinions they must succeed while solving a problem. This is so, because there are no interdisciplinary methods combing all

necessary disciplines of science. Therefore, the development of anything is costly. People, who create various objects and various activities, must test empirically all their decisions. These are experiments elaborated by people dealing with practical activity. The results of such activities must be effective, because they can cause serious economic and social consequences.

5. The characteristics of a Problem

The author wants to draw attention to one aspect concerning the cooperation with practical activity. There are two fields of human activity, namely:

- Basic theoretical sciences describing precisely detailed elements of the world.
- Practical activity consisting in creating new objects and preparing various activities indispensable for the mankind existence.

Many years ago there was a wide cooperation between these two kinds of activity. Nowadays scientists claim that the creators of practical activities are craftsmen, who obligatorily make use of scientific research results. This is a totally wrong view.

It is good to pay attention to a certain detail, which very clearly distinguishes creative practical activity from scientific activity. Well, while elaborating any undertaking the author must take into account the following kinds of parameters:

- Measurable parameters – determined by numbers, mostly of a physical character. Some of them are obtained by applying the appropriate theoretical basics. So, for this purpose scientific research results are made use of.
- Immeasurable parameters – not expressed by numbers, but describing indispensable features of the planned activity, or imposed by various legal conditions. In any project there are a great number of immeasurable parameters. Mostly for this reason each project before being realised undergoes various trials, which have solely a practical character and by no means result from scientific reasons.

Some scientific circles begin to notice a danger of the lack of an influence scientists have on the development of practical activity. There are opinions that the division of creative activity into basic sciences and applied sciences (practical) is senseless and useless. It is said that science does not exist near the society, but it is becoming its component as "Technoscience". These statements show a lack of awareness of who really governs the development of the world. International corporations spend huge amounts of money on designing new products and services. Their designing requires a lot of investments on laboratory examinations, which have nothing in common with classic science, either. Within this subject matter I can give an example of the USA, where big concerns carry out vast research. These concerns' research possibilities decide about the development. Here are some examples:

- IBM, an information technology concern – in 2001 obtained 3454 patents and spent on them $ 5bn (6.2% revenue)

- Ford, a car manufacturer, spent in the same year $ 7.4m on research.

In the USA many professors do research for practical purposes. They obtain money on this activity. Yet, entrepreneurs did not willingly buy the obtained patents. Until 1980 5% of the patents were bought. Therefore, in 1980 the USA Parliament accepted the act, according to which an entrepreneur could get free-of-charge a patent made on the state money. This act caused, among others, that 2200 new professor enterprises came into being. They employed 269,000 people and realised $ 40bn of the annual turnover. On the scale of the world's science this is an exception. In many countries there exists a similar dependence between the state authorities and scientists circles.

6. Global Needs to Support Practical Activity by Science

The present level of globalisation also causes many negative effects. Significant international organisations are trying to improve this situation. The improvement is based on the application of the recommendations that result from the present knowledge of decision-makers. This knowledge is based on the present level of science development. Each recommendation is based on one detailed conception. Their effectiveness is minimal. It is absolutely indispensable to take up interdisciplinary activities in order to combine general basics of action.

The main source of conflicts in the present world is poverty affecting a considerable part of the world's population. Poor people can be easily brought into the state of hostility towards others. Nationalistic, racial, religious, ideological and other slogans can do it. In this way fascism, communism and other systems were formed. Poor people are organised by such slogans in order to gain power. Only power gives wealth in poor countries. The elimination of poverty consists in economic development. The development, in turn, consists in creating new jobs. Investing creates jobs. The whole world carries out huge investments. Mostly, big international companies invest. Politicians do not have any influence on this activity. In many countries investments caused the development. In many poor countries investments did not cause development. Modern big investments do not create many jobs. Yet, they usually cause the development of small business, healthcare, education and other institutions. The elimination of unemployment depends solely on the development of small business. In the European Union small business accounts for 98 % of companies (most of them are services – in the USA 70% of GNP, 90% new jobs). In poor countries investments do not cause the development of small business. There are many reasons for this. For instance: services carried out by neighbours. The family produces food, makes repairs and sews clothes, produces material for clothes, builds houses, educates children. Sometimes a priest or ideological school also provides education. The essential element that hinders considerably the economic development is also immobility of workers.

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