Transitions towards a Knowledge Society

Aspectual Pre-evaluation of a Culture-Sensitive Implementation Framework

Mamello Thinyane, Alfredo Terzoli, and Peter Clayton
Department of Computer Science, Rhodes University,
Grahamstown – 6140, South Africa
mthinyane@rucus.net, {a.terzoli,p.clayton}@ru.ac.za,
WWW home page: http://www.cs.ru.ac.za

Abstract. Information and Communication Technology (ICT) is aiding the transition of society into information society and ultimately knowledge society. Embedded within ICT are the cultural and philosophical undercurrents of the society in which the ICT solutions are developed, currently predominantly the Western culture. The proliferation of ICT is therefore inadvertedly leading to more Westernization of the world. It is important, therefore, that ICT solutions are culture sensitive and flexible enough to be situated within different cultures. To that end, we utilize Herman Dooyeweerd's Theory of Modal Aspects to analyze a framework we has developed for implementation of locally situated knowledge based systems, to determine its efficacy in addressing the different modal aspects, which make up the total experience and cultural expressiveness of societies.

1 Introduction

The 21st century is seeing increased multi-culturalism and higher levels of globalization which has been aided by the proliferation of Information and Communication Technologies (ICTs). In this dynamic cultural interaction, there's however a dominance of the Western culture and as a result a general Westernization of the world [1]. This phenomenon has been termed by some observers as neo-colonialism and it occurs at the expense of a possible assimilation of less prominent, marginalized cultures and societies [1]. The process of Westernization of the world, through the proliferation of ICT, happens because these technologies encapsulate a culture and world-view from which they were conceived. For example, the Human Computer Interaction (HCI) components and usage metaphors would extensively reflect the culture and the language within which they were developed. There are two possibilities when such systems are introduced into different cultural setting. One results in a culture synthesis out of the amalgamation of differing aspects from the two cultures and the other allows for a functional integration of technology while maintaining the cultural integrity of the communities adopting the technology.

The culture specific influences in the world of ICT and computing have been observed particularly within the discussions on computing and the politics of gender identity. Extensive literature recognizes the masculine and military culture out of which computing and ICT was birthed, which has resulted in the exclusion and marginalization of many females [2, 3]. Tedre et al also recognize the cultural positioning of computing in their discussion on ethnocomputing [3]. Cultures play a pivotal role in the realization of ICT solutions and in their usage. An example is from the Eastern cultures, some of which seek meaning in the harmony and order of relationships between human elements and nature, the spiritual and the natural [4]. Zhang highlights, within the context of education and pedagogy in Eastern cultures, the outworking of the fundamental epistemological beliefs of a culture, in the values the society embraces, the nature of the examination process and the manner in which education systems are organized. He contrasts the Eastern notion of ICT within education as a new information source with the Western view of ICT as an open-content productivity tool [5].

The rest of this paper discusses the worldviews and philosophical theories that underpin the Western culture by highlighting the ground motives that the reformation Dutch philosopher, Herman Dooyeweerd, identifies as primary in Western thought. The Western culture's influences on ICT are then discussed with a particular focus on knowledge-based systems. This is followed by a juxtapositioning with alternative conceptualizations of knowledge and then a basic analysis of PIASK, a culture sensitive framework for implementing knowledge based systems.

2. The ground motives

Dooyeweerd, in his book “In the twilight of Western thought” calls the influences and factors that have shaped the western philosophical landscape, the 'ground motives' of western philosophy. Ground motives are pre-theoretical presuppositions that shape a worldview. These are the beliefs, which are either true of false, which are held by faith and which form the foundation for conceptualizing and understanding reality. It’s important to highlight Dooyeweerd’s Theory of Ground Motives and Religious Presuppositions which recognizes the inherently religious nature (the faith commitment) and inclination of every philosophy and theoretical thought [6]. The same observation was made by Clouser in “The myth of religious neutrality” [7]. This is necessary to highlight because it challenges and nullifies the assumed autonomy of theoretical thought, and places it on the same plane as other modal aspects [8].

The following are the four basic ground motives that have influenced the western philosophical landscape [6]:

- The form-matter motive – which is traditionally the Greek philosophy. It makes a distinction between the form motive and the matter motive. The former deified the cultural and social life of the classical Greek society, and the latter emphasized the biotic component of our existence.
- The word-revelation motive – encapsulates the biblical theme of creation, fall and redemption. It identifies the concentration-point of creation/reality in connection to an absolute creator, God.
- The nature-grace motive – sought to reconcile the Greek and the biblical motives, and since Renaissance sought to accommodate biblical and humanistic motives. It makes a sharp distinction between the secular and sacred, between priest and laity, between natural and spiritual.

