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CERN as an international scientific collaboration

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Abstract

It's not a secret that scientific development has been much faster recently, first of all because of booming information technologies, as they dictate the world what it should be in the next moment. Everything changes, including approaches to scientific research. That is why nowadays such phenomenon as scientific collaborations have become very popular. In this article, the authors derive the definition of a scientific collaboration compiled on the basis of various approaches applicable to collaborations. The example of the major scientific collaboration of CERN (European Center for Nuclear Research) emphasizes the importance of each aspect in the derived definition and concludes that the unambiguous definition of the scientific collaboration is further applicable in further fundamental studies of this phenomenon.

Keywords: Science collaboration, CERN, network, organizational structure;

1. Introduction

The spread of information technology in the XX century brought about the formation of the new way of life. The modern economy is gradually transforming into a complexly organized network system, the foundation of such an economy and society are network structures, flows and interactions. The scientific sphere can not be influenced by new trends, the answer to the influence of time in this sphere is the emergence and dissemination of all kinds of collaborations. Collaborations are considered by different scientists in terms of different approaches: resource, organizational, process, competence, networking and synergies. In this article, the authors use their own definition of innovation, compiled on the basis of all of the above approaches.

2. Definition of scientific collaboration

So, scientific collaboration is a collective organizational network of economic entities of two or more autonomous entities, which can be both state-owned or private organizations and individual scientists, for interaction and achieving a common goal - the implementation of the main and backstopping project. The goal is achieved through the establishment of effective interaction through the development of continuously harmonized joint rules, the use of common systems and infrastructure for communications. More effective implementation of tasks is due to the expansion

of the resource and competence base, for participants in the collaboration, access to additional equipment, data sources, explicit and implicit knowledge, the experience of other participants, and various types of costs are reduced. The principles of collaboration are: voluntariness, trust, mutual benefit. As a result, the subjects of the collaboration are trained, the absorption of new technologies, the preparation of a new generation of scientists with interdisciplinary competencies and the production of an innovative product with a new intellectual component of collective use and ownership take place [3].

3. Example of scientific collaboration

Consider the well-known scientific collaboration - CERN (CERN) - the European Center for Nuclear Research (Fig. 1).



Fig.1 CERN - European Center for Nuclear Research

The fact that this collective organizational network of economic entities is proved by the following data: about 8 thousand scientists from 85 countries of the world are involved in the projects of CERN [4]. The number of voluntary member countries accounts currently 21, and there are also participants with observer status who are actively involved in its activities. To support the work of the state, participants contribute about \$ 990 million dollars annually. The common goal of CERN participants is to study the main constituents of matter - the fundamental particles. The main area of research is the physics of elementary particles. Joint rules are determined privately by signing agreements between individual countries and the collaboration. The infrastructure includes two main sites and several smaller ones. A large complex of buildings includes workrooms, laboratories, production premises, warehouses, conference rooms, living quarters, canteens, an accelerator complex both on the surface (old Linac, PS), and underground at a depth of 100 meters (more Modern SPS, LHC). In the early 1980s, CERN became a pioneer in the use of Internet technology in Europe [2]. And in the late 1990s it became one of the centers of development of the new computer network technology GRID, for the preservation and rapid processing of a large array

of data from scientific experiments. Communication processes in the collaboration occur both on-line and off-line. The provision of CERN research was beyond the power of any country alone, cooperation led to a reduction in costs for the share of countries, the exchange of experience in the conduct of joint experiments, as well as scientific discoveries in the research areas. It also can be seen that the basic principles of collaboration are being followed: voluntariness, trust, mutual benefit. As a result of the collaboration, the subjects of the collaboration are trained (all kinds of schools for scientists and teachers are taught), the absorption of new technologies (for example, the Internet), the preparation of a new generation of scientists with interdisciplinary competencies (there are a number of projects in related fields, for example, physics and medicine). As a result of the research in the laboratories of CERN, discoveries are changing that represent the science of the world, and technologies are being developed that are widely distributed outside the laboratories (Internet, DataGRID, Scientific Linux, Proton Mail, etc.) [1].

4. Conclusion

Thus, using the example of a real scientific collaboration, one can draw a conclusion about the relevance of the definition derived, and the possibility of its further use as a fundamental concept for future research of scientific collaborations.

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