THE IMPORTANCE OF METHODOLOGY IN SCIENTIFIC RESEARCH

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Abstract: The research-development activity is considered, not without reason, the engine of an economy. The results of this activity lead either to another research or to a product which enters in the production process and, theoretically, leads to the improvement of life conditions. But, until the achievement of a result of the research-development activity, this activity has to go through several steps: thus, a research theme has to be chosen, the research activity form needs to be established as the methodology which stands at the basis of the said activity. Only after getting over those steps the research final result is reached and, as we mentioned, either it stands at the basis of another research or it enters in the manufacture process for the release of a new product on the market.

Keywords: scientific research, research methodology, qualitative analysis, quantitative analysis, observation

1. Introduction

The role of scientific research nowadays is more and more obvious. It is not by accident that research is considered a true engine of an economy. The results of the scientific research may lead to a creative economy, and economy of knowledge. Besides, the economy of knowledge has a joint evolution with a knowledge based society. Also, the more the economy of knowledge and the knowledge based society are advanced, the more they will take in more knowledge, creativity and even innovation. The scientific research methodology contributes too to the achievement of this intake through all the methods, procedures or techniques it has available.

2. Scientific research

The rational aim for any state is to build an economy based on knowledge, this represents the road to competitiveness, economic growth and prosperity.

A growth, be it sustainable, may not be achieved just by investments and the assurance of the macroeconomic environment stability if these are not doubled by a technical progress, such progress having the role to amplify the capital and labor force value. also, the passage from the resources exploitation to the knowledge exploitation is nothing else than a test of the jump from the cost based competitiveness to the one based on the final value.

Scientific research is a systematic and creative activity which has as its aim the increase of the volume of knowledge, that about man, culture included and the use of this knowledge for new applications..

The scientific research concept is known and used nowadays also under the name of research-development (briefly R-D). (Chiesa V. *et al.*, 2004)

The economic and social development engine for any country is research, development and innovation. The joint concern of all the countries for science and scientific research appears as an acknowledgement of their role in the assurance of the welfare and human civilization.(Plumb I. *et al.*, 2007)

Scientific research results in the appearance of science which incorporates to a great extent in technological products. Besides, scientific research multiplies by itself (as, unlike material values, the scientific ones are not consumed, lost), develops training, performs education, leading to the qualitative growth of the society.

To achieve its challenges, scientific research needs researchers, i.e. specialists in various scientific fields, equipment, financial resources and infrastructure. There are two directions through which scientific information may be created and capitalized, namely:

- there has to be an organizational framework composed of the means to collect, store, process and transfer scientific information;
- to create new scientific information through the research activity done in laboratories, research institutes and academies.

The research results may be inventions, innovations, new materials, software as well as equipment, technologies, modern systems of management, of personnel training, etc.

Within the present context, scientific research has to be looked at in accordance with the globalization phenomenon. In the field of research there are too, real global problems, in the sense that:

- science and research have to take into consideration: the globalization of economic life, the deepening of the international division of labor, the accentuation of international relations, the limited character of the resources and their irregular distribution on the globe, environment protection and the securement of mankind sustainable development.
- the need for scientific research is and acute issue and requires great efforts which, sometimes, cannot be supported by just one state;
- the sustainable development problems requires solutioning from an international perspective.

As the research activity does not always generate a profit, scientific research needs to be financed, mainly, from the state budget. The social motivation to support scientific research was always the production of scientific knowledge which contributed and contributes to economic and social development. The results of the scientific research create capabilities which may manage social, economic, financial, military crisis. It is not a secret that many developed states of today motivate scientific research from the perspective of military superiority. (Garnitzki D., 2006)

3. Scientific research forms

The scientific research activity represents and important factor which contributes to economic-social development and an engine of the economic-social progress: science and technology are basic components of modern life and help, in a direct manner, the states in the achievement of their economic and social objectives in order to have a sustainable development.