- The modern humanism motive – since Emmanuel Kant has been referred to as the nature-freedom motive. It sought emancipation from the supra-natural influence of religion and emphasized nature and the creativity of the modern man as the master of his destiny and of the world. It absolutized the theoretical-logical aspect and reason.

3. The West and ICT

Tedre et al highlight the fact that the roots of computing are in the cultural context of the West, and that the science itself is Western, middle or upper class and male in origin [3]. The developments and advancements, the philosophies, tools, concepts and methodologies that have been used in computing have been predominantly Western. For example:

- Falsification as a positivist tool and method is still used extensively in computing to validate correctness of programs. [3]
- The reductionist view of knowledge and reality within the western culture which has influenced the ontological underpinnings of knowledge based systems.
- The Western notion of mutual exclusivity, teleology and hierarchy through local division and dominance has influenced classificatory thought in computing [11]. For example, the classification within the SUMO ontology (Figure 1) reveals a specific worldview and way of organizing reality, which would be different from a different philosophical perspective.
- Reason and logic within the computing domain still reflect its western roots
- The learner focused, constructivist pedagogies are still the more prevalently supported on eLearning tools and Virtual Learning Environments (VLEs).

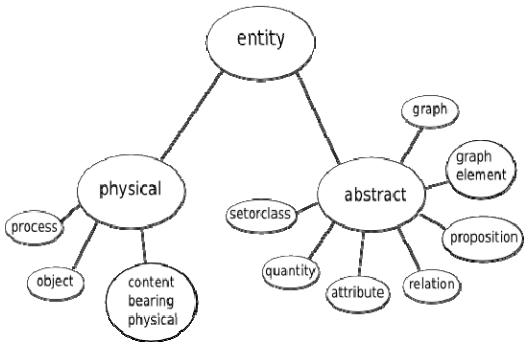

Figure 1- SUMO top level entities

The tools that have been developed have therefore embodied these cultural perspectives and their use is in harmony within cultures with aligned perspectives. These tools become problematic in contexts where there is a conflict with the local cultural perspective and this is exemplified by: perceived lack of user friendliness of applications and systems; extremely high learning curves for new applications and systems, often requiring one to acquire a new way of conceptualizing reality. For example, the Object Oriented Programming (OOP) paradigm is aligned with a reductionist view of the world but not with a view of the world that is unitary and where determination of types and relationships of objects is not a sufficient way to analyzing reality (e.g. the Vedanta of Sankara philosophy) [9]; lack of a cultural fit (intrinsic alignment) in

the usage of applications and systems; and user's experience in using the applications being separate, distinct and disconnected from their reality.

The assumption of universality of computing and that it is an a-cultural discipline is not valid. It is necessary, within the discipline, the tools and the systems developed, that an ethnographic critique is undertaken. The tools and the systems need to be culturally localized. An awareness of the different philosophical perspectives can also enrich the discipline and the systems developed.

4. Alternative philosophies and limitations in ICT

This section is centered on highlighting specific areas of conflict between the underlying philosophy in ICT and other philosophies, in particular looking at African and Asian worldviews. The focus on these regions is due to the fact that most Least Developed Countries (LDCs) are situated there (approximately 67% in Africa and 21% in Eurasia [10]), and in the process of exploring possible interventions for development, technology and ICT are usually taunted as good enablers. These regions also have significantly contrasting worldviews to the post-modern Western worldview. The majority of worldviews in these regions share a common undercurrent of Animism. This is expressed in the notion of unity and harmony between matter and spirit, and the immanent role of the gods or ancestors in everyday life. These worldviews also have a cyclic teleology (versus the linear view of history of the West [11]) and this is evident, for example, in the concept of rebirth of reincarnation in the Hindu religion. These distinctions in the basic presuppositions on which the worldviews are based contribute to the differences in conceptualizing reality. A good distinction is also made by Eco in 'the name of the rose' [12] and by Borges in 'the library of babel' [13] where they each present a different way of formalizing knowledge and reality. Eco's narrative presents a more empirical, logical and Western perspective. Another excellent and contrasting view is developed by Guattari et al in 'a thousand plateaus' [14] where he presents a rhizome metaphor for articulating the nature of knowledge, which is in contrast to the common hierarchical tree metaphor (Figure 1).

