Chapter XIX

Knowledge Needs of Self-Organized Systems

João Álvaro Carvalho
University of Minho, Portugal

Self-organized systems are capable of changing their own structure in order to adapt themselves to significant changes in their environment. They are at the top of a hierarchy of systems that arranges systems according to the degree of control they have upon their own actions. Self-directed systems, self-regulated systems and uncontrolled systems are the reminder levels of that hierarchy.

The framework developed in this chapter identifies the necessary components at each level of control. These components include operators, coordinators, regulators, directors, organizers and informers. The framework can be described as a model of the general architecture of self-organized systems. It is used to identify and characterize the knowledge needs of self-organized systems by examining the functionality, characteristics and knowledge needs of each of those components.

The use of the term knowledge in contexts related with organizations is becoming increasingly common. Organizational learning and innovation (i.e., organizational innovation capability) are metaphors intimately related with knowledge that are used to study and intervene in organizations. Perspectives on organizations based on such metaphors (e.g., Argyris, 1993; 1994; Senge, 1992; Senge, Kleiner, Roberts, Ross, & Smith, 1994; Nemeth, 1997), led to knowledge to be considered as a corporate resource that, like other organizational resources, has to be managed (Davenport & Prusak, 1998; Stewart, 1997; Myers, 1996; O’Leary, 1998). As a consequence, knowledge management has been emerging as a new professional activity.

This chapter proposes a framework that describes the use of different types of knowledge in organizations. The framework is mainly composed by a hierarchy of systems that classifies systems according to the degree of control they have upon their own actions. The hierarchy starts with uncontrolled systems and ends with self-organized systems.
systems which are described as systems that are capable of defining (or changing) their own structure. The different levels of self-control are explained through the existence of components (subsystems) whose functionality and knowledge needs are presented and discussed. The framework can be described as a model of the general architecture of a self-organized system.

ASSUMPTIONS ABOUT KNOWLEDGE

Organizations are the context where work is carried out. By work, it is meant purposeful action, i.e., activities executed with the intention of contributing to some purpose or to achieve some goal. Purposeful action is performed by someone, or something, that will be called an agent.

It will be assumed that, in order to be capable of acting, agents need knowledge. The definition of knowledge underlying this position will be broad. Knowledge includes whatever an agent knows that enables her/him/it to carry out the activities she/he/it is supposed to perform. It can be related to knowing how to do something, knowing facts or events, past or future, or knowledge resulting from thinking, e.g., ideas, models, judgments.

The identification and explanation of the knowledge needs of active things - agents - will be done using the concept of system and other concepts developed by authors that propose systemic approaches to study the “world”.

While talking about the knowledge needs of agents, it might be inferred that the term agent is standing for human agent. That isn’t necessarily true, as it is recognized that there are agents capable of automatically performing operations upon knowledge representations. However, the ambiguity is intentional, as it allows eluding the discussion whether knowledge exists only in the human mind or it can also exist in nonhuman entities. Such discussion is considered to be out of the scope of this chapter.

SYSTEMS

System is a concept that is useful to study active things, especially when they are complex. A system is the result of viewing the active world from a certain point of view. Any thing (and especially an active thing) can be viewed as being a system. A system (in general or in abstract) can be defined as an active, stable and evolutionary thing or object that operates in an environment with some purpose (Le Moigne, 1977).

A system converts some input into an output. What is converted can be either a

<table>
<thead>
<tr>
<th>changed objects</th>
<th>form</th>
<th>space</th>
<th>time</th>
</tr>
</thead>
<tbody>
<tr>
<td>passive things</td>
<td>matter</td>
<td>transformation</td>
<td>transportation</td>
</tr>
<tr>
<td></td>
<td>energy</td>
<td>conversion</td>
<td>transportation</td>
</tr>
<tr>
<td></td>
<td>information</td>
<td>processing</td>
<td>transmission</td>
</tr>
<tr>
<td>active things</td>
<td>systems</td>
<td>the alteration of a system addresses its structure</td>
<td></td>
</tr>
</tbody>
</table>
The Systems Approach View from Professor Andrew P. Sage: An Interview
[www.igi-global.com/article/systems-approach-view-professor-andrew/2540?camid=4v1a](http://www.igi-global.com/article/systems-approach-view-professor-andrew/2540?camid=4v1a)

Interesting Knowledge Patterns in Databases
[www.igi-global.com/chapter/interesting-knowledge-patterns-databases/16964?camid=4v1a](http://www.igi-global.com/chapter/interesting-knowledge-patterns-databases/16964?camid=4v1a)