

A World View Analysis Of The Effect Of Culture Within C2

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Abstract

This paper examines some of the issues that arise in the modelling of complex distributed information systems such as military Command and Control (C2) systems. It details the ongoing use of multidisciplinary perspectives that arise in anthropology and are already applied in computer science and systems engineering research. It contends that culture, which can be viewed from both an organisational and an anthropological perspective, is an important system variable and argues that the application of models and theories from anthropology can be helpful in the understanding of the development of shared meaning, and thus for collaboration in C2. It points to future research directions that will allow for the formalisation of the informal model so far developed from World View Theory.

1. Introduction

Society has become increasingly dependent on the development of large and complex software and hardware systems. With moves towards globalisation in many spheres, and with a continued emphasis on developing international collaboration on a wide scale, whether in e-commerce, e-government or within the development of multicultural military peacekeeping forces, Internet mediated activity has been growing incredibly rapidly.

Much of the research into the development and application of such distributed information systems has been founded on existing theoretical frameworks. Business disciplines such as marketing and law have easily influenced the electronic world but, in order to understand the complexity of cross-cultural activity (Brereton *et al*,1999) there is a growing interest in the

integration of anthropological perspectives with the modeling, and thus development of, complex distributed systems.

The research objective here is to first develop an informal model of the role of culture in such complex distributed systems and from there to develop a formal understanding of the role of culture in a C2 system. Following Checkland (1981), these systems are conceived as complex socio-technical systems since they can be idealised as open systems that depend on the technology, the thought processes of the people involved, and the organisational environment.

2. Anthropology and Culture in Command and Control Research

Command and Control research has often focused on communications and computer systems, researchers seeing their practice as an art which depends on many factors including operational culture and individual leadership styles, as well as information theory and systems engineering, and so draw on various paradigms for the understanding of their own discipline and advancing their body of knowledge.

Computer scientists and systems engineers have already become accustomed to the implicit use of multidisciplinary frameworks within their own area. Human Computer Interactions and Intelligent Tutoring Systems, for example, draw so strongly on frameworks from cognitive psychology that these foundations in psychology are not usually made explicit. Artificial Intelligence and knowledge representation draw on logical frameworks developed by the philosopher Aristotle (Sowa, 2000).

AI has attempted to address cultural issues and cultural algorithms have been developed (Reynolds, 1994) which focus on the shared understanding of cultural phenomena. These “memetic algorithms”, which are similar to the more familiar, genetic algorithms “address the evolution of culture in terms of evolution of ideas” Khaslavasky (1998) attempts to define culture and considers its role in the design of “internationalized” user interfaces.

Finkelstein and Fuks (1989) draw on viewpoint analysis, the interaction of various perspectives, in the specification and design of large, complex distributed systems. They see their approach as one, which “works on specification with advances in foundations of logic, linguistic philosophy, distributed AI and the use of social metaphors in computing” and they develop tools to support their approach.

3. Methodology

The use of soft systems methodologies allow us to identify internet-mediated distributed systems as complex socio-technical systems since they can be idealised as open systems which depend on the technology, the sentiments of the members, and the organisational environment (Checkland, 1981). Although the system is organised to focus on a primary task (military communications) this cannot be separated from the environment and the social factors, including cultural ones.

Checkland also notes that a reasonable method for gaining an understanding of such a system is to produce an overview of the system from several perspectives. It allows us to incorporate subjective and objective impressions of the system into a bricolage, a rich picture, which allows us to include the human agents, the problems, conflicts and other seemingly “soft” aspects of the system so as to determine the areas, which need improvement. Informal models are made of problem areas within a system to allow new conceptual models to be built and compared and evaluated against the problem in the rich picture. Formalisation of these conceptual models allows for solution of the problems within the system.

We turn to Kline (1995) who also gives us an understanding of how to derive credible perspectives on the complex system under examination. He maintains that three foundational perspectives of a multifaceted and hierarchical system are a synoptic, a piecewise and a structural perspective.