A few immediate examples where current computing tools would be limited, due to the difference in underlying philosophies, include:

- Upper ontologies (e.g. SUMO, CYC) that do not encapsulate and cannot represent knowledge from a different ontological perspective. Figure 2 indicates the high level classification of entities within Nyaya-Vaisesika philosophy [15]. A domain ontology that is developed based on the classification thought in that philosophy, would be difficult to merge or align (via an upper ontology) with other ontologies, simply because the ontology manipulation mechanisms and the underlying concepts in the upper ontologies are not directly equitable to concepts encapsulated in the Nyaya-Vaisesika ontology.

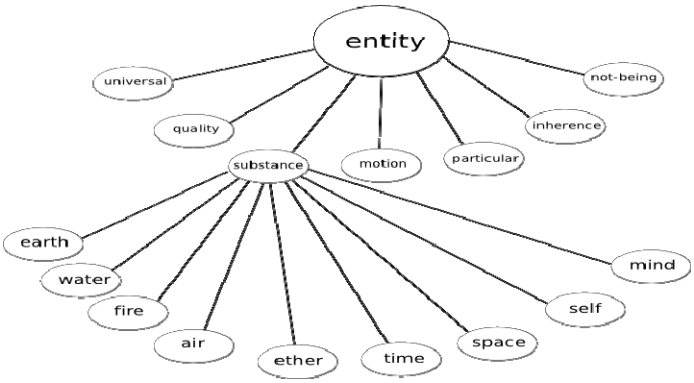

Figure 2 - Example oriental ontology

- Modeling knowledge from a non-Kantian perspective (*'ding an sich'* – presupposed on the existence of entities independent of our experience of the entity [8]), where the essence of knowledge is not the concepts in themselves but rather the process of knowing. Where meaning and structure precedes being. Dooyeweerd refers to the essence of knowledge as the multi-aspectual knowings [16]. The whole of the knowledge modeling discipline is predicated on this Kantian notion of *'ding an sich'* as such knowledge bases are simply entity-relationship specifications. It is difficult therefore to conceptualize, from a Western perspective, a knowledge base as anything but concepts and entities and how they relate to each other.
- Relations of containment - mechanisms are already in place to handle containment relationships of the whole-part type. Therefore representing a relationship that signifies the containment of different vehicle parts in a car is a trivial and well handled problem.

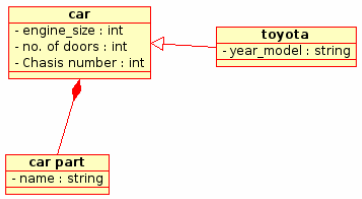

Figure 3 - Whole-Part containment relationship

The whole-part relationships can also be easily modeled using the RDF language constructs: <*rdf:type*>, <*rdf:bag*> and <*rdf:seq*>. In both the oriental and the western philosophies, the car (in Figure 3) contains the different parts that it's made up of. However in the oriental philosophies, the car is also contained in the individual car parts. There is a harmony of interdependence where a whole is said to inhere in the parts while the parts are the inherent cause of the whole.

- Representing enkaptic [17] relations - Enkaptic relationships are a foreign concept in the Western philosophy and are more aligned with philosophies that have sentiments of totality, unity and harmony [17]. The point of departure with the western philosophy is that objects and entities are assumed to 'individuate' from the universal, supra-temporal structures, laws, order and purpose [8]. "Structure and not substance" is the phrase that articulates the philosophy. The different enkaptic relationships, which in Western philosophy are summed up in a single whole-part relationship, include:

foundation enkapsis, subject-object enkapsis, symbiotic enkapsis, correlative enkapsis and territorial enkapsis [8], and the articulation of these relationships using the current tools and techniques is not well supported, if not impossible.

The biggest limitation in having computing and ICT being predominantly western is one that is well articulated by Olson:

"*The dominant culture may not acknowledge (and may have to way of acknowledging through linguistic lack of conceptual representation) the discourses of other cultures, such as the cyclical worldview (vs. the teleological worldview) or knowing through Dreamtime, where aborigines "separate time from location". The "all at once" dreamtime (notion of the past, present and future all co-existing) does not counter the aborigines concept of linear time, but rather qualifies and informs it"* [11]

5. Multi-aspectual philosophical framework

The lack of an internal ethnographic critique within the computing discipline means that the culture sensitive aspects of computing are left to chance and coincidence. Philosophy, however, provides a critical overview of the thoughts that shape a society and therefore can enrich the ethnographic considerations around computing and ICT.

