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A PHILOSOPHICAL UNDERPINNING FOR ISD

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ABSTRACT

If information systems development (ISD) is to be anything other than an ad-hoc discipline it must have a theory-like foundation. This paper interleaves philosophical discussion of ISD with practical suggestions. A philosophy with radically different presuppositions allows us to take a multi-aspectual view of I.S. that can address even tricky problems of multiple stakeholders and unintended and indirect impact.

1. INTRODUCTION

The overall failure rate of information systems (I.S.) is variously estimated at between 50% to 70% (Gladden, 1982, Lyytinen and Hirschheim, 1987, Cotterill and Law, 1993, Butterfield and Pendegrift, 1996), and has remained at this level over the last 20 years. It is disappointing that massive investment in I.S. development (ISD) methods, as well as new technologies, has not brought this down.

While some help might eventually be found through developing and using better methodologies, theories, models, etc., the inability to make much headway over the last 20 years suggests that we might need changes at a deeper level, and this has been argued by, for example, Winograd and Flores (1986) and Martin (2001). The deeper ('meta-theoretical') level determines the direction of our research efforts at the more visible level. The paradigms of our research determine what research is carried out, the world views we adopt influence what we value, and the presuppositions we hold impact on our rationalities and our very modes of thinking. Those who have argued for deeper changes have often appealed to philosophy, since it is philosophy that provides the tools for working at this level (Hart, 1984).

1.1 The need for a coherent philosophy

There is a bewildering diversity of philosophies from which to choose and different ones are appealed to from within different I.S. disciplines. For example, in artificial intelligence, appeals have been made to the rationalist Leibniz (Brachman and Levesque, 1985) and the neo-positivist Brentano (Newell, 1982), in human factors appeals have been made to the existentialist Heidegger (Winograd and Flores, 1986), and recently the information systems community has appealed to the critical theorist Habermas (Lyytinen and Klein, 1985). Klein and Myers (1999) have examined I.S. research by reference to hermeneutic philosophy and phenomenology.

While such diversity can be fruitful, our problem is that ISD, as the bridge between technology and its use, must concern itself with four major areas - usage and impact, process of development, the shape that technologies assume, and perspectives held on information systems in general (Basden, 2001). If the philosophies appealed to do not cohere, then ISD is hindered, for example, when positivistically inspired technologies are found inappropriate in the human context of use.

Burrell and Morgan (1979) have argued for incommensurability between paradigms in research - the very research that generates the technologies, methodologies, theories and models that we use in I.S.

While others (e.g. Lee (1991), Willmott (1993)) have argued that this may be overcome in the practical research arena, incommensurability remains a problem (Falconer and Mackay, 1999).

In this paper we briefly examine a philosophy that would suggest that this incommensurability exists only because of a presupposition on which conventional streams of thinking rest, that of Immanence Thinking. Starting from a different presupposition it claims to overcome the incommensurability in a principled way, providing a new framework for understanding information systems. This can, in turn, inform theory, model and methodology in a number of areas and thus might contribute to improving I.S. development and assessment and thus lead to some reduction in failure rate. To argue the presuppositional basis in detail requires a philosophical treatment that is inappropriate here. Instead, after a brief summary of the argument, we give an overview of the most relevant portions of this philosophy to ISD, and then illustrate briefly how it can lead to a framework for understanding I.S., and thence to methods and tools for ISD.

2. DOOYEWEERD'S PHILOSOPHY

The philosophy we examine was worked out by the late Herman Dooyeweerd (1895-1977), a Dutch philosopher whose writings are gradually emerging into the English language arena. In his major work, *A New Critique of Theoretical Thought*, Dooyeweerd (1955) made an incisive critique of 2,500 years of Western thinking, and then took the challenge of proposing a new approach that provides interdisciplinary frameworks for understanding such topics as we discuss here: success and failure in I.S.

2.1 Escaping Plato

Habermas (1988) discussed the fundamental distinction between the natural and cultural sciences, echoing that made by Kant, and noted (Habermas, 1972), the concept of theory "presupposed a demarcation between Being and Time". Kant, despite wishing to bring theory and practice together, drove a wedge between Ought and Is, and generations of technologists since then have focused on one to the detriment of the other, on technology without ethics.

