

# **SOCIOTECHNICAL SYSTEM RESILIENCE ASSESSMENT AND IMPROVEMENT METHOD**

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## **SUMMARY**

Resilience is an integrative concept that appeared in 21st century scientific thinking and encompasses two main ideas: response to stressful events and sustainability of systems in coping with stressful events (Reich et al., 2010). There is no consensus on a common definition of system resilience. Resilience is sometimes considered as a process, as a characteristic of system, as a dynamic of development, as an outcome and sometimes all of the above (Zautra et al. 2010). To be resilient, a system has to be exposed to significant threats or severe adversity and achieve a successful adaptation despite negative conditions (Luthar et al. 2000). Resilience related definitions, models and artifacts vary according to the diversity and the complexity of systems (technological devices, individuals, groups, work situations, organizations, communities, states, territories, etc.), of threats (natural, technological, entropic, economical, anticipated, surprise, etc.) and of adaptation modes (routines, compliance to rules, improvisation, return to a stable state, transformation, etc.).

Theories of Resilience has been developed with perspectives of improving safety performance and safety management systems in management sciences (Wildavsky 1988, Weick 1998, Weick et Sutcliffe 2007), in safety sciences (Hollnagel et al 2006, 2011) and in disaster and crisis management sciences (Confort et al. 2010). Some works on the definition of resilience are related to specific capacities: “capacity to cope with unanticipated dangers” (Wildavsky 1988), “capacity to improvise”, to “bounce back” (Weick 1998), “monitoring the boundary conditions of the current model for competence and adjusting or expanding that model to better accommodate changing demands” (Woods 2006), whereas other works aim to integrate all capacities required to be safe: “the intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions” (Hollnagel et al. 2011).

The aim of the proposed paper is to describe a framework for assessing and improving socio-technical system resilience. The framework is the result of an ongoing process aiming to develop methods and tools based on Resilience Engineering concepts and models. Framework presented is the result of the refinement of an initial method based on the Resilience Analysis Grid (Hollnagel 2011) and presenting some limitations identified after an initial experimentation.

The paper will be structured in three parts.

The first part is dedicated to the presentation of the theoretical background used for developing the method. The four initial cornerstone of system resilience has been refined in order to characterize nine dimensions: system capacity to respond to the variability of its environment, system capacity to respond to unwanted event, system capacity to monitor performance of the past, system capacity to monitor actual performance, system capacity to monitor potential performance, system capacity to learn from unwanted situation from the past, system capacity to learn from daily situation, system capacity to prevent impact of change on resilience performance, system capacity to prevent impact of evolution on resilience performance.

The second part is related to the presentation of the nine indicators of the method. Each indicators is structured with five levels allowing the definition of an assessment process. Each level corresponds to a set of concrete properties that will structure the evaluation of the resilience property of a system.

The third and final part presents the methodological guideline aiming to structure data collection processes

and analysis allowing producing a profile and a plan of actions for improving the resilience of a system. Four phases are described: Definition of the context of the study, data collection, system diagnostic and actions plan design.

### **RELEVANCE TO “MANAGING RESILIENCE, LEARNING TO BE ADAPTABLE AND PROACTIVE IN AN UNPREDICTABLE WORLD”**

The proposed paper contributes to the topics of the symposium by presenting a methodological framework aiming to assess and improve socio-technical system resilience based on resilience engineering literature. The nine indicators define and associated data collection and analyse processes aims contributing to the definition of the management of resilience.

### **SIGNIFICANCE/TAKEAWAY: HOW DOES THE PROPOSAL ADVANCE OUR ABILITY TO CREATE AND SUSTAIN RESILIENCE?**

The method proposed aims to support the observation of a system and the realisation of individual and collective interviews with the perspective of assessing system properties with the support of nine indicators elaborated with resilience engineering thinking and to support the definition of plan of actions aiming to improve system resilience.

### **REFERENCES**

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