



## Janusz Ziarko

Associate Professor, Andrzej Frycz Modrzewski Krakow University  
<https://orcid.org/0000-0002-9100-2807>

# Soft Systems Methodology in identifying and eliminating occupational safety hazards

## Introduction

Many occupational safety and health (OSH) problems observed in companies are perceived as complex, open-ended, multidimensional or unsolvable. What are the key features of such problems and how do they differ from routine problems; and do we have ways of solving such problems? There is an ongoing discussion in the English-language literature about unsolvable problems. This paper presents the main thrust of this discussion in the context of Soft Systems Methodology (SSM) as a concept for dealing with such problems. In the Polish scientific literature, little attention has been paid to the identification of complex OHS problems and their solution. Nowadays, both theoreticians and practitioners dealing with OSH issues should focus more attention on finding ways to deal with these challenges, to solve complex problems. It has been recognised that standard approaches to improving OSH conditions, which are variable, uncertain, complex, ambiguous, are clearly inadequate and positive change impossible, as the required level of information about OSH risks and their determinants, as well as the clarity of objectives and ways to achieve them, is too difficult to achieve. On the other hand, it is well known that routinely applied analytical-reductionist approaches to solving OSH problems overlook factors such as values, perspectives, experiences or relationships between stakeholders. Solving complex problems requires reflection and debate on the nature of the problems and proposals for alternative solutions based on diverse views

and value frameworks.<sup>1</sup> Hence, the aim of the article was to indicate the potential for using systems thinking and SSM methodology in the area of identifying and solving complex OSH problems. The problem of consideration was encapsulated in the question: does SSM provide an organisational framework for implementing the process of finding solutions to complex problems and improving OSH? The research thesis was that the use of SSM and systems thinking in solving complex OSH problem situations, would translate into improved individual and organisational safety, into the creation of safe systems of work. The method used was a semi-systematic literature review<sup>2</sup> aimed at identifying selected determinants of SSM use in activities in the area of identifying and solving complex OSH problems.

## Perceptions of workers' safety and health at work

Good occupational health of an employee is associated not only with the absence of illness, but also with his or her physical, mental and social well-being. It is conducive to employee productivity and organisations should strive to achieve high performance with the least possible commitment of resources. The most valuable business resource is the employee and their work. Therefore, employers as well as employees should be concerned about health and fitness, the wellbeing of all members of the workforce – a key factor in productive work. Health and fitness – crew wellbeing is a sense of job satisfaction and fulfilment related to work, with positive feelings related to the physical and social working environment.<sup>3</sup> It is also the full intrapersonal harmony of the worker, illustrated by the maximum working efficiency of all his/her systems and organs and the desired level of adaptability to the demands of the external environment.<sup>4</sup> Hence, the actions taken by occupational health and safety managers to ensure a safe and healthy working environment for employees, to create a safe system of work, should not only be a necessity related to compliance with labour law.<sup>5</sup> It is above all a systematic study of the objectives

---

<sup>1</sup> B. Head, "Wicked Problems in Public Policy", *Public Policy*, vol. 3, no. 2, 2008, pp. 101–118, [https://www.researchgate.net/publication/43502862\\_Wicked\\_Problems\\_in\\_Public\\_Policy](https://www.researchgate.net/publication/43502862_Wicked_Problems_in_Public_Policy) [accessed: 25 April 2022].

<sup>2</sup> H. Snyder, "Literature review as a research methodology: An overview and guidelines", *Journal of Business Research*, vol. 104, 2019 pp. 333–339, <https://doi.org/10.1016/j.jbusres.2019.07.039>.

<sup>3</sup> E. Trzebińska, *Psychologia pozytywna*, Warszawa: Wydawnictwa Akademickie i Profesjonalne, 2008, p. 41.

<sup>4</sup> A.M. Grant, M.K. Christianson, R.H. Price, "Happiness, Health or Relationships? Managerial Practices and Employee Well-Being Trade-offs", *Academy of Management Perspectives*, vol. 21, no. 3, 2007, pp. 52–53.

<sup>5</sup> Ustawa z dnia 26 czerwca 1974 r. – Kodeks pracy [Labour code], Dz.U., 2020, item 1320, Section 10: Bezpieczeństwo i higiena pracy [Occupational safety and health].

and expected results contained in the strategies and policies of OSH management, the tasks performed and their scope, the means of work, tools and materials used, taking into account their contexts: competence, socio-cultural, environmental, to identify all physical and psychological risks and to define working methods that eliminate or minimise these risks.<sup>6</sup> It is important to act for OSH in such a way that each worker knows how to act, can act and wants to act for his own and other workers' health in order to improve, protect and save it.

OSH requires the management of the working conditions and behaviour of workers, ensuring the required level of protection of their health and life. Work organisers do not always recognise the complexity of OSH risk issues, which consists of a number of soft factors and conditions that must be taken into account and met in order to make the working environment safe. Failure to take even one element into account can seriously undermine safe working conditions, generating disorders at work that result in disease states. Achieving the desired level of OSH is also conditioned by the conceptual scope and understanding of the terms OSH and safe system of work.

