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Towards an Information Systems Paradigmatic Framework

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Introduction

Kuhn [1970] suggests that the underlying structure of a discipline arises from a set of assumptions generally accepted by practitioners, teachers and disciplinary constituents. This set of generally held underlying assumptions within the discipline is called a paradigm which as Kuhn [1970] says may also incorporate theories, precepts, values and principles. When we write of discipline we mean: a complete set of fundamental laws, rules giving a real world view and including those artifacts both tangible, discrete and behavioural. A discipline then, is a community of scholars who have both internal and external validity. External validity in as much as they are recognised as such by scholars in other closely related and contiguous disciplines and internal validity as they have developed a set of rules to make them reasonably distinguishable from other scholars and fellow scholars.

A discipline is not a profession (Kuhn[1970]). A profession can be made up of a variety of disciplines, overlapping with other professions. We define profession in these terms; a regime of approach towards solving real or theoretical world problems...using generally recognised tools and generally accepted techniques, created by tool-makers and either culled from experience or developed in answer to a specific problem.

Techniques and tools defined by the discipline are created from a common understanding. They become an expression of the generally held underlying assumptions of the discipline. A model may also be defined as a tool. For example, in Information Systems (IS) the input/process/output model is used to explain the input of raw data and the output of meaningful information (de Marco [1978] and Yordon [1989]). It is also a powerful

tool which is used in the creation and definition of IS.

In reviewing the history of *homo sapiens* we find an unbroken trail of tools. Each tool leads to the formulation and production of the next. The culture which shapes a tool reveals its assumptions and hence its paradigm, by the artifacts it leaves. Benjamin Franklin wrote "Man is a tool making animal"(from J Bronowski [1976]) and there is an overwhelming body of evidence which supports this statement (Oakley [1975]). The presence of a tool-maker suggests the existence of a tool-user (they may be the same entity). The archaeological evidence of a communicated tradition of tool manufacture and use, suggests a cohesive body of skills inherited by subsequent generations.

Schein [1984] suggests a three stage ascent from basic assumptions to the artifacts and creations which drive the evolution of paradigms (see Figure 1). We would argue that from the tools in current use by a discipline, the generally accepted underlying assumptions can be deduced. To do this it is necessary to know the tools which are currently accepted by that discipline. For example within IS, Avison [1993] discusses a model of Research in Information Systems Development, in which the Techniques and Tools as well as Methodology Frameworks of IS stem directly from the Theory of IS Development using a contingent framework from emerging themes (see Figure 2).

It is postulated that the model of a discipline is in three parts. By extending the idea of tools being the visible sign of paradigmatic assumption which underpin a discipline, we find that three entities play a role; the tool Maker, the tool User and the Inheritor of the discipline.

The Disciplinary Model

A discipline is seen as requiring three roles. The tool Users, essentially the practitioners of a discipline, the tool Makers or researchers, and the Inheritors of the discipline; the students or scholars. This is expressed as

Figure 3.

The tool **User** communicates the requirement for a tool to the Maker for action. When the tool is created, the User has several options with a new tool, or one only slightly different to a previous tool. Utilitarian strategies are developed (which themselves are conceptual tools) to assist in the use of the tool and eventually communicate to the Maker the success/failure of that tool.

The relationship between the User and the Maker is the most crucial in the model. For the User, it requires the formulation of a problem and the communication of that problem to the Maker. In practical terms the communicative role may not be necessary as the Maker and User may be the same entity.

The tool **Maker** discharges some of his/her responsibilities by producing a tool (and possible multiple versions) for the User. (Oakley [1975]). This highlights a professional relationship. The Maker, however, has additional responsibilities. The Maker has a duty to teach the use of the tool to Inheritors of the discipline. By extension the Maker also teaches how new tools are created, passing the necessary skills of tool creation to the Inheritors of the discipline. The relationship between Inheritor and Maker is educative in nature.

Without an interactive relationship both the User and the Maker act in a vacuum. To overcome this potential and serious threat to a discipline, the Maker may need to constantly survey the discipline and the User constantly inform the Maker of tool issues and problems regardless of whether he/she is surveyed.

The educative relationship between the Makers and the **Inheritors** is also interactive in an indirect sense. Inheritors of the discipline are also, by nature of their training, actively exploring the use of tools in a practitioner or pseudo-practice environment. They also pass their problem formulation to the Maker (like the User) for incorporation into successive tools.

The model is completed with the relationship between Inheritor and User. This relationship is essentially adoptive in nature. The User adopts the tool ensuring the survival of the discipline and the creation of a knowledge bank of experience and education. The User then relates to the Inheritor in a relationship of patronage where the User provides the Inheritor with the opportunity to view and study the tool use, either as an active participant in the workplace, or as a scholar.