The research-development activity takes the following main forms:

a) Fundamental research is an experimental or theoretical activity initiated, above all, for the accumulation of new knowledge concerning the fundamental aspects of perceivable phenomena and facts, without having in view a special or specific application;
b) Applicative research corresponds to the innovation work; its target is the acquirement of new knowledge to apply into practice; so, it is an activity oriented to a practical and specific purpose; the creation of new products, processes and services or the significant improvement of the existing ones;
c) The development research (experimental), systematic activity, which uses the existing knowledge accumulated out of research and/or practical experience with a view to the launching to manufacture of new materials, products or devices, the introduction of new procedures, systems and services or the substantial improvement of the existing ones. (Miles I., 2007)

The research activity has as its aim the production of knowledge, knowledge being expressed first in publications. In scientific research a distinction is made between fundamental research, applied research and development and innovation research. Thus, if knowledge refers to rules and principles, we may speak about knowledge as a result of fundamental research, these being expressed in publications. If knowledge refers to procedures or to the application of knowledge as a result of fundamental research to specific contexts, then we may discuss about applied scientific research

whose result appears still in publications. The case in which knowledge is sufficiently proceduralized to be expressed in scientific publications which may be doubled by invention patents and prototypes, then these invention patents and prototypes provide a commercial protection to published knowledge. So, research-development produces knowledge expressed in publications doubled by patents and prototypes registrations which provide commercial protection. (Văcărel I. *et al*., 2006)

4. Scientific research achievement stages

Generally, in scientific research one finds most of the phases and stages of scientific creation but, there is also the possibility that peculiar elements appear in accordance with the field of research (technical, economic, socio-political, etc).

The scientific research stages are the following:

a) the choice of the research theme and of the funding resources for it;
b) scientific documentation;
c) theme accomplishment;
d) scientific work wording;
e) scientific research results capitalization.

a) The choice of the research theme and of the funding resources for it

Corresponds to the phase of „problem perception", „problematization" or „problem definition and delimitation". The following considerations (principles) are sought for:

- The complex themes are accomplished by research teams, sometimes with a multidisciplinary composition;
- The complex themes may be divided into sub-themes which are distributed to teams or to individual researchers;
- Researchers may choose the theme in accordance with their specialization, experience, resources they have available, the theme importance, other preferences, motivation (draw up of the doctor's thesis, of a scientific work which will be published or presented in the country or abroad, etc);
- Researchers may suggest themes with which they may participate in projects tenders which will be contracted for the achievement of national or international programs or which may help them in drawing up their doctor's thesis, etc.;
- The failure risk must be at a minimum (the theme has to be feasible).

For the economic research themes are chosen from among economic issues arisen from the confrontation of theory with empirical facts.

Once the theme chosen, the value of the research activity has to be established as well as the identification of the financing sources for it. If the theme is not a complex one then the financing value is not high, but, if the theme is a multivalent and requires cooperation with one or several partners then the value which is necessary for financing is higher and the "financing source" may become "financing sources" if what is needed cannot be covered from one financing. (Vişan S., Botez L.F., 2011)

b) Scientific documentation

The scientific documentation is achieved in order to know the present status of the research in the respective domain at a national and international level. For example, for researchers in economics it is necessary that they know concepts, notions, theories, indicators and measurement and analysis methods.

The following stages are covered:

- Bibliographical documentation (learning, for economists), compulsory stage because any research does not appear on an empty space, besides the knowledge already existing in the country and at an international level. The specialized literature of the manuals, treaties, encyclopedias, specialized magazines, various surveys, volumes of scientific events, publications on the internet will be consulted;

- The direct documentation aims at knowing certain information (statistical data, facts) related to a country, geographical region, domain, company, etc. the information has to be correct, coherent and rich in contents;
- The consultation of specialists may ease the work a lot and may shorten the research duration. (Vişan S., Botez L.F., 2011)

c) Theme accomplishment

It is the most research stage, by which:

- The specialty works are critically analyzed;
- Economic reality is attentively observed;
- Work hypotheses are formulated;
- Experiments are achieved;
- The experiments results are interpreted;
- Conclusions are formulated.

Illumination may occur during experiments when new hypotheses may appear and they need to be checked and sometimes generalized. The mathematical apparatus always helps with the interpretation of the experimental results as close to the truth as possible. (Vişan S., Botez L. F., 2011)

d) Scientific work wording

The obtained experimental data are processed under the form of tables, graphs, are introduced in equations or inequalities for which the solutions corresponding to reality are sought for (those entering in a domain of values).