- A structural view is one that provides details of how a particular system fits together within its hierarchy and provides information on the relationship between local and global effects within the system.
- A piecewise view is one that looks at the smallest portions of a system that might be relevant in providing information to aid in the solution of any particular problem.
- A synoptic view is an overview, which extracts, synthesises and thus maps a desired property of the system.

4. Definitions of Culture

Culture is a concept that is often discussed in academic literature. Before attempting an analysis of the role of culture in complex systems is important to gain a working definition from appropriate literature. The definition of culture is often understood differently by researchers in different fields as they carry out their studies. Definitions of ‘culture’ that have originated in two general domains are:

- anthropology and ethnography
- political empowerment

4.1 Anthropology.

A classic definition of culture found in early anthropological literature is that it is the ‘knowledge, belief, law, morals, customs’ (Tylor, 1871), which are passed on from one generation to another within a particular society or group of people. Anthropologists of Tylor’s generation were expected to examine a ‘civilisation’ and produce a taxonomy with categories such as weapons, textile arts, myths, rites, and ceremonies. Tylor saw this activity as a scientific one and as a parallel to that of the plant and animal scientists of his time who were completing classifications of ‘botanical and zoological species’.

Malinowski (1948 [1922]), another early anthropologist, is famous for his ethnographic fieldwork particularly among Trobriand islanders. In his time, he was considered unscientific because of his

reliance on the detailed field notes of his observations. It had already become traditional, in his time, to rely on the written opinions of experts on specific aspects of culture such as religion or magic. However in his work, Malinowski demonstrated the study of culture as an art rather than a science, and failed in his attempts to produce anthropological and positivist scientific laws regarding culture from his collected work. He stated that he wanted to keep interpretation separate from 'pure fact'. However, he realised that there had to be a form of interpretation in the field otherwise, he was dealing with a mental 'chaos of facts'. Malinowski's perspective on the study of culture was that it consisted largely of identifying particular human behaviour, and interpreting the underlying beliefs causing the specific behaviour.

'Civilisations' and enterprises have become much more complex during the twentieth century, and anthropological concepts of culture have been applied in many fields of study, including nursing, studies of policing and factory work (Van Maanen, 1995). The definition of 'culture' has thus been extended, and described in many complex and diverse ways. Van Maanen comments (1995) that there is still considerable debate concerning 'the sacred heart of ethnography, the culture concept'. Postmodernists and deconstructivists also have problems with the concept of discrete and finite cultures and an 'incredulity towards metanarratives' (Lyotard, 1984). Others regard the concept of culture as something left over from a colonising era (Fabian, 1983).

The definition of culture that is most commonly found in the literature of science and engineering (Cobern, 1991; Waldrup & Taylor, 1995) is that of Clifford Geertz who indicates that "The concept of culture I espouse ... is essentially a semiotic one. Believing.. that man is an animal suspended in webs of significance he has spun, I take culture to be those webs, and the analysis of it to be therefore not an experimental science in search of law but an interpretive one in search of meaning. (Geertz, 1973, p.3)

Geertz' definition is one which proposes that a person's knowledge of his or her world, is essentially mediated by signs, and it is the structure of these signs which establishes reality for an individual or a group.

4.2 Political Empowerment.

There is a link also between this notion of culture and multiculturalism, and the ensuing effect of multiculturalism on society. Giroux's understanding of culture in this domain is one that is widely accepted in education and is that "culture is reduced to a type of monumentalism and ... is organised around the process of transmission and the practice of moral and political regulation" (Giroux, 1990).

Within the literature of science education, especially when dealing with issues of multiculturalism, the definitions of culture become blurred. Some researchers adopt a critical perspective on the explication of culture from anthropology and Geertz's (1973) 'webs of significance' become interwoven with the politicised 'straightjacket' of the system, as expressed by Giroux (1990).

5. **Worldview**

The term ‘world view’ (Cobern, 1991) has two different connotations in English. The first has a philosophical meaning and involves a person’s concepts of human existence and reality; the second is an individual’s picture of the world that he or she lives in. The term ‘world view’ as used in anthropology refers to the ‘culturally-dependent, implicit, fundamental organisations of the mind (Cobern, 1991, p.19).