Model Interaction

Interaction between each of the parties to the model is enhanced by role assumptions. Hence an Inheritor may eventually become a User (for example when a student becomes a practitioner). Some Inheritors may become Makers (for example when a student embarks upon a PhD and becomes an academic researcher). A Maker may become a User (for example an academic researcher may go into the field either full time or part time and apply the tool). The model suggests that a strong interactive relationship between User and the Maker, enhanced by a variety of methods, will contribute to the continuation of the discipline.

All parties to the model interact against a background of a dynamic environment. The User may see changes in the environment and require new or changed tools to cope. The Maker may become aware of problems suffered by all Users because of their unique role of seeing abstracts and trends in Users' problems. They may draw conclusions about tool usage and suggest innovation and change.

A Model of the Discipline of Information Systems (Shanks, Rouse and Arnott [1993] based on Keen [1987])

Shanks, Rouse and Arnott [1993] discuss a Model of the Discipline of Information Systems based on Peter Keen's [1987] work, defining the current status, trends and needs in IS research, practice and scholarship. This model is IS specific defining the IS "professional" discipline from within, in terms of assumptions about research topics and methods, their application to practice, and the authors' beliefs that the discipline "is and will remain, fundamentally computer-based - pg 32". As stated previously, however, a profession is not a discipline as it can be made up of a variety of disciplines. Many researchers within IS have expressed concerns, over the years, with the development or lack thereof, of IS paradigmatic assumptions (Weber [1987], Culnan [1986], Banville & Landry [1992], Galliers [1994]) that position and define IS as a discipline in its own right.

If we view the Disciplinary Model we see that the generic roles of tool User, Maker and Inheritor, reflect the paradigmatic assumptions on which any discipline may be based. The Model of the Discipline of Information Systems (Shanks, Rouse and Arnott [1993]) is thus subsumed by this more generic Disciplinary Model. The tools in use, whether theoretical or applied would then reflect the underlying paradigmatic assumptions of the IS discipline. Definition of the User would include the role of the Practitioner, the Maker of the Researcher and the Inheritor of the Scholar, thus, positioning and defining IS within the **Disciplinary Model**.

Addressing the crucial roles of **Practitioner and Researcher**; it seems that there is a need for the survey of commercial practice in order to build appropriate tools. Commercial experience suggests the paradigm behind the discipline. We teach: but how much of it is relevant and usable by students in commercial practice ?

The Researcher's Role is to interpret the paradigm for the benefit of students. It assumes that all researchers in the area have a shared and common language - a "school" of shared knowledge, precepts and cognitive approach. Researchers think in the same way, and agree to the same problems and research in collegiate areas (Crane [1969], Schwartz [1969], Allen [1977]).

Recognition of the paradigm comes from stability in the discipline, hence, we observe an accumulation of ideas which centre around themes. For example, Avison's [1993] work on the model of Research in Information Systems Development (Figure 2).

Within Information Systems a tool may manifest itself in a number of ways, not all of which are computer based, or are necessarily used to create computerised systems. First, a tool may be a conceptual, for example, IS Management Frameworks. Second, a tool may manifest itself in the creation of another tool for example a Systems Development Life Cycle approach may contribute to the creation of an application system. Third, a tool may be a physical artifact, for example a piece of hardware. The roles of researcher and practitioner are heavily influenced by the practitioner specifying areas of research. Typical work in this area would include case studies and field research. This is defined as focused research, however, little of this research is purely about detecting the paradigm.

Research about the paradigm would ask questions about a universe of practice. By way of example: what data modeling techniques and tools are generally by the Users? How relevant are these IS tools ? Answers to these questions might influence both the nature of the educative process for the Inheritors of the discipline and the nature of more focused research.

The **Relationship Between the Researcher and the Scholar** is not currently driven by any acceptance or knowledge of a discipline. The shortfall in our understanding of the IS discipline may come directly from a lack of survey research which focuses on the tools produced within the discipline. If we accept the theory and we were to examine a representational list of tools, what are the underlying assumptions from which they were created ?

What does acceptance of a tool tell us about the IS discipline ? The difficulty we have in defining Information Systems as a discipline is, if we say that the tools reflect the paradigmatic assumptions then we must have a means of defining the tools. By asking practitioners to define their tools we may bring the discipline into sharper focus, but disciplinary tool validation remains a problem.

The Future

What of challenges to the Information Systems paradigmatic assumptions which according to Kuhn [1970] is the harbinger to scientific revolution ? Based on the idea that the tool reflects the paradigm, we might say that small changes in paradigmatic assumptions are reflected in small changes to the tool(s). This would seem to indicate that IS needs more researchers involved in the search for our underlying basic assumptions. There is also a pressing need to discover what is really happening in the world of good commercial practice in order to effect and adequately record changes to tools and thus, find out what may be happening within the discipline of Information Systems.

References available upon request from Deborah Bunker. Copies of figures will be made available at AIS.