Dooyeweerd looked further back, and saw the same principle operating in previous eras. "All else is a mere footnote to Plato", said A N Whitehead (1937) about what has happened in Western thinking since Plato. This was Dooyeweerd's concern. In a thorough analysis of Western thinking over the last 2,500 years, Dooyeweerd (1955) showed that it has been governed by four 'ground motives' that provide the force which drives theoretical thinking forward in a particular direction over the long term. Three of these were dualistic: Form-Matter from the time of Plato, Nature-Grace of mediaeval Europe, and Nature-Freedom since the Renaissance and Enlightenment. Positivism versus interpretivism is one manifestation of the latter, as is the separation of nature from culture.

Dooyeweerd argued that these incommensurabilities - along with others such as determinism-freedom, diversity-coherence, theory-practice, spirit-matter, and so on - are the inevitable outcome of the three dualistic ground motives. These in turn arise from a very basic presupposition that has underlain much of Western thinking since the time of Plato. The presupposition, which Dooyeweerd called Immanence Thinking, is that the basic Principle on which all else depends is to be found within temporal reality or experience itself. He argued and demonstrated that this leads inevitably to presupposing that one half of temporal experience is fundamentally incommensurable with the other.

Clouser (1991), expanding Dooyeweerd's thought, explains why this is. Presuppositions of this kind are not constitutive of theoretical analysis or discourse but of religious commitment in a social setting, in which the 'divine' is that which is self-dependent and on which all else depends - such as number to the Pythagoreans, reason to rationalists, and language to some of today's social theorists. This leads to various kinds of reductionism, in which thinkers take what they hold 'divine' to be important and the rest unimportant, and to apparent incommensurabilities.

Dooyeweerd held, as Habermas does, that all theoretical thinking including his own rests on presupposition, and that we cannot escape it (as phenomenology tried to). However, Dooyeweerd argued that we need not accept the Immanence presupposition that leads to incommensurabilities. Instead, he sought and adopted a different type of ground motive, the Hebrew one of Creation-Fall-Redemption. This presupposes that what is self-dependent and on which all else depends transcends all temporal reality and experience, and it gives primacy to Meaning over Being, Law over Entity. We cannot here argue for the validity of doing this, but the effects of doing so were far-reaching in the way Dooyeweerd developed his system of thought. He developed general theories of modal aspects, of entity, of time, of epistemology, theory and practice, of social institutions, of history and progress, and much else. It is his theory of modal aspects that is of most value to us here.

2.2 Overview of aspectual functioning

The most visible part of Dooyeweerd's philosophy is a pluralistic ontology that is proving to be useful in a number of interdisciplinary fields, such as environmental sustainability (Lombardi, 2001). It is being considered for information systems (de Raadt, 1997), and promises to be of value in I.S. design and evaluation.

Dooyeweerd's ontology was of fifteen aspects of reality, each having a distinct kernel meaning, that form an ordered spectrum of Meaning:

1. Quantitative aspect, of amount
2. Spatial aspect, of continuous extension
3. Kinematic aspect, of flowing movement
4. Physical aspect, of energy and mass
5. Biotic aspect, of life functions
6. Sensory aspect, of sense, feeling and emotion
7. Analytical aspect, of distinction, clarity and logic
8. Formative aspect, of history, culture, creativity, achievement and technology
9. Lingual aspect, of symbolic meaning and communication
10. Social aspect, of social interaction, relationships and institutions
11. Economic aspect, of frugality, skilled use of limited resources
12. Aesthetic aspect, of harmony, surprise and fun
13. Juridical aspect, of 'what is due', rights, responsibilities
14. Ethical aspect, of self-giving love, generosity
15. Pistic aspect, of faith, commitment and vision.

The meaning of a single aspect is quite broad; for example the formative aspect covers culture, history, technology, creativity, achievement of goals, planning, formulation of artifacts, formulation of ideas, methodology, technique, and so on - everything in which human formation (whether of physical, conceptual or social things) is central. The reader does not need to understand the aspects; the text below will explain what is needed. But it should be noted that the aspectual spectrum encompasses all reality, and provides both its diversity, via their mutual irreducibility, and coherence, via inter-aspect relationships; see below.

