

Chapter 1

Socio-Technical Systems: A Meta-Design Perspective

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ABSTRACT

Meta-design of socio-technical systems complies with the need to integrate two types of structures and processes: technical systems, which are engineered to provide anticipatable and reliable interactions between users and systems, and social systems, which are contingent in their interactions and a subject of evolution. Meta-design is focused on objectives, techniques, and processes to allow users to act as designers. It provides, rather than fixed solutions, frameworks within which all stakeholders can contribute to the development of technical functionality and the evolution of the social side, such as organizational change, knowledge construction, and collaborative learning. This paper combines the theoretical framework of meta-design and its underlying principles with the consideration of methodological aspects and practical cases. Five different principles are explored: (1) cultures of participation, (2) empowerment for adaptation and evolution, (3) seeding and evolutionary growth, (4) underdesign of models of socio-technical processes, and (5) structuring of communication. Design collaboratories and knowledge management are used as examples to analyze meta-designed systems representing socio-technical solutions as well as frameworks within which socio-technical solutions can be developed. The combination of theoretical and methodological considerations leads to a set of practical guidelines for meta-designers.

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INTRODUCTION

New technologies and new media are important driving forces and prerequisites to address the complex and systemic problems our societies face today. But technology alone does not improve social structures and human behavior, making the design of *socio-technical systems (STSs)* a necessity rather than an academic luxury.

A unique challenge faced in focusing on STSs is that they combine two types of fundamentally different systems:

- Technical systems that are produced and continuously adapted to provide a reliable, anticipatable relationship between user input and the system's output. This relationship is engineered to serve the needs of users and is—at least incrementally—preplanned.
- Social systems that are the result of continuous evolution including emergent changes and behavior. The development of their characteristics cannot be planned and controlled with respect to the final outcome; the changes within STSs are a matter of contingency (Luhmann, 1995) and can only—if ever—be understood afterward and not in advance; social systems mainly serve their own needs and not those of others.

The strength of STSs is that they integrate these different phenomena so that they increase their performance reciprocally. Even more important, the integration of technical and social systems helps them to develop and to constitute each other, for example, the interaction among community members is supported by technical infrastructure, and the members themselves can contribute to the development of the infrastructure, as is typically demonstrated by open source communities. However, the relationships between the development of the social and the technical

are not deterministic but contingent. For example, developing software for specific organizations does not deterministically change them but only influences the evolution of their social structures. Software designers can be reflective with respect to the impact of a software system on its social context, and they can make their assumptions about the expected evolution of the social system explicit and a matter of discourse, but they cannot control the organizational change.

One emerging unique opportunity to make a systematic and reflected contribution to the evolution of social structures in STSs is *meta-design* (Fischer & Giaccardi, 2006), representing a design perspective supporting the evolution of systems that have contingent characteristics. Whereas many design activities aim to develop concrete technical solutions, meta-design provides a *framework* within which STSs can be developed. Fischer and others (Fischer & Giaccardi, 2006) have outlined a variety of important characteristics of meta-design. The most important principles characterizing a meta-design framework for the development of STSs are (Fischer, 2010):

1. Support for cultures of participation that put the owners of problems in charge and give them control of how technical systems are used and which functionality is underlying the usage. In this context, an ecology of roles (Preece & Shneiderman, 2009) will develop including developers, co-developers, consultants, facilitators, and curators (see the section, “Cultures of Participation”).
2. Mechanisms to support empowerment for adaptation and evolution at use time by offering functionality for tailorability, customization, and user-driven adaptability (Mørch, 1997) (see the subsection “Empowerment for Adaptation and Evolution”).
3. A procedure model that includes the phases of *seeding*, evolutionary growth, and *reseed-ing* (Fischer & Ostwald, 2002), in which the seed represents a result of underdesign—it

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