The next step is the scientific work draw up according to a previously established plan. The present stage of the knowledge in the respective domain is presented, then the experimental results obtained, conclusions and proposals. (Vişan S., Botez L. F., 2011)

e) Scientific research results capitalization

The scientific research results are turned in as research reports which are sent to the research program which finances the research theme or they are sent to a publishing house to be published as monograph, magazine article or they reach the inventions office to be published as invention patent or to a scientific event. In this situation, just as in the case of the doctor's thesis draw up, a public presentation of the achieved research is held.

The research results may also be presented under the form of consulting granted to beneficiaries to assess their performances, proposals for activity improvement, environment protection, a.s.o.

The research team is organized in accordance with the theme complexity. Usually, it is composed of specialists (researchers, professors, students, candidates for a master's degree, candidates for a doctor's degree) and managers. All in all, the liability lies with the project manager.

When the them is subdivided, liabilities fall on project partners' persons in charge and on each researcher.

The organization as a team has advantages related to the work in parallel which decreases the research deadline and helps with the young people professional training and the research results are better substantiated, analyzed, interpreted. This organization manner is absolutely necessary for major themes which require inter and multidisciplinary researches. The disadvantages are related to the discipline within the team, an aspect which may limit the initiative and creation capacity of individual researchers.

According to case, a researcher may be part of several research teams. The research team functions only for the duration of a research theme set up. (Vişan S., Botez L. F., 2011)

5. Scientific research methods

5.1.Qualitative analysis

This type of research has at its basis a research which can be done inside a "population" which, preferably, needs to have a sufficient number of items which allow for the performance of such a research. A small number of items may lead to distorted results and the research objective is compromised.

When a qualitative analysis is carried out, in fact, a comparative analysis is done. This comparative analysis may be empirical, by the study of samples, situations, cases, populations, etc., methodological, when different research strategies are used and which may lead to different research results in different moments of the research, or simply theoretical, when the results validation takes place through different research methods (Krausz S., 2007)

At the same time, the qualitative analysis may be functionalist, meaning that it helps the identification of the determinist influences of the situational contexts and action logics and quantify the effects, culturalist, which consists of the assessment of culture determinants on practices and behaviors and on the respective effects, configurational, which has as its aim highlighting of the complex systems coherence and the human resources management within different contexts and evolutionist, which aims at the research of a finite number of configurations and to highlight the situational convergencies. Another method of qualitative analysis is also the observation which has to be objective. Observation must be done, if possible, by the application of several procedures which may offer results completing themselves reciprocally. All the details need to be searched and, above all, the observation must be accomplished with perseverance, until the establishment of clear conclusions and the avoidance of deceptiveness. The observation was and still is present in any knowledge form, so much more in the scientific one. Besides, the systematic observation is considered the first way in which the secientific investigation manifested itself. (Krausz S., 2007)

5.2.Quantitative analysis

Within the framework of the comparative analysis occurs a systematization of the information which stand at the basis of scientific research and the results of such systematization appear under the form of series, tables, graphs, etc, which include data organized according to certain criteria.

The obtained data go through a kerning and adjustment process in accordance with the research objectives. Among the adjustment procedures we may count the following: mobile media, adjustment graph, average addition, average rhythm or the smallest squares. (Krausz S., 2007)

6. Research results

First of all, we may say that a research does not end then when this result is obtained because, most of the times, the said result, stands at the basis of another research or the result is capitalized under the form of an invention patent or it has as a result a better product which goes to the manufacture process..

In the second place, the result we reach subsequent to the research may confirm or invalidate the hypotheses from which we started in the scientific approach and, in the case of a confirmation, formal or practical solutions may be obtained. The said solutions may lead to the shaping of a recommendation, suggestion or various lines of action, the identification of contradictions or limits or, as we already mentioned, the grasping of new research directions.

As a conclusion, the results of the performed research may be underlined due to the applied methodology, a sub-systematization of the obtained results may be done into a coherent subsistant, a demarcation may be done in relation to previous research on the respective subject and, last but not least, possible difficulties or research directions which may be covered for the development of the theory or finding other solutions.

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