The aspects fulfil several philosophical roles, bringing together Is and Ought, and Being and Time, and integrating ontology, axiology and epistemology, three of Burrell and Morgan's (1979) five philosophical issues. They are modes of Being, enabling physical, conceptual, social, etc. existence. They are law-spheres that provide norms for meaningful functioning. They are ways of knowing, each aspect providing a distinct set of concepts and perspectives to be taken. For example the three main perspectives on I.S. that have been discussed over the last decade can also be seen as, approximately, focusing on certain aspects:

- A 'hard' systems perspective focuses on quantitative (amount) and analytic (logic and objectivization) aspects of I.S.
- A 'soft' systems perspective focuses on lingual (interpretation) aspect of I.S.
- A 'critical' systems perspective focuses on juridical (emancipation) and pistic (presuppositions) aspects of I.S. with the lingual (dialogue) helping.

2.3 Determinative and normative functioning

Each aspect has a set of laws or norms that meaningfully govern all activity and existence (Doing and Being). However, 'laws' are not rules or norms that human societies have identified, fashioned and encoded to guide their activity, but rather 'principles', similar to those adduced by Klein and Myers (1999) for guiding interpretive research, that require creative response in their application. An entity functions by responding to the laws of relevant aspects. Sometimes we are aware of our functioning in an aspect, such as when actively seeking to obey the laws of syntax and semantics while writing, but usually we are not aware, and our functioning in each aspect is tacit, taken for granted. Then we only become aware of them in breakdown situations. As Clouser (1991) and Stafleu (1987) discuss, this relates to theory and practice.

The laws of earlier aspects (e.g. quantitative, physical) are determinative while those of later aspects (e.g. lingual, social, ethical) allow us freedom in responding (even to transgress them), and thus are normative. Dooyeweerd's theory of aspects provide a way in which Determinism and Freedom may be integrated within one framework, mutually exclusive no longer. This gives us the key to a new approach to information systems, their development and usage.

2.4 Human functioning

Meaningful human living usually involves all aspects working together in harmony: multi-aspectual functioning, though one aspect is often of primary importance. For example, as I compile this paper, I am primarily functioning in (responding to the laws of) the lingual aspect (meaning conveyed by symbols). But I am also functioning in earlier aspects in order to do so (e.g. breathing: biotic aspect), and in later aspects, which give a wider meaning or 'flavour' to my lingual functioning (e.g. being polite rather than rude in my writing: the social aspect).

Three types of multi-aspectual human activity particularly interest us here. I.S. design and development is one in which social and ethical issues mingle with those of language and technology, and the formative aspect (of formation, planning, method) is of particular importance. Use of I.S. is a second type of multi-aspectual functioning, but what the primary aspect is depends on the application. Science, research and theory-making is the third, but in them the analytic aspect is primary (Clouser, 1991, Stafleu, 1987).

An important axiom in Dooyeweerd's thought, that derives from his eschewing the Immanence presupposition, is that no aspect is absolute. Every aspect refers beyond itself to others and, ultimately to its transcendent Source. An important corollary of this is that no aspectual functioning can ever be absolute. Especially, no theoretical knowledge can be absolute. This is why Dooyeweerd strongly criticises rationalism and positivism. We will see below that he applies this corollary even to his own theory of aspects.

2.5 Diversity and coherence

Each aspect is ontologically irreducible, so that none can be derived from the others; this gives a philosophic basis for genuine diversity. In any situation, no aspect should be ignored. As modes of Being, they account for the diversity of entity types (physical, biotic, conceptual, social, etc.). As law-spheres, each aspect defines and enables a distinct type of functioning that cannot be explained fully in

terms of others. As Meaning, they make possible a diversity of perspectives. Therefore in I.S. design or evaluation each must be deliberately considered in its own terms.