Carlo Caponecchia and Anne Wyatt<sup>7</sup> offer an extended definition capturing the content scopes of terms important to OSH, which is in line with general legal requirements. It reads: a safe and healthy/hygienic system of work is characterised by an integrated, continuously improving set of measures taken within a specific work context, which together are to:

- ensure that working environments, processes, procedures and tasks are designed to minimise the likelihood of hazards causing physical or mental harm to employees but also, for example: to customers, passengers, visitors or members of the public;
- identify and control all actual and foreseeable risks on an ongoing basis and keep them at acceptable levels;
- minimise the damage caused by OSH risks associated with physical and psychological injuries and facilitate workers' return to work after an accident.

One aspect that distinguishes the proposed definition is the emphasis on the importance of work design to achieve a safe system of work. The definition emphasises the importance of integrating the various activities related to the elimination of OSH hazards. The combination of these can be helpful in ensuring safety, as opposed to activities that focus on individual hazards or single controls. It also focuses on proactive preventive OSH strategies and actions, rather than less effective strategies to control risks after problems have occurred. Such a proactive approach to creating a safe system of work is integral to productivity and achievement related to organisational goals, good quality of work and life, later economic outcomes. Proper

---

<sup>6</sup> C. Caponecchia, A. Wyatt, "Defining a 'Safe System of Work'", *Safety and Health at Work*, vol. 12, no. 4, 2021, pp. 421–423.

<sup>7</sup> *Ibidem*.

OSH management influencing the organisation of work, building a safety culture and developing OSH competencies promotes the creation of a safe work system.

## Hazards as complex, multidimensional socio-technical OSH problems

Health and safety problems are distinguished clusters of factors/conditions and/or employee behaviours that generate hazards and their negative effects on an individual and/or a larger number of employees and that are widely recognised by employees as harmful factors/conditions and/or behaviours that need to be diagnosed and eliminated or to achieve the desired form or course of action. The definition of an OSH problem has both *objective* and *subjective* elements. The objective elements are the empirical evidence of the negative impact of threatening factors or employee behaviours, while the subjective components include perceptions, valuations and judgements of the interplay of different factors and/or employee behaviours as to whether they are indeed OSH problems that need to be addressed. Many factors in the work environment are hazards to the worker: dangerous, harmful or disruptive, creating difficult and/or impossible problems for OSH. They are multidimensional in the sense that they represent extensive, intricate, multi-track, interconnected sets of socio-technical factors and conditions. Describing, explaining and understanding them poses a number of difficulties, hence it is difficult to propose specific actions for OSH and to predict their results. The difficulties observed in workplaces in ensuring the desired level of OSH, including the solution of complex, multidimensional situations generating OSH risks, are due to the fact that attempts are being made to solve these problematic situations with ordinary management techniques, and this is a fundamental mismatch. More often than not, projects aimed at improving OSH are oriented towards reducing deficits, for example resulting from post-accident conclusions, i.e. based on past experiences and top-down guidelines, while the actual problematic challenges are decentralised, interconnected, multifaceted, trend-based and difficult to define.

The question arises: what approach and what tools should be used to make them useful for solving complex health and safety problems? Let us first look at: a) the way we most often analyse problems, and b) what characteristics we give to problems.

Re a) the observed OSH threat is broken down by the analyst into multiple elements/scenes, into smaller fractions, each with its own specific logic and associated analytical decisions. These concern the people who will be considered, the contexts in which they will be located, their attitudes, their beliefs about the situation and associated behaviours, the objects and tools they will use, and the ways in which they relate to others. The definition being created to describe and explain the problem takes into account groups of information focusing on the construction of a specific situational element/scene, where the motive for gathering information was the scene

highlighted, rather than the nature of the problem, which sees the links that exist between its elements and brings them all together.

Re b) we assume, following Jeff Conklin,<sup>8</sup> that we often treat problems as well-structured and having characteristics:

- relatively well-defined and stable instructions for solving the problem;
- a specific stopping point, i.e. we know when the objective or solution has been reached;
- a solution that can be objectively assessed as good or bad;
- belong to a class of similar problems that can be solved in a tried and tested way;
- solutions that can be practised, improved and possibly discarded.

Well-structured problems are characterised by the fact that a) the quantities/information given and sought, related to the problem, are always well-defined, b) the problem is only solved once the analyst has accumulated sufficient solution knowledge to explain and understand the problem.<sup>9</sup> The question arises: is this analytical approach sufficient to clarify and solve OSH hazard problems?

In responding, we draw attention to the fact that OSH risks are difficult to identify precisely because they concern professional situations involving many colleagues with significant differences: value systems, beliefs, needs, expectations, tasks performed or competences. Characteristically, many of the characteristics of a threatening situation are not known or not well defined, for example, the actual goals pursued by the participants in the situation are unclear and the directly available information is insufficient to know and solve the problem. Difficult problems also provide reliable information, enough to infer what is going on in the situation, and this allows the problem to be defined, to identify options for solving it.