Kearney’s (1984) model of world view presumes a logical and structural integration of presuppositions within any individual and therefore the model is known as a logico-structural one. He then identifies seven logico-structural categories contained within a given individual’s world view:

- The Other
- Classification
- Causality
- Relationship
- Self
- Time & Space

These categories serve as a framework for analysis of a world view. Kearney (1984, p.65) draws the parallel between these factors of an individual world view and the categories a doctor uses for the diagnosis of a patient’s disease. In order to determine the world view of an individual, his or her understanding of the seven categories of Other, Self, Time & Space, etc., need to be identified and integrated to produce a picture of the complete world view.

6. **Kline’s Analysis of Complex Systems**

Kline’s hypothesis, (Kline 1995) is that at least three views are needed for a reasonably good understanding of hierarchically structured systems with interfaces of mutual constraint: synoptic, piecewise and structural.

6.1 ***Structural View***

Arguably, the most common type of architecture view is the structural view in which a system is depicted as a set of inter-related elements. Examples include:

- the contents lists of books and papers;
- the taxonomies used by biologists to categorise forms of life;
- the high-level designs of software systems;
- the graphs used by mathematicians to depict systems as networks of nodes and inter-connecting arcs;
- the blue-prints used by the architects of buildings and engineers in general;
- the master-plans used by military and business strategists to depict the inter-relationships of other subsidiary plans;

- the organisation charts used to depict the authority/responsibility structures in institutions.

6.2 *Piecewise View*

Another common view is the piecewise view that depicts the smallest relevant parts of a system for a particular problem. Examples include:

- the detailed wiring diagrams produced by electronic and electrical engineers that show the smallest components of the devices with which they are concerned and the way that they are inter-connected;
- the detailed design drawings produced by mechanical engineers that show the smallest components of the devices with which they are concerned and the way that they are inter-connected;
- the musical scores used by composers to depict the notes to be played by the instruments in orchestras;
- the ingredients lists of recipes;
- the inventories of repositories.

6.3 *Synoptic View*

A less common type of architecture view is the synoptic view. Synoptic views treat systems as an atomic entities or wholes. They selectively emphasise characteristics of the system that are deemed to be salient in a given context and suppress (or omit) information that is not pertinent in these respects. Examples include:

- the synoptic weather charts used in television and newspaper weather reports. These are perhaps the examples of synoptic views that are most commonly encountered in everyday life;
- “black-box” system diagrams that emphasise the inputs and outputs to a system (the black-box) and the relationships between the inputs and outputs resulting from the action of that system. Such diagrams do not depict how the transformation from input to output takes place;
- topographical, political, climatic, demographic etc. maps.

When considering the possibilities of multicultural military operations or institutional cultures or international expansion (and thus forming a system of systems), it is important to recognise therefore that an understanding of the dominant culture of each sub-system is necessary before the beginning a military operation.

Anthropological techniques whether viewed as scientific ones, as Tyler did, or the more artistic and interpretive ones, allow for the creation of ethnography which can provide the synoptic view of an military enterprise. An understanding of the local political situation and local worldviews, from modern and historical sources, provide different perspectives on the effect of culture on the human activity system