However, irreducibility of aspects on its own would lead to fragmentation, whereas in life we experience coherence. This was accounted for by Dooyeweerd's second major claim for the aspects: though irreducible they are intertwined by two types of relationship: analogy and dependency. By the first he held that in every aspect there are 'echoes' of each of the others. For example, causality is of the physical aspect, but in the analytic aspect we find logical entailment. By dependency, he meant that each aspect requires all those before it (e.g. legality has no meaning except in a social context) - though it does not 'emerge' from earlier aspects.

3. A POSSIBLE APPLICATION TO INFORMATION SYSTEMS DEVELOPMENT

3.1 Example of multi-aspectual use of information system

Mitev's (2001) account of the failure of the SNCF Socrate rail ticketing system provides an example of multiple aspects of failure of an I.S. (in which aspectual functioning is denoted by the aspect's numerical order in {} brackets):

"Technical malfunctions {8}, political pressure {15}, poor management {11}, unions and user resistance {15} led to an inadequate {13} and to some extent chaotic {12} implementation. Staff training {9} was inadequate and did not prepare {13} salespeople to face tariff inconsistencies and ticketing problems. The user interface was designed using the airlines logic and was not user-friendly {6}. The new ticket proved unacceptable {6} to customers. Public relations {9} failed to prepare the public to such a dramatic change {12}. The inadequate database information {7} on timetable and routes of trains, inaccurate fare information {1}, and unavailability {11} of ticket exchange capabilities caused major problems for the SNCF sales force and customers alike. Impossible reservations {8} on some trains, inappropriate prices {13} and wrong train connections {3} led to large {1} queues {2} of irate {6} customers in all {1} major stations. Booked {13} tickets were for non-existent trains {11} whilst other trains ran empty {11}, railway unions went on strike {11}, and passengers' associations sued SNCF {13}." [Mitev's referencing removed]

From this brief analysis we can see, firstly, what a wide range of aspects contributed to the overall failure of the information system, beyond the economic or technical. Secondly, we can see how aspectual analysis, discussed later, might be started: discern aspects within descriptions.

3.2 Repercussions

Dooyeweerd claimed that the aspects pertain, whether we human beings know of them or not. Thus our response to aspectual laws, positive or negative, has repercussions. For example, if I am rude in my writing, even unwittingly, the reader will not accept my arguments. Each aspect yields different types of repercussion - physical, emotional, social, economic, juridical, and so on. Like Klein and Myers' (1999) 'principles', aspectual laws cannot be arbitrarily selected or set aside. So they are norms, not in the sense of social norms, but as definitions of healthy functioning.

The salient issue here is that when we respond positively to (in line with) the laws of an aspect, there will be positive repercussions, but when we respond negatively (transgressing its laws) there will be negative repercussions. What has been called the Shalom Hypothesis takes this further: we must function well in every aspect if we wish to achieve 'shalom'. We use this Hebrew word since there is no adequate English equivalent to express what we mean: a deep and lasting peace, health, prosperity and well-being, with strong overtones of completeness and wholeness. If we function poorly in any

aspect then shalom is jeopardized. This has been applied by Lombardi (2001) to provide a means of understanding sustainability as the 'shalom' of a community and environment.

3.3 A framework for understanding success and failure

In information systems, 'shalom' means that all the repercussions of an I.S, in use are positive, in every aspect. Total shalom would result in a zero failure rate. It is doubtful whether this is possible within this temporal reality, so such a goal is best seen as an ideal, akin to that of ideal communication that Habermas sets up (1986). Instead, we can seek an improvement. One of the most important uses of Dooyeweerd's thought during ISD is likely to be as a means of improving holistic understanding and enriching discourse (and thus it might lead us nearer to Habermas' ideal as well as our own).

Each aspect provides us with a distinct perspective and set of values, and in many stakeholder perspectives certain aspects predominate (e.g. the informational, legal, economic issues). The aspectual framework can therefore aid us in a number of ways. First, it gives us a way of affirming each stakeholder's perspective, and of helping to prevent dominant perspectives from obliterating others. Second, it can stimulate discussion about perspectives that happen not to be represented by any stakeholders present. Third, it can stimulate participants to open up tacitly held perspectives (Winfield, 2000). Fourth, it can help clarify issues by separating out elements of tangled discussions. Finally, since the aspects imply norms, they can be used to stimulate holistic consideration of the conditions required for success of the information system.