An example of a complex problem is the constantly observed threat of mobbing in the work environment – consisting of persistent harassment, bullying, intimidation, use of psychological violence against a subordinate or co-worker in the workplace. The measures taken to overcome the problem, including educational, preventive measures, often do not find recognition among co-workers, nor do they stop the bullies from carrying out their intentions. We see that often preventive measures do little to reduce the threat and increase the sense of security of employees. Bullying is a complex problem, affecting employees, the organisational environment and the very quality of being an employee very negatively. Although we know the extent of the impact of bullying on a person's mental state, that even seemingly harmless bullying attacks can lead to chronic anxiety, fatigue, job burnout and even depression, we do not react. Addressing the complex problem of bullying requires

<sup>8</sup> As cited: T. Ritchey, *Wicked problems: Structuring social messes with morphological analysis*, Swedish Morphological Society, Discussion Paper, 2007, [https://www.academia.edu/715659/Wicked\\_problems\\_structuring\\_social\\_messeswith\\_morphological\\_analysis](https://www.academia.edu/715659/Wicked_problems_structuring_social_messeswith_morphological_analysis) [accessed: 8 December 2021].

<sup>9</sup> C. Kupisiewicz, *O efektywności nauczania problemowego*, Warszawa: PWN, 1960, p. 93.

a multifaceted diagnosis of the problem. It is also important that the community facing the problem of reducing bullying and improving its safety engages in different ways to create possible solutions.

The boundary between well-structured and ill-structured problems is unclear, fluid and not amenable to formalisation. Badly structured problems are complex, multidimensional problems, generally the opposite of well-structured problems. They do not have definitive solutions or rules that inform the achievement of a solution. Complex problems are often complicated, twisted, continuous and resistant to complete solution, and their solutions are not necessarily good or bad.<sup>10</sup> Each complex problem is fundamentally unique, requiring a specific rather than a standardised approach to solution. Horst W.J. Rittel and Melvin M. Webber<sup>11</sup> have given ten characteristics of complex, unstructured problems:

- 1) There is no definitive formulation of the complex problem, i.e. even the definition and scope of the problem is contested;
- 2) Complex problems do not have a 'stopping rule', i.e. they do not have a definitive solution;
- 3) Solutions to complex problems are not true or false, but good or bad in the opinions of stakeholders;
- 4) There is no immediate or definitive test for solving a complex problem;
- 5) Any solution to a complex problem is a 'one-off operation'; results cannot be easily undone and there is no possibility of learning by trial and error;
- 6) Complex problems do not have a clear set of potential solutions, nor is there a well-described set of acceptable operations that can be incorporated into the plan;
- 7) Each complex problem is fundamentally unique;
- 8) Each complex problem can be seen as a symptom of another problem;
- 9) Existing discrepancies in a complex problem can be explained in a number of ways;
- 10) The planner has no 'right to err', i.e. there is no social tolerance for initiatives or experiments that fail.

Open problems usually have several viable solutions. Each solution has strengths and weaknesses, it has advantages and disadvantages, which are evaluated according to who is affected by the problem and how it is solved. It is important to be aware that there is no single 'right' solution, and that the chosen solution should be recognised by the majority of employees. It is therefore necessary to consider what the key factors

<sup>10</sup> H.A. Simon, "The Structure of Ill Structured Problems", *Artificial Intelligence*, no. 4, 1973, pp. 181–201, <https://ojs.unbc.ca/index.php/design/article/viewFile/1273/1090> [accessed: 25 April 2022].

<sup>11</sup> H.W.J. Rittel, M.M. Webber, "Dilemmas in a general theory of planning", *Policy Sciences*, vol. 4, 1973, pp. 155–169, [as cited in:] B. Head, *op. cit.*

are that trigger the risk, sustain it and often make it impossible to eliminate it, how to recognise them and then eliminate them. If their elimination is not possible, it is worth minimising their impact.

## Soft Systems Methodology versus problematic health and safety situations

The problem: is OSH: a) a concrete reality, consisting of real elements, or b) an emergent reality, through values and meanings subjectively attributed to factors of the work environment and work itself by workers? The systems thinking that grows out of reflection on the question posed rejects the thesis of a concrete reality of OSH and inclines towards the view that it is an area with an emergent structure, extremely complex and changing. This makes OSH a multifaceted and multilevel reality, the cognition of which requires a multidirectional coupling of human perceptual, intellectual and emotional activities.<sup>12</sup> Researchers such as Peter B. Checkland have begun to argue that ‘human systems’ are diverse, and that their description and understanding of how to confront the problems we face in our daily work should be done on the basis of the meanings people give to the world.<sup>13</sup> Soft Systems Methodology (SSM) is a form of systems thinking by Checkland that allows us to perceive, describe and explain social reality as a construct of interpretations of human experience. SSM, as proposed by Checkland, is a method of structuring complex problems and developing desirable and feasible changes that are accepted by a diverse group of people. For example, such a heterogeneous team of employees may consist of: blue-collar workers, administrative staff, management staff, programmers, customers, making each of them perceive and interpret the problem differently. Checkland described SSM as a structured, flexible process for dealing with what are considered to be problematic, disordered situations that require structured action to improve. Thus, SSM is a participatory methodology, bringing together stakeholders with different worldviews and perspectives and involving them in constructive deliberations to determine the meaning of a problem, assuming that it transcends cultural or cognitive boundaries, the stakeholder(s) and the organisation. SSM stimulates a team approach to discussing the problem situation and related insights and ideas. This approach serves to better guide development and present new ways of making the problem situation more acceptable, less fraught with tension

<sup>12</sup> K. Dąbrowski, *Trud istnienia*, Warszawa: Wiedza Powszechna, 1986, p. 14.