Because philosophy itself is rooted in a specific culture, it is important to identify and establish a transcendental philosophical framework to guide the implementation of ICT solutions, in particular, knowledge-based local systems. For this task we explore the work of Dooyeweerd, who identified 15 modal aspects (modes that we operate in within our experiential horizon) and articulates the nature, the properties and the relationship between the modal aspects. His work is taunted as "a philosophically sound basis for diversity and coherence, and interdisciplinarity (in this case, interculturality)" [17]. The underlying principle in Dooyeweerd's thinking is *the shalom hypothesis* aka the *simultaneous realization of norms* principle. This principle highlights the need for operating within the laws of a modal aspect in order to maintain sustainability and a deep, rounded, rich well being [8]. An extensive overview of the theory of modal aspects by Dooyeweerd is in his magnum opus "A new Critique of Theoretical Thought" [8] and "In the Twilight of Western Thought" [6]. Dooyeweerd identified the following 15 modal aspects: Quantitative, Spatial, Kinematic, Physical, Biotic, Sensitive, Analytical, Formative, Lingual, Social, Economic, Aesthetic, Juridical, Ethical and Pistic. Dooyeweerd's theory of modal aspects provides a tool for analyzing [17], shaping and assessing various undertakings on the basis of their overall good.

6. Aspectual overview of PIASK

We have developed a framework, PIASK, that we proposed for building multi-modal, multimedia and ontology based knowledge systems [18]. PIASK is a layered architecture that attempts to provide a basis for implementing locally situated and culturally sensitive knowledge based applications. The framework has been utilized in implementing a prototype of a knowledge based ecommerce portal in the context of exploring ICT interventions for development in a rural community in South Africa [19]. A basic aspectual analysis (Table 1) of

PIASK highlights the key areas that are addressed at each of the 5 layers. This analysis is a necessary critique that is needed to determine the adequacy of PIASK as a balanced framework that is coherent across the diverse modal aspects, and across diverse cultures.

Table 1 - Basic Aspectual Analysis of PIASK

PIASK Layer	Modal Aspect	
Presentation	aesthetic	biotic spatial quantitative economic
	lingual	
	sensitive	
	biotic	
	spatial	
Interaction	social	
	sensitive	
Access	formative	
Social Networking	social	
	juridical	
	ethical	
Knowledge Base	pistic	
	analytical	
	lingual	
	formative	

The key layers of the framework, as far integrating the implemented applications and systems within a local culture, are the knowledge base layer (which encapsulates the indigenous knowledge of the community, with its embedded epistemological and ontological presuppositions), the social networking layer (emulating the social systems within the community, and providing an interface to the human, as a participant in a community of Socially Intelligent Agents (SIAs)), presentation layer (handling the primary interfacing to the users in a manner that conveys the user's aesthetics, preferences and sense of beauty and form) and the interaction layer handles the interaction based on the users' preferred usage modality. The PIASK framework encompasses a variety of modal aspects, which allows for an intrinsic consideration of factors within the experiential horizon of the users of the system. Some aspects are less prominently addressed by the PIASK framework because they only come into play indirectly, for example the economic, biotic, and spatial aspects.

7. Conclusion

The current evident transition towards a global knowledge society has its share of (un)desirable outcomes; assimilation of marginalized cultures, loss of diversity (and beauty) through Western-influenced homogenization. We have highlighted examples of the limitations of a mono-cultured solution to be relevant and appropriate in another culture. In order to maintain the harmony in the context of the diversity of cultures and philosophies, it is necessary to situate the ICT solutions on a transcendent philosophical framework, and for this we have proposed

Dooyeweerd's theory of modal aspects. This philosophy can be used to analyze and shape ICT solutions (as exemplified through the analysis of the PIASK framework) in a systematic manner to determine the coherency of the solution, as far as the overall good, well-being and sustainability (i.e. *the shalom principle*) is concerned. The transition towards a global knowledge society needs to be coupled with an understanding and implementation of mechanisms that would direct it towards a desired outcome, and we have proposed one such mechanism.

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