

Chapter 9

Structuring the Cultural Domain with an Upper Ontology of Culture

Emmanuel G. Blanchard
McGill University, Canada

Riichiro Mizoguchi
Osaka University, Japan

Susanne P. Lajoie
McGill University, Canada

ABSTRACT

Study of cultural similarities and differences is an important research topic for many disciplines such as psychology, sociology, anthropology, archaeology, museology, communication, management and business. This presents many potential opportunities for Information Technology specialists to develop culturally-aware technology, but it also raises the risk of inconsistent approaches of the cultural domain. In this chapter, the authors present the fundamental concepts of the Upper Ontology of Culture (UOC), a formal conceptualization of the cultural domain they developed by identifying the common backbone of culture-related disciplines and activities. As a neutral, theory-driven, and interdisciplinary conceptualization, the UOC shall provide guidelines for the development of culturally-aware applications, for the consistent computerization of cultural data and their interoperability, as well as for the development of culture-driven automatic reasoning processes.

INTRODUCTION

Study of cultural similarities and differences is an important research topic for many disciplines such as psychology, sociology, anthropology, archaeology, museology, communication, manage-

ment and business to cite but a few. This presents many potential opportunities for IT specialists to develop culturally-aware technology.

However the various coexisting and competing discipline-specific approaches and methods that have been developed, the genuine fuzziness of folk language that people use to discuss cultural matters and the ill-defined nature of cultural questioning

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lead us to the statement that cultural awareness is particularly difficult to address consistently in information technology.

As mentioned by Lane and his colleagues, “*ill-defined domains, in contrast to those that are well defined, are characterized by problems that tend to lack consistent, unambiguous, and generalizable solutions*” (Lane et al., 2007). Indeed, culture is an easy-to-use concept in everyday discussions. But it becomes much more difficult to deal with it when the time comes to give it a proper and consensual definition, to determine its constituents or to describe its specifics: in other words to consider it in a scientific manner.

Even when this is the case, cultural notions and terminologies sometimes differ from one discipline to another. The research focus of disciplines may also vary. For instance, some disciplines such as anthropology may be interested in discussing cultural artefacts, whereas others such as psychology may not be. Moreover, a huge amount of data is annually produced by research that could nurture the development of culturally-aware systems. But the computerization of such cultural data as well as the interoperability and centralization of resulting collections are currently limited. Finally, mastering the various research initiatives on culture is a difficult and highly time-consuming task, and the process of knowledge acquisition may frequently be limited by commercial realities and constraints such as deadlines. This could potentially result in ill-designed systems that would extensively rely on ethnocentric views of their development team, implying cultural misconceptions and stereotypes. This may thus affect the credibility of the resulting application, potentially increasing users’ misconceptions about a targeted culture, or reducing the efficiency of human-computer interactions.

Using formal ontology engineering techniques, the Upper Ontology of Culture (UOC) project aims to develop a generic conceptualization of the cultural domain, neutral and interdisciplinary, by identifying the cultural backbone common to

culture-related disciplines and activities. Such theory-driven conceptualization has many interests for the development of research on artificial cultural awareness:

1. To allow development teams to consider cultures in a scientifically-sound and cross-disciplinary way, i.e. to propose appropriate guidelines on what development teams should focus on when addressing a specific cultural issue,
2. To propose ways of appropriately computerizing cultural aspects of a given problem by suggesting templates for theory-driven data structures and data management processes,
3. To promote interoperability by enforcing the consistency of cultural data modelling between systems, thus facilitating reuse of computerized cultural data,
4. To promote cultural automatic reasoning, thus allowing systems to take culturally-informed decisions that may impact on their internal processing as well as on human-computer interaction.

This chapter is organized as follows. The first section is dedicated to the presentation of previous research linking culture and information technology. We start by discussing the different potential meanings of the notion of *cultural awareness*. Thereafter we explore the nature and potential sources of cultural knowledge, the necessary component that all culturally-aware systems have in common. The second section is dedicated to the presentation of the domain of ontology engineering. Basic notions and principles widely endorsed in this domain are described as well as specific technologies we are using in our project i.e. the HOZO ontology editor and the YAMATO Standard Upper Ontology. The UOC is discussed in the third section. After listing its main objectives and presenting some techno-cultural challenges it will help to tackle, we report our ontological analysis of three culture-related domains (context,

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