<sup>13</sup> P.B. Checkland, *Systems Thinking, Systems Practice*, Chichester–New York: Wiley, 1981, [as cited in:] S. Simon-Solomon, *Systems Thinking in the Workplace – An Action Research Approach*, Research Paper, University of Missouri–St. Louis, [https://www.umsl.edu/~sauterv/analysis/F08papers/Simon\\_Solomon\\_Systems\\_Thinking\\_in\\_the\\_Workplace.html](https://www.umsl.edu/~sauterv/analysis/F08papers/Simon_Solomon_Systems_Thinking_in_the_Workplace.html) [accessed: 1 May 2022].

and unanswered questions.<sup>14</sup> SSM is particularly useful for developing realistic action plans to solve complex socio-technical situations where people are: confused, have different views about the nature and origin of the problem, where they differ about the goals to be achieved to solve the problem and the possible ways to achieve them. In plans created using SSM, neither a set of health and safety requirements to which the work system should conform is developed, nor is such a system designed. SSM is used to create a set of feasible and environmentally acceptable actions that can be taken to improve the actual problem situation. These actions should be as helpful as possible in creating a set of organisational process improvements, where a process is a set of organisational tasks performed intentionally by employees. The core of SSM is the identification of activities to bridge the gap between the 'actual problem situation' and the 'conceptual picture of the desired situation' emerging in the thoughts of the people involved.

An important idea to support SSM is to involve project stakeholders in learning the problem situation together, as equal members of the team. Encouraging the sharing of their experiences, which helps stakeholders to understand the situation more fully. To inspire stakeholders to creatively find solutions in collaboration and consensus. SSM debates help people understand each other, accept different world-views and reach a common judgement that can be the basis for action to overcome a problematic situation. This makes it easier to coordinate a team across divisional boundaries.<sup>15</sup>

We note that SSM prefers to capture 'problem situations' in which the actors are people, and does not use the concept of a problem. Assuming that there is a problem we assume that there is a solution to the problem and that finding this solution will make the problem disappear. In reality, problems do not disappear, so the aim of SSM is to learn about the problem situation and to propose feasible actions that bring about the desired changes accepted by the stakeholders.<sup>16</sup> Therefore, Checkland believes that the SSM process, is a structured process of thinking about and learning ways to make changes that take into account the different perceptions of the situation by its participants, depending on their worldview. Learning facilitates a better understanding of the problem situation as an unstructured 'soft' problem in any organisational or social context, by the people involved. It allows reasonable actions to be

---

<sup>14</sup> P. Checkland, J. Poulter, *Learning for Action: A Short Definitive Account of Soft Systems Methodology, and its use for Practitioners, Teachers and Students*, Chichester, UK: Wiley, 2006, pp. 4–5.

<sup>15</sup> D. McDonald, G. Bammer, P. Deane, *Research integration using dialogue methods*, Chapter 3: *Dialogue methods for understanding a problem broadly: integrating judgments: Soft Systems Methodology*, <http://press-files.anu.edu.au/downloads/press/p60381/mobile/ch03s10.html> [accessed: 30 April 2021].

<sup>16</sup> P. Checkland, J. Poulter, *Soft Systems Methodology*, [in:] *Systems Approaches to Managing Change: A Practical Guide*, eds. M. Reynolds, S. Holwell, London: Springer, 2010, p. 191.



taken to improve the problem situation and finally it is a process based on a specific set of ideas, namely systemic ideas.<sup>17</sup>

However, little is known so far about the usefulness of SSM for investigating and resolving problematic OHS situations. It is thought that the use of SSM in the area of OSH provides: 1) the participation of different representatives of the work environment in a design focused on improving OSH; 2) an excellent approach for revealing multiple situational perspectives in the analysis of a problem, for exploring alternatives to serve the relevance of decisions. How we use SSM and what impact it will have on OSH depends on: 1) treating what workers do in the course of their duties as purposeful systems; 2) declaring their views on the origins of OSH and its risks and revealing the assumptions made about how they perceive, understand, interpret OSH, its place in the hierarchy of importance of needs, and the contexts from the perspective of which we define OSH, such as: attitudes, beliefs, perceptions and actions of people variously involved in OSH problem situations; 3) treating SSM as a learning system to help learn about hazards, identify their course and impact on other phenomena, assess their probable and actual effects, and find facilities to take preventive and precautionary action.<sup>18</sup>

## Application of SSM as an action learning system for OSH

Actual OSH problems are difficult, complex problems, containing many tangled sub-problems that cannot be untangled – and therefore cannot be objectively defined.<sup>19</sup> We can, however, define the problems associated with the various malfunctioning activities, or hazardous events of importance to OSH, occurring in the problem situation. The fundamental principle of SSM is the whole system. Then, thinking systemically about the problem situation, we select from it those elements that, in our subjective opinion, contribute to the incorrect execution of an action or the occurrence of a specific hazardous event. We treat these instances as systems, define them and set their boundaries. We exclude the remaining elements from our analysis of the problem.

