

# THE IMPORTANCE OF SOCIAL SCIENCES IN THE EDUCATION OF CIVIL ENGINEERS

**Stjepan Haladin**

*University of Zagreb, Faculty of Civil Engineering, Kaciceva 26, Zagreb, Croatia*

**Miljenko Antic**

*Georgia State University, Department of Political Science, College of Arts and Sciences*

*P.O. Box 4069, Atlanta, GA 30302-4069*

[miljenkoantic@netscape.net](mailto:miljenkoantic@netscape.net)

## **Abstract**

Modern technical civilization, which is based on technically educated experts, uses technological determinism as the most efficient method for solving problems. However, many analysts warn that technological determinism might have fatal consequences. Civil engineers - being a part of the technical intelligentsia - produce living conditions for modern people because they build various settlements and infrastructure. Furthermore, they work with large groups of employees who have different levels of education. Therefore, civil engineers need to know how to interact with and motivate different groups of people. This requires knowledge about human behavior. Finally, scientific investigations about workplace organization in civil engineering are very scarce, and this field is still open for further research. For these reasons, this article will argue that social sciences should be an integral part in civil engineering education.

**Keywords:** technical civilization, sociology, civil engineer, and technological determinism

Proving that civil engineers need education in sociology and other social sciences is not difficult because it is well regarded that they should consider social factors in their technical projects as well as in organization of civil engineering enterprises. Very few people deny that, in theory, social sciences are important for this kind of profession. However, in the actual curriculum planning, social sciences are considered relatively unimportant in the education of technical intelligentsia. One may even find some sort of “technocratic fundamentalism” that argues that civil engineers need only those courses that directly relate to their technical expertise. This approach cannot be explained solely on the basis of misunderstanding, egoism or arrogance of technical intelligentsia. According to a Murphy law, “societies and individuals start to behave rationally only after all other means are exhausted.” There are many proofs for this law in economy, science, politics, ecology, etc. Sociology is not an exception. Therefore, this article argues that, in this field also, we are close to a critical moment when the only solution will be to start to behave rationally.

In Croatia, it is possible to find some significant research in industrial sociology, especially in the field of the steel industry, electronic industry and oil production. However, in general, industrial sociology is much less developed and implemented in Croatia than in the United States and in Western Europe. One of the key contributing

reasons for this is the fact that social sciences play a much more important role in the education of engineers in the USA and in Europe than they do in Croatia. For example, at the Massachusetts Institute of Technology, civil engineering students have eight courses in social sciences and other humanities. These classes account for more than twenty percent of their curriculum.<sup>i</sup> At the Georgia Institute of Technology, another elite institution for the education of civil engineers, students have courses in political science, history, economic analysis, sociology and ethics, among others.<sup>ii</sup> This broad range of courses in social sciences did not harm the level of technical expertise of engineers who graduate from the above-mentioned institutions. In contrast, at the Faculty of Civil Engineering, University of Zagreb, students have only one mandatory course in social sciences (Sociology of Work) and one available elective (Sociology of Organization). In addition, due to absence of funding, there has been no scientific investigation in these fields during the last ten years. Therefore, it is important to explain what sociology can offer to civil engineering.

1. To begin with, we live in an increasingly technological world. The “natural world” almost does not exist any more because our entire environment has been transformed by human activities. People do not live in a world that they make. Therefore, human beings should not adapt themselves to nature but to the technical world that surrounds them. According to Helmut Schelsky, one of the most prominent investigators of the modern technical world, “nobody rules any more, but people must serve technical apparatuses that surround them.”<sup>iii</sup> Similarly, according to Fetscher, “technical apparatuses are not any more only tools that serve humans but also a self-sufficient system to which people should adapt themselves.”<sup>iv</sup>

Indeed, there are many proofs for such claims. To illustrate, people’s very existence depends on technical apparatuses. Water, light, food, settlements, heating, transportation, education, etc. are results of industrial production. In addition, consumer products have manuals that instruct how we should use and preserve them. In other words, industrial products tell people how they should serve the products. Is it any wonder, then, that people talk with nostalgia about natural milk and wine, about homemade cheeses and sausages, and about water from springs? Horse riding or simply staying in nature seems like long-ago abandoned surrogates for “real” life.

A logical consequence of such a situation is technocracy – a ruling of “experts.” Technocracy has its own ideology and value system that can be summarized as follows: “experts should decide about economic, political and social questions.”<sup>v</sup> Such an ideology cannot be reconciled with the modern democracy. To illustrate, according to technocratic ideology, generals, not democratically elected politicians, should decide about war and peace. Equally important, there is no guarantee that people, who are experts only in their own professions, will really make optimal decisions. For example, civil engineers produce objects that determine living conditions of humans. Throughout history, human settlements, bridges, temples, sculptures, cemeteries, among others, have been defining elements of every civilization. Therefore, those civil engineering experts that are narrowly educated only in their own profession are not capable of making optimal decisions because they are not able to understand all the consequences of their projects.