3.4 Towards ISD methodology

These possibilities can be combined into methods or techniques for analysing highly diverse, interdisciplinary situations found in real life. Aspectual analysis methods can be used in both design (prospective) and evaluation (retrospective). For evaluation, we can undertake an aspectual analysis of a situation to identify both the areas of concern and also the areas where things are working well (e.g. so that they be not jeopardized by other changes). For design, in which it is proposed to make an intervention in a situation by introducing new technology or techniques, aspectual analyses of the current situation and of alternative scenarios of intervention give us a means of comparison. Since the aspects include all the human ones, such discussion is not only about the technical artifact but also about human and social structures and activity.

One recent method based on Dooyeweerd's aspects is MAKE, multi-aspectual knowledge elicitation, developed by Winfield (2000) for planning and building knowledge intensive systems. In a relatively straightforward way, MAKE guides and stimulates the participants to identify aspects that are important to their situation, and open up their constituents, starting with the most obvious aspects and gradually uncovering the relevance of each of the others. He found that MAKE did indeed stimulate participants to consider wider issues, that lay participants could very readily grasp the meaning of the aspects and work with them during analysis, and that MAKE could explicate certain types of tacit knowledge. A second method, not so well developed, complements MAKE to analyse the quality of functioning found in each aspect, and repercussions that (might) arise.

Two visual tools have been developed to help multi-aspectual analysis. MAKE employs a flexible version of the the mind-map (Fig. 1) to build up an understanding of inter-aspectual relationships. The second method employs the Christmas Tree (Fig. 2), designed to provide an overall picture of areas of concern that emerges during discussions. Any major positive or negative repercussion that emerges can be 'hung on' the tree at the aspect in which it is meaningful, with positive on one side and negative on the other. As the picture develops, patterns emerge showing areas of important benefit or major problem, and these can therefore be clarified and tackled during the design and development process.