According to the SSM, the defined systems are spheres of human activity. They are called core definitions. Appropriately named and described, they make it possible to build models depicting the dynamics of the case under study – a fragment of a problem situation – illustrating the functional conditions of the analysed activity

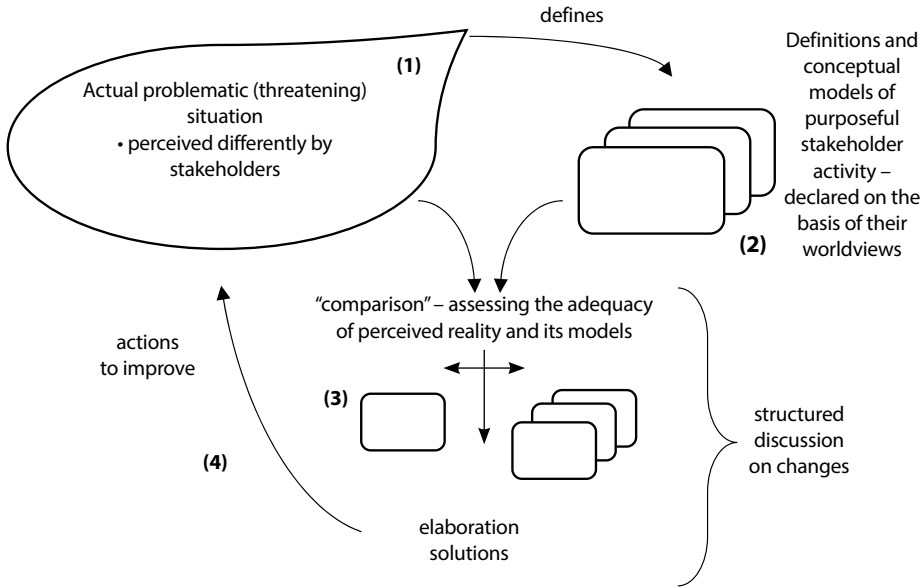
<sup>17</sup> P. Checkland, J. Poulter, *Learning for Action...*, *op. cit.*, p. 4.

<sup>18</sup> P. Checkland, J. Scholes, *Soft Systems Methodology in Action*, Chichester, UK: John Wiley and Sons Ltd., 1999, [as cited in:] *Soft Systems Methodology. Introduction to SSM*, Improvising Design, <https://blog.improv-design.com/soft-systems-methodology/introduction-to-ssm> [accessed: 1 May 2022]; T. Kocowski, *Potrzeby człowieka. Koncepcja systemowa*, Wrocław, Warszawa–Kraków–Gdańsk–Łódź: Ossolineum, 1982, p. 40.

<sup>19</sup> H.W.J. Rittel, M.M. Webber, *op. cit.*

system and its effects/consequences. In SSM, hierarchy is also important. A problem should be looked at from different levels of resolution, with each level being characterised by an emergent pattern of system behaviour (emergence), generating specific effects of that behaviour. The concepts of hierarchy and emergent properties are fundamental to the SSM approach.<sup>20</sup> Related to hierarchy and emergent properties of systems are the concepts of communication and control. The realisation of the system's objectives and its course are determined by the quality of communication between system actors and the effectiveness of control. Seeking to improve a problem situation using SSM is a way for the actors in that situation to engage in collaborative learning about the actual problem situation in order to explore relevant perspectives on its goals, processes and what needs to change. SSM analyses should allow the analyst to see and assess hitherto unrecognised flaws in the existing work system, and within it the factors and their interrelationships affecting OSH. Moreover, if such defects are detected, SSM enables the reflective analyst to make recommendations and take action to improve the work organisation and eliminate OSH risks. The SSM model is shown in Figure 1.

Figure 1. Iconic representation of the SSM learning cycle



Source: compiled from: P. Checkland, "Soft Systems Methodology: A Thirty Year Retrospective", *Systems Research and Behavioral Science*, vol. 17, 2000, p. 16, [https://download.clib.psu.ac.th/datawebclib/e\\_resource/trial\\_database/WileyInterScienceCD/pdf/SRBS/SRBS\\_4.pdf](https://download.clib.psu.ac.th/datawebclib/e_resource/trial_database/WileyInterScienceCD/pdf/SRBS/SRBS_4.pdf) [accessed: 1 May 2022].