Moreover, civil engineering demanded, and it will demand in the future, a large work force. Hence, civil engineers must coordinate and lead large groups of people with different levels of education, traditions, aspirations, etc. In addition, their

workers frequently work and live under unfavorable conditions – far away from their homes, in stressful environments and exposed to the elements. Therefore, civil engineers need additional skills and knowledge about individual and social behavior.

Briefly, civil engineers need a comprehensive education, which includes humanistic education, in order to avoid “technocratic totalitarianism.” Sociology should be an important part of such an education.

2. Civil engineering curriculum faces a paradox. On the one hand it is a pragmatic study that enables engineers to implement scientific accomplishments. On the other hand, virtually the entire process of education is theoretical. Students solve theoretical problems in classrooms with little hands on practice in construction. Furthermore, this theoretical education is focused only on technical problems in civil engineering. Human resource management is almost completely absent from their education. However, in practice, a very important part of civil engineers’ work is solving problems connected with leadership, which is not part of their profession, as defined narrowly. As a result, a pragmatic education does not achieve its own goal – practical education of civil engineers. This is an additional reason why social sciences should be an integral part of civil engineering curriculum.

3. Social relationship in civil engineering enterprises is a topic that is still wide open for reflection and research. This claim is illustrated with some randomly chosen subject matters that still await appropriate answers.

*Technology:* selection of appropriate technology; technology and social relations; adjustments of social relations to a new technology; conflicts between different sections in an enterprise; conflicts among workers; unequal work load; decision-making about appropriate work load.

*Organization:* organization of enterprises; dislocation of organizational sections; communication lines in an organization; complexity of organization; working groups; formation of working groups (ideals of organization and reality of organization); segmentation; competition; abstention; fluctuation; transportation and accommodation of workers; discrimination at work as a result of social, educational, ideological, national and sexual differences; individual and group competition for prestige and promotion; formal and informal rules; violation of rules (idler, toady, pilferer, etc.); abuse and harassment; privileges; social differences; threats, sabotages; absentees; thefts; strikes; relationship between organization and efficiency; role of managements and workers; usefulness of organizational reforms.

*Qualification structure:* qualification of workers; subordination; permanent and seasonal workers, their statuses and relations; education at work; specific problems with seasonal work force concerning habits, aspirations, fluctuations, accommodation to organized work, etc.; working conditions and living conditions in civil engineering enterprises; jargon, customs, habits, rules, style of living, aspirations and values of workers; relationships and conflicts inside hierarchical structure (managers – workers, educated workers – unqualified workers, old – young); differences between workers in civil engineering and other branches of industry; typical social conflicts (causes and consequences, participants).

*Leadership:* hierarchy; leadership styles (military style - democratic style); higher and lower levels of leaders, experts, staff, administration; influence of leadership

on efficiency (top, middle, and first managerial roles, role of foreman); expectations from young civil engineers at the beginning of their careers; what older experts and workers think about young experts; what young engineers know and how they behave; how to educate engineers about solving social problems at the place of employment.

*Construction site:* is a construction site simply a place of employment or should it be treated as a social entity where large groups of people work and live; should somebody care about the living and working conditions on the building site or should the workers (temporary settlers) take care of these problems on their own; living conditions and styles of living on a construction site (shacks, trailers, barracks and other lodgings, sustenance, leisure, entertainment, social contacts, neighbors); building site as a place for social promotion of peasants to workers.

This article is only an outline and all the questions above should be elaborated further. For example, the position of foreman in civil engineering differs from his/her position in other branches of industry. There are many different definitions of foreman and descriptions of his function. It is even more difficult to define his functions in civil engineering because the organization of work in this occupation is much more flexible than in other occupations where work is much more repetitive and routine. The same can be said about other participants and phenomena in civil engineering. Unpredictability in this profession produces a broad range of discretionary powers for individuals that may cause rule over organization with unpredictable consequences.

All in all, social organization of civil engineering enterprises is still open for further investigation. Traditionally, civil engineering was reduced to the technology of building. However, for some time now, economic aspects of building started to be an integral part of civil engineering. The time has come when social aspects of building should also be an integral part of the civil engineering profession. This is a prerequisite for efficiency in this profession. Therefore, sociology must be an integral part of the professional education of civil engineers. In addition, sociological investigations should be an important element in scientific investigations in civil engineering.

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<sup>i</sup>A complete list of courses is available at:

[http://web.mit.edu/civenv/html/academic\\_programs/undergrad/course\\_1c.html](http://web.mit.edu/civenv/html/academic_programs/undergrad/course_1c.html).

<sup>ii</sup> See <http://www.semesterconversion.gatech.edu/CE.htm>

<sup>iii</sup> Schelsky, Helmut, *Auf der Suche nach Wirklichkeit*, Dusseldorf 1965, pp. 457

<sup>iv</sup> Fetscher, Iring, *Uvjeti preživljavanja covjecanstva*, Globus, Zagreb 1989, pp. 58

<sup>v</sup> Sultanovic V., *Društvo, elite I tehnokracija*, V. Masleša, Sarajevo 1980, pp. 105