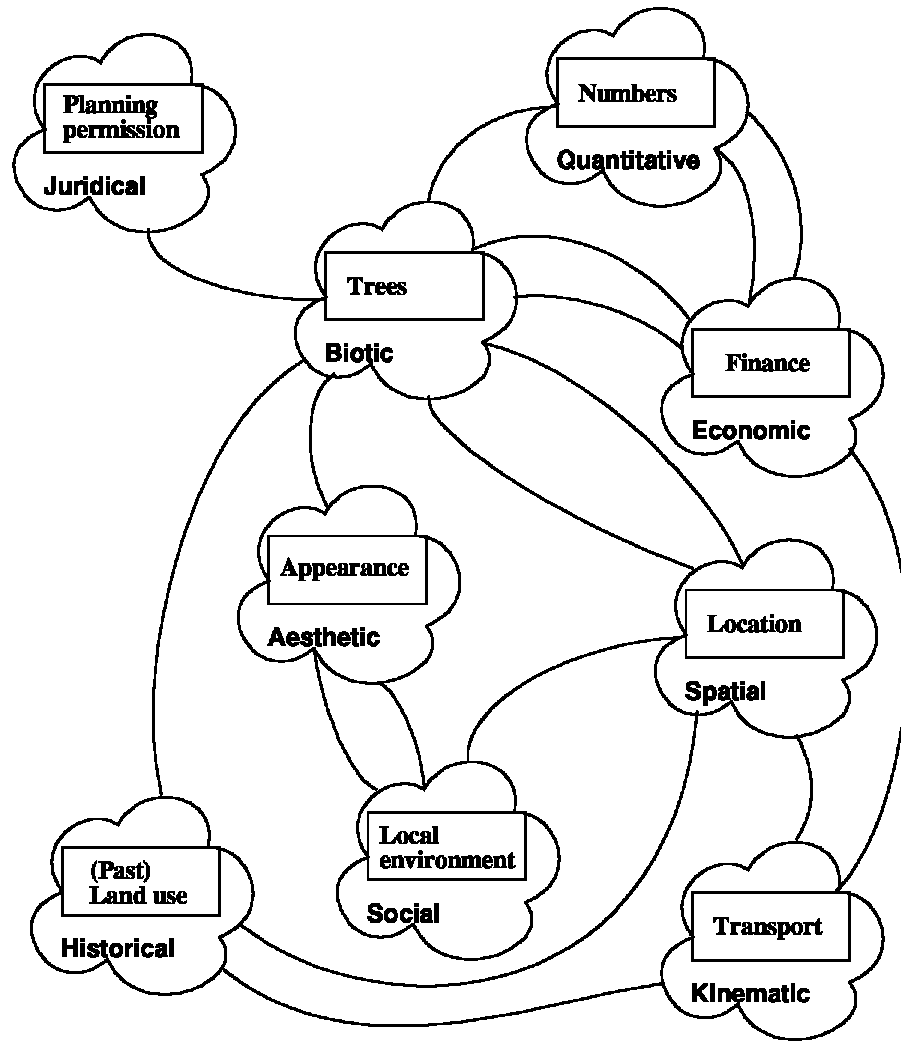


Fig. 1. Winfield's Multi-Aspectual 'Mind-Map'

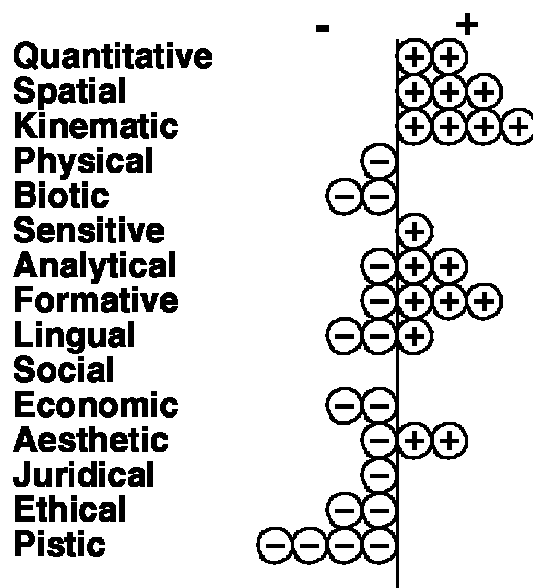


Fig. 2. 'Christmas Tree' of aspectual functioning.

3.5 Multiple, unintended, indirect impact

Major difficulties for ISD arise from the presence of multiple stakeholders with disparate perspectives and goals, and from unintended or indirect impacts of I.S. use. The methods of aspectual analysis may be extended to address these. This involves analysing the functioning of each stakeholder in each aspect, and the repercussions that occur as a result.

- Multiple stakeholders. Roles, perspectives, etc. of the stakeholders are often aligned with certain aspects (e.g. technical, economic, juridical). So an aspectual analysis of stakeholders and their needs can reveal which aspects are important in each situation, disagreements between stakeholders can be resolved by recognising the importance of each, and stakeholders who tend to be forgotten can be identified by each asking who might be active in, or feel repercussions of, each aspect.
- According to this theory, unintended impacts arise not only from lack of specialist knowledge or the task-artifact cycle (Carroll and Campbell, 1989) but even more from aspects being overlooked. By analysing how much attention has been given to issues in each aspect during design, development and use, we can identify which have been overlooked, and thus what types of unintended impact are most likely to occur. Conversely, by carefully considering all aspects during ISD, the incidence of unintended impact can be reduced.
- Indirect impacts. These result from the interconnectedness of the world. A stakeholder who receives repercussion of aspectual functioning changes their own functioning in various aspects, and this, in turn, generates yet more repercussions - an expanding chains of aspectual repercussion can occur. Aspectual analysis could perhaps enrich Actor Network Theory.

4. DISCUSSION

4.1 The validity of Dooyeweerd's approach

For various, mainly historical, reasons Dooyeweerd's philosophy is not well known, and has yet to face the rigours of widespread critique and the refinement that comes from that. But the process has started. A number of thinkers critically examined parts of Dooyeweerd's critique of Western thought, who then responded by revising his ideas substantially (Choi, 2000). Since Dooyeweerd's death, further criticisms have been made with attempts to modify or refine the approach to satisfy them. For instance Klapwijk (1987), while applauding Dooyeweerd for making "the structure of theoretical thought transparent", suggests there is a vicious circle and attempts to break it. He also believes, as some others do, that Dooyeweerd's approach is too antithetical to other streams of thought, and suggests how it might be made less so without jeopardizing its central tenets.