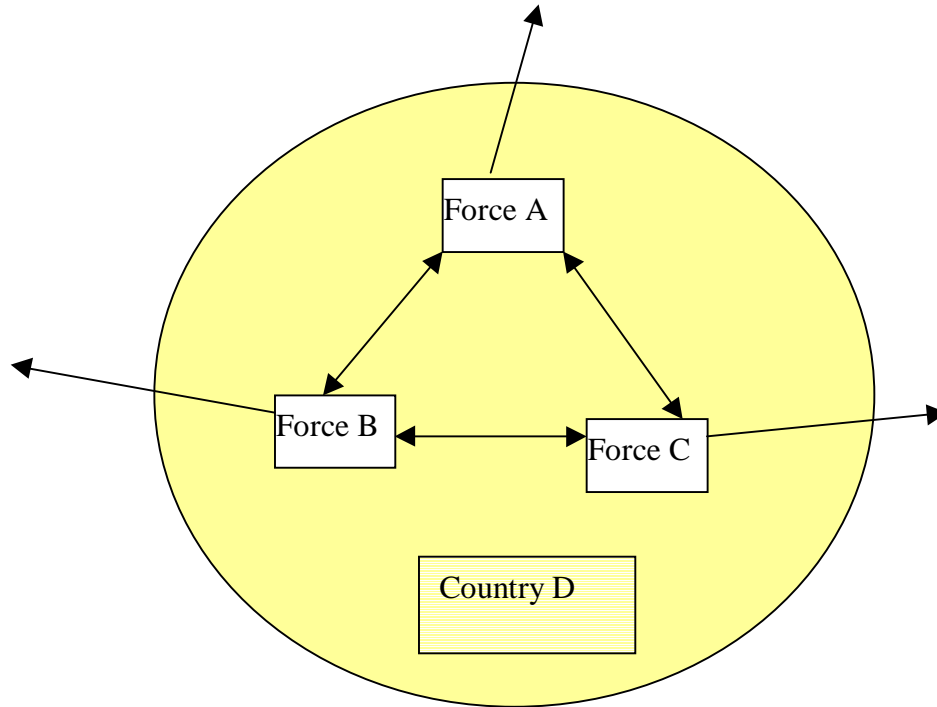
7. Discussion - An Application From C2 Systems

In considering a C2 system it is apparent that a *structural view* of a particular military force's command and control would include a top level view of the elements within that force and the particular hierarchical way in which the elements relate to each other. A *piecewise view* of the C2 system would give the details of the smallest relevant pieces involved in the system, including the hardware, software and human activity which comprised the system. A *synoptic view*, and one which emphasized the role of culture within the system, would focus on the role of culture within the system, the inputs and outputs which were affected by cultural issues.

Consider the situation where Australia is working on a combined peacekeeping operation in another country in the Asia Pacific region. It is quite possible to imagine the scenario where the country of operation is one with a distinctly different culture and where peacekeepers represent several others. The problem is to set up an effective communications system.

7.1 Structural View

A structural view may be constructed thus where we see 3 forces A, B and C at work in a coalition mission in country D. This diagram is a very simple representation of the structure of their



communication needs

7.2 *Piecewise View*

A piecewise view of the system would give a comprehensive layout and specification of all hardware, software and staff needed to allow effective internal and external communication by Force A, B and C in country D.

7.3 *A Synoptic View*

As has been stated, culture is a semiotic concept which implies that the system is dependent on the meaning which each human agent within the system gives to important features of the system. Worldview theory gives an opportunity to examine the system from the individual human operator upwards and to determine his or her particular response to:

- The Other
- Classification
- Causality
- Relationship
- Self
- Time & Space

With this understanding it is therefore possible to predict the response of an individual to a particular stimulus or change and to begin to have an understanding of the effect of this change on the system dynamics. A synoptic view that allowed only for the effect of culture might examine the differences of an individual, and thus the group, within Force A in their interactions with Force B and Force C individually and the issues that Force A, Force B and Force C face as a coalition in their relationships with the natives of Country D.

If one of the forces were, for example, the Royal Australian Air force (RAAF), then the cultural aspects would involve issues derived from Australian culture (anthropologically) and RAAF culture (organisationally). So for each individual in Force A, we could derive a matrix based on worldview theory generally classified by the universals of World View theory.

World View theory uses universal “cognitive categories” to describe people. These have been described above but, taking the first, Relationship, as an example, it is possible thus to use an analysis which “classifies” individuals from Force A, B and C within Country D and develop a series of attributes to represent the cultural factors under consideration.

Examples of Relationship that have impact on military communications and information systems include:

- Command approach
 - Control free
 - Selective control
 - Problem bounding

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