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**Development of engineering activities**

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The emergence of engineering activity as one of the most important types of labor activity is associated with the appearance of manufactory and machine production. In the Middle Ages, engineering activity in the modern sense did not yet exist, but rather, it was technical activity, organically related to the craft organization of production.

Engineering activity, as a profession, is associated with the regular application of scientific knowledge in technical practice. It has been formed since the Renaissance. At first, the value orientations of this activity are still closely related to the values of craft technical practice (for example, direct contact with the consumer, apprenticeship in the process of carrying out this activity, etc.). In this era, the orientation toward the
application of science, although it is brought to the fore in an explicit form, is yet only a marginal attitude.

The first improvised engineers appear exactly in the Renaissance. They are formed in the environment of scientists who turned to technology, or handicraftsmen, self-taught, who have become familiar with science. Solving technical problems, the first engineers and inventors turned for help to mathematics and mechanics, from which they borrowed knowledge and methods for engineering calculations. The first engineers are at the same time artists-architects, advisers-engineers in fortifications, artillery and civil engineering, alchemists and doctors, mathematicians, naturalists and inventors. These are, for example, Leon Batista Alberti, Leonard da Vinci, Niccolo Tartaglia, Girolamo Cardano, John Nepper and others.

Knowledge at this time was seen as a very real force, and the engineer-as the owner of this knowledge. How much highly valued such knowledge is seen from the example of the life history of an ordinary Florentine engineer Cheka. He was born from a craftsman's environment (the workshop of joiners who made wooden models of structures, architects and scaffolds for architects), he was taken by the Florentine commune to a permanent salary as a city engineer.

In peacetime, he repaired fortresses, was engaged in the invention of devices for entertainment devices. In wartime, he helped organize a skillful dig, with the help of which an enemy fortress was taken.

During the execution of one of the engineering works Cheki was killed from a crossbow: for the enemy of his invention were more terrible than the arrival of the whole army. He was a typical figure for that time, although he was not an outstanding engineer.

During this period, the engineers were, as the well-known historian of science M.A. Gukovsky wrote, "coming from the shop craft, but everyone was drawn to science, feeling the absolute need for it to properly set up their technical work". We can say that they were already oriented to the scientific picture of the world, although they did not yet rely on science in their daily practice. Instead of anonymous artisans, more and more technicians-professionals, large technical individuals, famous far beyond the immediate place of their activity, appear.

But a rapid and fundamentally new development of technology requires a radical change in its structure. The technique reaches a state in which further advancement of it is impossible without saturation with science. Everywhere, there is a need to create a new
technical theory, to codify technical knowledge and to provide a general theoretical basis for them. Technology requires the attraction of science.

It is this dual orientation of the engineer - on the one hand, the scientific research of natural and natural phenomena, and on the other hand - the production or reproduction of his design by the purposeful activity of the creator-man - makes him look at his work differently than the craftsman does, and scientist-naturalist. If the purpose of technical activity is to directly set and organize the manufacture of the system, then the goal of engineering activity is first to determine the material conditions and artificial means that affect nature in the right direction, which make it function in the way it is necessary for a person, and only then, on the basis of the acquired knowledge specify the requirements for these conditions and facilities, as well as indicate the ways and sequence of their provision and manufacture. The engineer, thus, like the experimental scientist, operates with idealized ideas about natural objects. However, the first of them uses this knowledge and representations to create technical systems, and the second creates experimental devices to justify and confirm these representations.

With the development of experimental natural science, the transformation of the engineering profession into a mass one in the 18th and 19th centuries, there is a need for systematic scientific education of engineers. It is the appearance of higher technical schools that marks the next important stage in the development of engineering activity. One of the first such schools was the Paris Polytechnic School, founded in 1794, where the question of systematic scientific training of future engineers was deliberately raised. It became a model for the organization of higher technical educational institutions, including in Russia. From the very beginning, these institutions began to carry out not only educational, but also research functions in the field of engineering, than contributed to the development of technical sciences.

Engineering education has since played a significant role in the development of technology.

By the beginning of the twentieth century, engineering activity is a complex complex of various types of activities (inventive, design, design, technological, etc.), and it serves a variety of technical fields (engineering, electrical engineering, chemical technology, etc.). Today, one person simply will not be able to perform all the various jobs needed to produce a complex product, as, for example, at the beginning of the 19th century Henry Models, one of the first machine-building plants, did it. He himself was a self-taught mechanic, at the same time an inventor. He invented, in particular, the support of the
lathe, while he himself developed a new design of the product, and technological equipment, and the technology of its manufacture. At the end of the last century, Leipzig still had a factory where all the engineering work (from design to working drawings) was performed by one person - its owner R. Zack. There was no technical bureau, no draftsmen. Already in those days, his "multilateral" activities seemed curious.

Modern engineering activity is characterized by a deep differentiation in various sectors and functions, which has led to its division into a whole series of interrelated activities and cooperating co-operators. This differentiation became possible, however, not immediately. The complex cooperation of different types of engineering activity was developing gradually. At the first stages of its professional development, engineering activity was focused on the application of knowledge of natural sciences (mainly physics), as well as mathematics, and included the invention, the design of a prototype and the development of technology for manufacturing a new technical system. Engineering activities, initially performed by inventors, designers and technologists, are closely related to technical activities (it is performed in the production of machinery, masters and workers), which becomes performing in relation to engineering activities. The relationship between these two activities is done through drawings. The draftsmen who made them were called "scientist draftsmen" in Russia. To prepare these specialists for the factories, the Stroganov School of Technical Drawing, founded in 1825, was intended.

However, over time, the structure of engineering activities becomes more complicated. Classical engineering activities included the invention, design and organization of manufacturing (production) technical systems, as well as engineering research and design.
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