4.2 The validity of the aspects

However, to date, there has been little critique of value of what is important to ISD: Dooyeweerd's notion of aspects. We can identify two major areas to which critique should be directed, and which require different treatment: the theory of aspectuality itself, and the particular suite of aspects suggested by Dooyeweerd.

No major theoretical flaw has yet been found in the theory of aspects; the main problem with it is that it rests on very different presuppositions from conventional thought, and many misunderstand it or simply dislike it. To the positivist it feels too interpretivist since it tackles normative issues of human life, to the interpretivist it feels rather positivist since it holds that there is an external reality. In fact it is neither, and the theorist must, at least on a trial basis, adopt the different presuppositions, some of which have been discussed above while others (such as the primacy of Meaning over Existence, Law

over Entity) have not. For the practitioner, however, the differences in presupposition can be less troublesome since, in the practical situation of enhancing discourse and analysis within ISD, all that is required is to adopt a taxonomy of aspects.

Regarding his particular suite of aspects, Dooyeweerd recognised that every concrete suite of aspects (including his own) is open to question on the grounds that to make a suite involves functioning in a non-absolute aspect, the analytic. So the critique of his suite of aspects shifts to asking why Dooyeweerd's aspects might be preferred to those of others (such as the Five E's of Soft Systems Methodology or Maslow's famous hierarchy):

1. Dooyeweerd's notion of aspects has a philosophical underpinning, and this gives us explicit ways of testing and refining it.
2. Dooyeweerd's suite has been subjected not only to empirical scrutiny but to three additional types. Philosophical scrutiny involved seeking antinomies, teleological scrutiny involved discussing the role of each aspect in the total spectrum of Meaning, and historical scrutiny surveyed the aspects that thinkers have held as important over the last 2,500 years.
3. Though the kernel meanings of the aspects can never be fully comprehended by means of theoretical (analytical) thought, Dooyeweerd claimed they can be 'grasped' by intuition. Both Winfield (2000) and Lombardi (2001) support this: lay clients could understand and work with the aspects after a short period of learning.
4. Compared with other suites of aspects, Dooyeweerd's has wider coverage, and because of the scrutiny it has been subjected to, it is more likely to be applicable across cultures. Choi (2000) has applied Dooyeweerd's critique to Korean culture and thought.
5. Dooyeweerd spent a life's work thinking about the aspects, with little intellectual axe to grind within the conventions of the time, and he was self-reflective in the Habermasian sense. It is not clear to what extent this is true of the proposers of other suites.

Therefore we are justified in adopting his suite as a starting point for ISD, even though we may refine it sensitively as we use it.

5. CONCLUSION

The paradigms under which researchers develop technology are often seemingly incommensurable with those under which artifacts are used or developed for use in the human environment. I.S. development is handicapped, and the failure rate of information systems remains high. While new methods and theories might help, it has been suggested that solutions should be sought in the deeper (or meta-theoretical) realm of philosophy.

This paper has examined the philosophy of Dooyeweerd (1955), which rests on presuppositions very different from those of most Western thinking. It combines determinative and normative aspects of a situation, without sinking into either positivism or interpretivism. Dooyeweerd's theory of modal aspects leads us to understand information systems as human functioning in a diversity of distinct aspects, each of which has laws that lead to repercussions.

We have illustrated, very briefly, how this aspectual framework can furnish us with a model of success and failure of information systems that can address diversity of types of failure, and lead us to a taxonomy and two methods that can be used in ISD. We have briefly discussed how it can be extended to deal with the complexities of multiple stakeholders and unintended or indirect impact. This is possible because the aspects transcend not only the individual stakeholders but even cultural differences.

Though the philosophical approach of Dooyeweerd has still to be subjected to thorough critique, and application of it is in its early stages, it is being 'discovered' across a range of disciplines, from information systems through agriculture and transport to environmental sustainability. So we commend it to the I.S. community for examination, testing and refinement.

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