<sup>20</sup> N.V. Patel, "Application of soft systems methodology to the real world process of teaching and learning", *International Journal of Educational Management*, vol. 9, no. 1, 1995, pp. 13–23, [https://www.measureevaluation.org/resources/training/capacity-building-resources/basic-me-concepts-portuguese/Methodologies\\_IS\\_Development.pdf](https://www.measureevaluation.org/resources/training/capacity-building-resources/basic-me-concepts-portuguese/Methodologies_IS_Development.pdf) [accessed: 7 May 2022].

When undertaking an analysis of a threatening health and safety situation (stage 1), using SSM, the intention is to accurately identify and fully understand the problem posed by the threat, which requires gathering complete and accurate information about it. The analysis focuses on identifying those situational issues that the people involved in the situation consider to be problematic. We begin by describing and explaining each stakeholder's understanding of the phenomena generating the OSH hazards. Each stakeholder is, as it were, at the centre of the work system and is surrounded by a number of elements with which they interact. He or she perceives risk-generating situations, in unstructured form, from his or her own perspective: that of the human worker. They offer their opinions and views about the situation, e.g. about the events and processes generating health and safety problems, the cultural values and norms in force, or power relations and opportunities for improvement. Each of them, using their own mental models, sees the same situation differently and makes a different judgement about it. They describe it, taking into account the local socio-organisational context in which the work is done. He or she depicts his or her role in the situation and how it relates to other elements of the situation, such as, for example: colleagues, tasks, tools, technology, physical environment and organisational problems. Refers to the prevailing culture, social and organisational structure in the organisation. Recognises and demonstrates the importance and impact of culture and organisational structure, as well as the organisation itself, on the behaviour of colleagues. In particular, it shows how employees actually interact with elements of the situation and which are potentially the source of the developing threat.<sup>21</sup>

The participants in the problem situation then sort out this disorder in order to capture the diversity of perceptions and views of the situation, presenting it by drawing a rich picture. This is often a visual representation, not of the problem-threat, but of the situation in which this threat evolves and is dangerous. The picture depicts/describes the participants in the situation and the problems they are experiencing, it illustrates the connections between the participants in terms of their roles, the tasks they perform and how they perform them. It serves, through the identification of the problem situation, the learning of the stakeholders, their accumulation of knowledge about the causes and effects of situational health and safety risks. Learning, this creation and agreement of rich images, is a source of inspiration for the situation's stakeholders indicating those aspects/elements of the situation related to human activities that need to be named and represented in the form of conceptual models. The rich image does not attempt to model the situation in a precise way. It is a representation of how a team of stakeholders together might look at and think about a problematic situation. The picture can be refined as understanding of the situation becomes

---

<sup>21</sup> P. Carayon, P. Hancock, N. Leveson, *et al.*, "Advancing a sociotechnical systems approach to workplace safety – developing the conceptual framework", *Ergonomics*, vol. 58, no. 4, 2015, pp. 548–564, <https://pubmed.ncbi.nlm.nih.gov/25831959/> [accessed: 3 May 2022].

more complete and the relationships within it become clearer.<sup>22</sup> The rich picture of our area of interest essentially has two components: 1) a structure component and 2) a process component. When creating a rich picture, it is necessary to use material and symbolic elements separated from the problem situation and present them in the form of a structure generating a specific pattern of behaviour, generating a threat (having specific emergent properties). Such elements in a problematic bullying situation, for example, would be: the employees of the team, the tasks performed by the employees, the relationships occurring between the employees and the employees and the tasks they perform, and the boundary separating these elements. The second component deals with the processes of interest generated by the structure in question. The elements to be included here essentially answer the question “what is happening?; who, what is the perpetrator?; why is it happening?” Such elements could be, among other things, a violent communicative supervisor–subordinate relationship, having the characteristics of bullying, and the attitudes of other employees witnessing such communicative behaviour. The relationship between structure and process influences a situational climate that overwhelms employees in a problematic situation related to an existing OSH risk.

The structures, processes and problems of the organisation, presented in a rich picture, provide the basis for naming and formulating the basic definitions of the problem (stage 2). These will allow to separate, name and describe the objectives and activities of the different subsystems of employee activity in the problem situation that contribute to the activation of OSH risks. Creating a master definition involves two steps and clarifies two aspects of the focus area for further analysis. The first is to select from the rich picture the problem(s) or task(s) that need to be addressed, i.e. to identify the problem behaviours/activities – that is, all those elements that need improvement. The second step is to identify and define the system, which is the system of human activity that creates the problem(s) and becomes the focus of concern and that will be used for further analysis related to problem solving and/or task performance.

Master definitions are formulated in a way that is useful for investigating and proposing a solution to a problem situation. In the course of formulating a definition, a given threatening element (input to the system) is transformed into an acceptable form (output).

The main definition may start with the words (entry into the action system) “in the communication of the manager with some subordinates, aggressive wording prevails ....., which are perceived by employees as ....., causing them ... states; which often results in reduced performance...,” followed by an idea-proposal formulated as a deliberate

---

<sup>22</sup> P. Checkland, “Autobiographical Retrospectives: Learning your way to ‘action to improve’ – the development of soft systems thinking and soft systems methodology”, *International Journal of General Systems*, vol. 40, no. 5, 2011, pp. 487–512.

transformation of communicative problem situations into situations... (exits from the action system).

