Asphology – the Birth of a New Science

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Currently, in the field of 'safety culture' a great deal of attention is paid to the concept of culture. Culture is an abstraction, yet the forces that are created in social and organizational situations deriving from culture are powerful. If we don't understand the operation of these forces, we become victim to them. Cultural forces are powerful because they operate outside of our awareness. We need to understand them not only because of their power but also because they help to explain many of our puzzling and frustrating experiences in social and organizational life [1].

Normally, issues related to culture highlight one or another aspect or idea shared by members of a particular group or organization (the latter referred to as organizational culture) [1].

Currently, there are more than 30 various definitions of organizational culture [2]. Such diversity results from the fact that culture has not yet been studied enough in group, organizational, and occupational domains to have spawned new theory. It is still an evolving field [1].

One of the most widely accepted definitions of culture is that given by Edgar Schein: culture of a group can be defined as a pattern of shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems [1].

However, we think that the concept of 'safety' also deserves an in-depth study. According to the IAEA Safety Glossary [3], 'safety' means the protection of people and the environment against radiation risks, and the safety of facilities and activities that give rise to radiation risks.

The mission to ensure safety of people and society in the context of scientific and technological progress and development of nuclear technologies is a complicated political, scientific and technical, social and economic challenge. Scientists from around the world gradually come to a conclusion that the system of knowledge about protection of people and the environment from hazards of human activities should become a stand-alone theory.

The classic approach to the development of a new theory consists of a sequence of steps: gathering experimental data - defining regularities among the data - formulation of an empirical law - building a system of hypotheses. Such reactive way to develop the theory of safety seems to be too long. From one accident to another empirically humanity takes too short steps towards safety...

Until the accident at Three Mile Island (1979), little attention was being paid to the important role of human factors and human reliability in the operation of nuclear power plants. The Chernobyl accident (1986) highlighted the importance of safety culture and the impact of human and organizational factors on safety performance.

After the Fukushima Daiichi nuclear accident (2011) the concept of systemic approach to safety that establishes interconnections among individuals, technology and organization (ITO) is being actively developed [4].

According to [4] the systemic approach to safety addresses the whole system by considering the dynamic interactions within and among all relevant factors of the system — individual factors (e.g. knowledge, thoughts, decisions, actions), technical factors (e.g. technology, tools, equipment), and organizational factors (e.g. management system, organizational structure, governance, resources).

It should be mentioned that the Fukushima Daiichi nuclear accident was initiated primarily by the tsunami of the Tōhoku earthquake, i.e. from natural external effects. Unfortunately, the ITO concept doesn't consider the impact of external effects on a nuclear facility as well the impact of a nuclear facility on the environment and stakeholders.

Consequently, new paradigm ITOE should be referred to that would cover also external factors.

We use the term «external factors» to mean natural and human induced external events in the region that have the potential to affect the safety and security of facilities and activities. This could include natural external events (such as extreme weather conditions, earthquakes and external flooding) and human induced events (such as aircraft crashes and hazards arising from transport and industrial activities), depending on the possible radiation risks associated with the facilities and activities. Although concern about malicious acts involving nuclear installations is not new, recent terrorist events have demonstrated that an attack on a nuclear facility might be attempted and that terrorists have formidable capabilities and dedication. This has led to an increased focus on defences against terrorists at nuclear facilities, as well as at other critical infrastructures.

Thirty years following the Chernobyl accident have given rise to a clear understanding that complicated set of various safety-related issues is the subject of interdisciplinary research.

The aim of in-depth interdisciplinary studies should be not only to obtain a comprehensive and coordinated vision of the full scope of safety issues, but eventually to develop reliable methodological tools applied for the analysis of more specific issues.

In other words, today we need to have a kind of 'safety philosophy' or science about safety.

We suggest using the term «asphology» or «asphaleology» which means science about safety. The new term comes from Greek word ασφάλεια – aspháleia that literally means «safety, protection» [5].

One may already state that the new science should emerge at the intersection of already existing natural, social and technical sciences, see Fig 1.

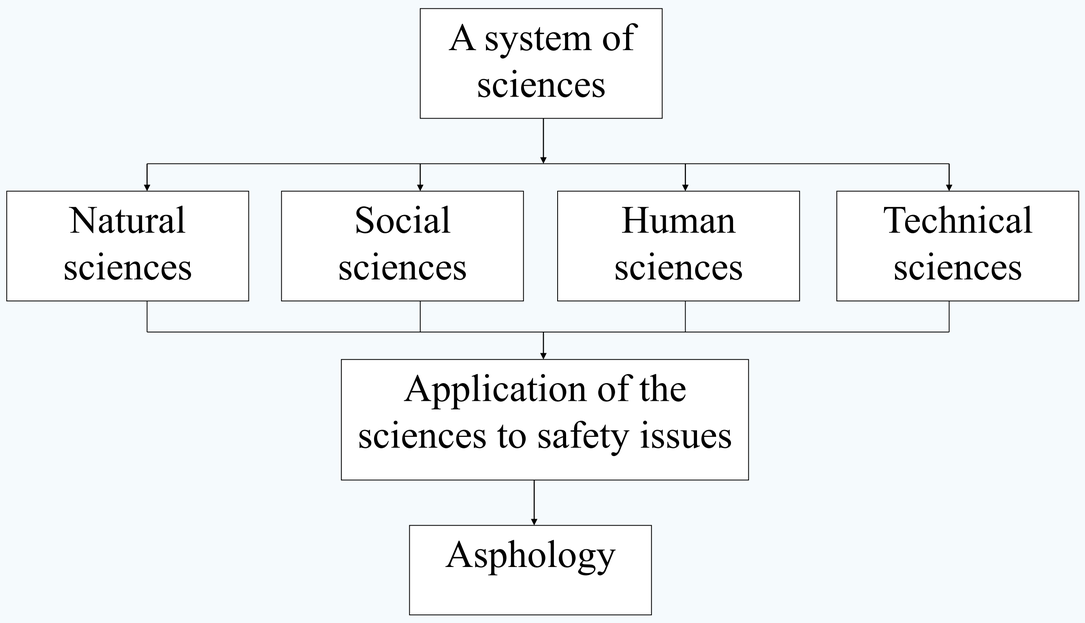

Figure 1. Interdisciplinary approach to the development of a new theory

Asphology should not be understood in a narrow practical way as a methodology of scientific research related to the study of standards and regulations, laws and tools, but should be regarded in a wider sense as a worldview, scientific ideology, a kind of philosophy regulating integrated scientific cognition.

Conclusions

It is necessary to develop the new ITOE paradigm covering interconnections among individuals, technology, organization and external factors.

We need a new science called «asphology», the science about safety.

References

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[5] Dodson Greek-English Lexicon. By John Jeffrey Dodson. May 19, 2012.