Social Assessment of Innovations and Professional Responsibility of Future Engineers

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Abstract. This article focuses on the social aspects of technological development in the digital age. The assessment of feasibility and effectiveness of implementing new engineering developments implies an assessment of the sociological context of their future use. The position of the authors arises from the general concept of socially responsible innovations. It is emphasized that the global nature of implementing digital technology requires an ethical approach in analyzing the impact of implemented engineering developments on economic, political and social relations. The formation of professional culture of the future professional implies the availability of skills of social assessment of innovations and the readiness to be held responsible for innovative activities.

1. Introduction
In a digital society, engineering activity features a high degree of system integration [1], it acquires a global nature and becomes the backbone of any activity. The specifics of the network culture of the information society changes the requirements to charging the intellectual potential of engineering activity [2, 3, 4]. Aspiring engineers, that constituted the foundations of the creative class of modern scientific and technological progress, should possess not only knowledge in their professional field, but also a high level of responsibility in relation to the prospect of implementing their developments. In this regard, the training of technical specialists should include a body of knowledge on applied ethics and ethics review [5]. The development of the discourse of ethics review based on technical and technological innovations under the control of competent specialists becomes the basis for sustainable development of the society [6, 7].

This article aims to conduct a sociological analysis of students' readiness for responsible engineering activities. The authors associate the responsibility with the integrative quality of the individual, which shows the ability of a person to be held responsible for its actions before oneself, society and the state.

The concept of "Responsible Research and Innovation" (RRI) has been updated in the context of the digital society [8]. In Russia, the research of this field is still in its infancy. The concept of “responsible research” implies a focus on proactive management, active participation of representatives of social groups and various agents, which determines the socio-humanitarian parameters of techno-scientific development [9].

From a perspective of responsible research, the concept of “Social Technology Assessment” (TA) has become widespread. Under social technology assessment it is understood an epistemological claim for systematic and multidimensional research and early recognition of the possible consequences of
scientific and technological development on the basis of all available knowledge [10]. The goal of social assessment is to develop and implement innovations in a more acceptable, socially desirable and sustainable way.

Social technology assessment (TA) is interpreted as a theory of assessing the consequences of scientific and technological development based on all available knowledge of the natural, engineering and human sciences [11]. The essence of TA is captured in the Western European program “Responsible Research and Innovation” (RRI), where a three-element communication model has been formed, which includes politicians, experts and civil society [12].

The development of social assessment agenda led to the decision that “responsible innovations” are one of the conditions for the implementation of the European Union's innovation program “Horizon 2020” (Horizon 2020). In this program, responsible innovation refers to an approach that allows you to “anticipate and assess the possible impact and social expectations pertaining to scientific research and innovations in order to facilitate the development of inclusive and sustainable research and innovations” [13,14]. At the same time, an emphasis is made on the integral approach that combines a socio-humanitarian assessment of innovative projects, a techno-scientific paradigm, and applied ethics [15, P.10].

Sociological studies emphasize that students recognize the need to begin work while still studying, having made a choice in favor of entrepreneurship. However, the availability of intentions is of consequence in 30% of cases of further involvement of students in real activities [16]. In addition, an analysis of students’ opinions shows the absence of such an important element as the responsibility of the individual towards oneself in the course of activities) [17].

2. Research Methods
The methodological background for studying students' readiness for responsibility and social assessment is the theory of planned behavior, according to which purposeful actions of an individual are to be preceded by the formation of intentions [18].

In this study we used the following empirical research methods: questionnaire survey, web interviewing (sample of 110 students), several sociological surveys conducted among the students of Peter the Great St. Petersburg Polytechnic.

The empirical base of the study is a sample among engineering professions amounted to 4 thousand respondents. Among the respondents to the survey, 68% of respondents have a clue of their future job. Moreover, only 64% of the surveyed students are going to be involved in a job connected with the received training specialty, 28% were undecided [19-25].

3. Results
The results of this exploratory study (web interviewing, sample of 110 students) allowed to analyze how the students understand the concept of professional responsibility and responsible behavior. Among the respondents, 51% agree that the responsibility of an individual for its actions increases. Students rated their capability to take risks as follows: almost half of the respondents (54%) are ready to take risks; 16% are not ready; 30% found it difficult to answer.

Based on the answers, the following groups have been identified:
1. Most of the students (69%) believe that professional responsibility is first and foremost, discipline, organized nature and ability to meet the deadlines.
2. Running second (about 50%) are the parameters as follows: independence, ability to use the available resources; yielding the desired result; ability to assess the consequences of their actions and behavior.
3. 44% of students consider high quality of work to be the essence of professional responsibility.
4. Getting achieved the objectives set by superior officers gained 31% of supporters among students.
5. Readiness to take risks as the essence of professional responsibility was noted only by 13% of respondents.
While analyzing the opinions of students, it is possible to distinguish specific strategies of responsible behavior:

- 46% of students tend to take all available opportunities and attract those who can help in achieving results;
- 21% of respondents always take up the matter on their own, get it done and bear responsibility for this;
- 18% of students choose a job according to a previously known algorithm;
- 15% of students learn, at first, the opinion of experts, weigh up everything, and then get down to work.

4. Conclusion

As can be seen from the above, students are characterized by a fairly clear strategy of responsible behavior, which meaning and model they form on their own. Among the main elements of professional responsibility, organizational and managerial skills, optimization approach and a trusting relationship prevailed. The ability to bear responsibility while getting things done was in the last place.

Modern engineering education should be aimed at the development of a complex of skills where an important place belongs to responsible attitude and the skills of social assessment of innovations. In order to ensure the readiness of future engineers for responsible research and social assessment of innovative developments it is essential to establish an interdisciplinary professional and educational environment.

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