A master definition defines what is being transformed, by whom and for what purpose. Helpful in formulating master definitions is the mnemonic CATWOE,<sup>23</sup> which facilitates the questions: 1) Who is/are the client(s) (C)? 2) Who are the actors (A)? 3) What is the transformation about (T)? 4) What are the world views of the stakeholders (W)? 5) Who is the owner of the system (O)? 6) What are the environmental conditions (E)? For the problematic bullying situation in question, we identify the following key elements of the system,<sup>24</sup> answering the questions:

- Customer: Who is served by the improved system? – people who feel at risk in terms of health and safety;
- Actors: who will perform the transformation process activities? – Employees performing the activities defined in the system – manager, health and safety officer, staff;
- Transformation process: What process will transform the input data into output data? – showing how a system – a problem-eliminating structure (output data) is created from the input data (taken from the rich image);
- Stakeholder worldviews: What view makes this transformation worth the effort? Stakeholders' worldviews mean that the transformation process should be considered and created with contexts in mind;
- Owner: who has the right to say whether a system will be implemented or not? – Every system has an owner who has the right to start or stop the system;
- Environmental constraints: what are the constraints that may prevent the system from operating? Elements that exist outside the system that affect transformation processes and system operation.

The core definitions form the basis for the construction of conceptual models, which models present a clear arrangement of actions intended to be implemented by transformative actors. These are models of purposeful action that can be considered relevant to the debate and dispute on how to solve a problematic situation. At this stage of the SSM methodology, they are not considered as practical projects. They usually take the form of a layout/map of actions needed to bring about improvements in the system of action. In step one of building such models, the layout of activities is specified to then show how these activities are interrelated and complementary. For example, the actions required for a transformation that eliminates aggressive forms of communication (bullying communication) that violate the wellbeing of the other can be put as follows:

- 1) Identify the conditions/requirements for safe communication behaviour (verbal and non-verbal) desired in the organisation;

---

<sup>23</sup> P. Checkland, J. Poulter, *Soft Systems Methodology, op. cit.*, p. 221.

<sup>24</sup> *Ibidem.*

- 2) Disseminate/inform about the requirements related to the improvement of the communication culture eliminating aggressive communication;
- 3) Identify ways of aggressive highly undesirable communication behaviour that should be stigmatised;
- 4) Monitor incidents of aggressive communication (verbal and non-verbal) affecting the well-being of another person;
- 5) Record people breaking the rules of safe communication behaviour (verbal and non-verbal) and identify what the breach consisted of and what the consequences were;
- 6) Inform about incidents of aggressive forms of communication, stigmatise them;
- 7) Enforce the use of safe communication behaviours (verbal and non-verbal) that do not compromise the welfare of the other person;
- 8) Monitor progress in improving communication culture, take corrective/improving actions;
- 9) Evaluate the impact of the measures applied on improving the communication culture and eliminating undesirable communication behaviour;
- 10) Keep employees informed of the results of efforts to improve the communication culture.

Working with models, is the comparison of conceptual models with the real world, rich images representing problem situations, and the debate related to the results of these comparisons. This is another SSM activity to ensure the preparation of an ever better set of actions/recommendations, in line with the priorities for change/transformation contained in the core definitions, to be introduced into existing action systems. The outcome of the debate should be the identification of streamlining changes that meet two criteria: systemically desirable and culturally feasible in a given situation.

## Conclusions

SSM is a significant step in methodologies for dealing with OSH problem situations to improve working conditions, translating into higher safety and better health for workers. It allows going beyond the traditional ways of doing things for OSH (which activates after the fact of an accident at work), and favours proactive ways, focusing attention on latent or emerging risks, exploring and developing the potential of work systems to meet the growing OSH challenges of new technologies or a more competent workforce.

