

# Chapter 1

## Socio-technical Systems

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### Summary

Many people now acknowledge that systems which are developed using a socio-technical approach are more likely to be acceptable to end users and to deliver real value to stakeholders. Socio-technical approaches can help the design of organisational structures and business processes as well as technical systems. Even though most systems can now be described as socio-technical systems (STSs), socio-technical approaches to development are not widely used. Most developers still follow the traditional, reductionist approach to development, which divides the system into a social system and a technical system. Such an approach fails to consider the ways that the social and technical aspects are interdependent and interact, which is central to the performance and behaviour of STSs. This chapter discusses the development of socio-technical systems design and discusses some of the problems that have hindered the use of socio-technical approaches.

### Background

The concept of socio-technical systems emerged shortly after World War II, in work being carried out by what is now the Tavistock Institute. They were looking at long wall coal mining operations, and had identified that the way that people worked did not follow the mechanistic view of work, which emphasised specialisation and the division of labour. Instead they found that the social aspects were also important, particularly the ways that individuals and teams

co-operated and collaborated to use the available technologies. The performance of the system was based on the ways that people worked with machinery in that particular context.

The ideas of STSs were taken up in many countries across the world, and several philosophies emerged, which generally reflected local and national cultures. In Scandinavia, for example, they emphasised the humanistic aspects, which reflected the culture of workplace democracy in those countries. These methods remained largely unchanged, though, as new ways of working, and new types of organisational structures emerged. Socio-technical methods were largely sidelined when lean production techniques and business process re-engineering emerged in the late 1980s. The ideas behind the methods, however, have remained relevant, and there have been some attempts at bringing the methods up to date by linking them to agile approaches to system development, for example.

## ETHICS

One of the best known socio-technical methods is ETHICS (Effective Technical and Human Implementation of Computer-based Systems). ETHICS was developed in the UK in the early 1980s by Enid Mumford from the Manchester Business School. Like most STSD methods, ETHICS considers the introduction of a new system as part of a broader change process. There are four identifiable aspects to this change process that need to be considered:

1. Setting and achieving system objectives that take into consideration the differing views of all of the system stakeholders.
2. Adaptation to the new system and new ways of working.
3. Integration of the various elements of the new system into a coherent, functioning whole.
4. Stabilisation of the new ways of working.

ETHICS implements the change process using a series of steps. These deal with organisational issues, as well as providing some guidance for the design of the final system, including the design, implementation and evaluation of the technical aspects of the system:

- The diagnosis of the economic and social needs, covering both efficiency and job satisfaction.

- The setting of efficiency and social objectives.
- The developing of alternative strategies that meet both sets of defined objectives, and selection of the strategy that best meets both sets of objectives.
- The detailed design of the chosen strategy.
- The implementation of that design.
- The evaluation of the implementation of the system after it has bedded in.

The identification of the technical options—the hardware, software and the design of the human-machine interface—is carried out simultaneously with the identification of the organisational options (i.e., the different ways of structuring the organisation to meet the efficiency and job satisfaction objectives). The sets of technical and organisational options are usually interdependent.

What is evident from methods like ETHICS is that the development of any system is necessarily interdisciplinary work. The people and the organisation cannot be considered in the same mechanistic way as the technology, and require different skills and disciplines to analyse and design the social aspects of the system, and the ways in which they interact with the technical aspects of that system.

## **Other approaches encompassing STS ideas**

There are many other methods that are explicitly described as socio-technical methods or approaches, apart from ETHICS. There are also several other approaches that encompass socio-technical ideas, or at the very least are consonant with those ideas. These methods include:

- Soft Systems Methodology.
- Cognitive Work Analysis.
- Ethnographic workplace analysis.
- Cognitive systems engineering.
- Human centred design (video) . For software, this is often called user-centered design.

## Problems with existing STSD approaches

Many of the existing STSD approaches reflect their cultural roots in terms of time, space and place, and hence have not always been transferable to other situations. There are several readily identifiable problems with existing approaches, including:

- A lack of consistent terminology, even to the extent of variations in the definition of exactly what constitutes an STS.
- Determining the appropriate levels of abstraction to use, based on where the system boundaries are drawn, and a tendency to focus on the technical aspects in greater detail.
- Conflicting value systems, with humanistic values on the one hand, being regarded by some as incompatible with managerial values.
- A lack of agreed success criteria, partly because it can be difficult to identify evaluation criteria for the social aspects of the system.
- A focus on analysis rather than synthesis, showing how a system looked once it was built, rather than offering support for how to construct a successful system.
- A lack of multidisciplinary, with some disciplines failing to understand what other disciplines can contribute to system development.
- A perceived anachronism, because the methods did not change to reflect the changing nature of organisations and ways of working.
- A lack of support for identifying the appropriate stakeholders and users.

## Implementing Organisational Change

The introduction of a new system often forms part of a larger organisational change process. Sometimes the change will be evolutionary, and sometimes it will be deliberately revolutionary, such as when the company wants to introduce new ways of working that may lead to reductions in the workforce. The group whose main objective is to bring about the organisational change often have extensive backgrounds in business management, and a good understanding of business processes; the systems development group, in contrast, will usually have a strong technical background. Implementing organisational change, however, can often give rise to unanticipated effects that may have an impact on

other parts of the business. In some cases this will have a knock-on effect on the development of the system that is to support that business. It is therefore important that the organisational, social and technical aspects of the system are considered together, and that the organisational change team, and the system development team communicate and synchronise their activities on a regular basis. STS methods provide one way of at least ensuring that the organisational, social and technical aspects are appropriately dealt with. We explain how a socio-technical approach can link the processes of system development and organisational change management in our chapter on Socio-technical Systems and Organisational Change.

## **Retrospective**

The ideas that underpin socio-technical approaches have never really gone away, even though some of the methods may have fallen into disuse. In particular, when lean methods and business process re-engineering came into fashion, STSD methods were perceived as being unable to deal with the new world. In spite of this, there has been increasing awareness of the need to consider systems as socio-technical systems, although many people fail to fully comprehend the importance of considering the social and technical issues together. Instead, they take a more traditional reductive approach to system development by dividing the system into a social part and a technical part. This state of affairs can be addressed by sensitising stakeholders to the concerns of other stakeholders, and convincing them about the value of adopting a socio-technical approach, and by integrating STS thinking into the systems development and organisational change management processes.