## References

- Caponecchia C., Wyatt A., “Defining a ‘Safe System of Work’”, *Safety and Health at Work*, vol. 12, no. 4, 2021, pp. 421–423.
- Carayon P., Hancock P., Leveson N. *et al.*, “Advancing a sociotechnical systems approach to workplace safety – developing the conceptual framework”, *Ergonomics*, vol. 58, no. 4, 2015, pp. 548–564, <https://pubmed.ncbi.nlm.nih.gov/25831959/> [accessed: 3 May 2022].
- Checkland P., “Soft Systems Methodology: A Thirty Year Retrospective”, *Systems Research and Behavioral Science*, vol. 17, 2000, p. 16, [https://download.clib.psu.ac.th/datawebclib/e\\_resource/trial\\_database/WileyInterScienceCD/pdf/SRBS/SRBS\\_4.pdf](https://download.clib.psu.ac.th/datawebclib/e_resource/trial_database/WileyInterScienceCD/pdf/SRBS/SRBS_4.pdf) [accessed: 1 May 2022].
- Checkland P., Poulter J., *Learning for Action: A Short Definitive Account of Soft Systems Methodology, and its use for Practitioners, Teachers and Students*, Chichester, UK: Wiley, 2006.
- Checkland P., Poulter J., *Soft Systems Methodology*, [in:] *Systems Approaches to Managing Change: A Practical Guide*, eds. M. Reynolds, S. Holwell, London: Springer, 2010, pp. 191–242.
- Checkland P., “Autobiographical Retrospectives: Learning your way to ‘action to improve’ – the development of soft systems thinking and soft systems methodology”, *International Journal of General Systems*, vol. 40, no. 5, 2011, pp. 487–512.
- Dąbrowski K., *Trud istnienia*, Warszawa: Wiedza Powszechna, 1986.
- Grant A.M., Christianson M.K., Price R.H., “Happiness, Health or Relationships? Managerial Practices and Employee Well-Being Trade-offs”, *Academy of Management Perspectives*, vol. 21, no. 3, 2007, pp. 51–63.
- Head B., “Wicked Problems in Public Policy”, *Public Policy*, vol. 3, no. 2, 2008, pp. 101–118, [https://www.researchgate.net/publication/43502862\\_Wicked\\_Problems\\_in\\_Public\\_Policy](https://www.researchgate.net/publication/43502862_Wicked_Problems_in_Public_Policy) [accessed: 25 April 2022].
- Kocowski T., *Potrzeby człowieka. Koncepcja systemowa*, Wrocław, Warszawa–Kraków–Gdańsk–Łódź: Ossolineum, 1982.
- Kupisiewicz C., *O efektywności nauczania problemowego*, Warszawa: PWN, 1960.
- McDonald D., Bammer G., Deane P., *Research integration using dialogue methods*, Chapter 3: *Dialogue methods for understanding a problem broadly: integrating judgments: Soft Systems Methodology*, <http://press-files.anu.edu.au/downloads/press/p60381/mobile/ch03s10.html> [accessed: 30 April 2021].
- Patel N.V., “Application of soft systems methodology to the real world process of teaching and learning”, *International Journal of Educational Management*, vol. 9, no. 1, 1995, pp. 13–23, [https://www.measureevaluation.org/resources/training/capacity-building-resources/basic-me-concepts-portuguese/Methodologies\\_IS\\_Development.pdf](https://www.measureevaluation.org/resources/training/capacity-building-resources/basic-me-concepts-portuguese/Methodologies_IS_Development.pdf) [accessed: 7 May 2022].
- Ritchey T., *Wicked problems: Structuring social messes with morphological analysis*, Swedish Morphological Society, Discussion Paper, 2007, [https://www.academia.edu/715659/Wicked\\_problems\\_structuring\\_social\\_messeswith\\_morphological\\_analysis](https://www.academia.edu/715659/Wicked_problems_structuring_social_messeswith_morphological_analysis) [accessed: 8 December 2021].
- Simon H.A., “The Structure of Ill Structured Problems”, *Artificial Intelligence*, no. 4, 1973, pp. 181–201, <https://ojs.unbc.ca/index.php/design/article/viewFile/1273/1090> [accessed: 25 April 2022].
- Simon-Solomon, *Systems Thinking in the Workplace – An Action Research Approach*, Research Paper, University of Missouri–St. Louis, [https://www.umsl.edu/~sauterv/analysis/F08papers/Simon\\_Solomon\\_Systems\\_Thinking\\_in\\_the\\_Workplace.html](https://www.umsl.edu/~sauterv/analysis/F08papers/Simon_Solomon_Systems_Thinking_in_the_Workplace.html) [accessed: 1 May 2022].

- Snyder H., "Literature review as a research methodology: An overview and guidelines", *Journal of Business Research*, vol. 104, 2019 pp. 333–339, <https://doi.org/10.1016/j.jbusres.2019.07.039>.
- Soft Systems Methodology. Introduction to SSM*, Improvising Design, <https://blog.improv-design.com/soft-systems-methodology/introduction-to-ssm> [accessed: 1 May 2022].
- Trzebińska E., *Psychologia pozytywna*, Warszawa: Wydawnictwa Akademickie i Profesjonalne, 2008.
- Ustawa z dnia 26 czerwca 1974 r. – Kodeks pracy [Labour code], Dz.U., 2020, item 1320.

### *Soft Systems Methodology in identifying and eliminating occupational safety hazards*

#### *Abstract*

Soft Systems Methodology (SSM) and occupational safety and health (OSH) are areas of human knowledge and interest that are important to, but relatively independent of, each other. SSM uses the idea of systems to find solutions to complex, poorly defined, so-called soft problems that we face in work environments. The aim of this article was to identify the potential for using systems thinking and SSM methodology in the area of identifying and solving complex health and safety problems. The method used was a semi-systematic literature review aimed at identifying selected determinants of the use of SSM in activities to improve OSH.

It was pointed out how important it is for the effectiveness of OSH undertakings to be able to use SSM and systems thinking as a structured and systematic approach to analysing and eliminating occupational safety and health hazards present in the working environment.

**Key words:** systems thinking, Soft Systems Methodology, problem situation, occupational safety and health (OSH), health and safety risks