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Decision Making and Information Systems Development - A Conceptual Framework

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Abstract

A long-standing anomaly within information systems development (ISD) exists - claims made for the benefits of methodology usage and the actuality of practice are poles apart. While both academics and practitioners have been aware of this credibility gap, the information systems (IS) community continue to have difficulty reconciling it. Apparent breakthroughs such as structured and object-oriented methods fall well short of guaranteeing success. It is contended that neither methodological nor amethodical approaches fully explain or express the complexity of systems development and that a new perspective drawing on decision-making theory may yield fresh insights. A framework is developed, combining an analysis of decision-making within the systems development life cycle, key models of decision-making and the actors involved in the process of systems development. It is contented here that ISD is, in essence, a problem-solving and decision-making process and that systems development is neither deterministic or without structure - it is creative yet somewhat ordered, improvisational yet explicit, and both rational and political. The paper concludes that a deeper understanding of differing viewpoints on systems development held by actors and other phenomena can be illustrated with the framework.

Keywords: Information systems development, decision-making, decision support systems, methodologies, improvisation.

1 INTRODUCTION

Within the IS community, mostly amongst academics, information systems development (ISD) has long been the subject of a methodological contretemps between those who believe in the use of more ‘formalised’ structured, methods and those who subscribe to a socio-technical, interpretivist approach. For many practitioners and academics alike there is a dichotomy between the intuitive appeal of trying to bring order to chaos with structured or object-oriented methods and the gnawing doubt for some, and absolute certainty for others, that in reality, systems are rarely developed mechanistically or by the rulebook. Even for those in practice who fully endorse an organization’s prescribed method, say SSADM, the sheer complexity and messiness of many projects makes compliance nigh impossible. Despite this, organizations, particularly larger ones, usually have an official, ‘normative’ view on how systems should be developed. The “privileged position” (Truex, Baskerville & Travis 2000 p. 54) held by methodologies in ISD is thus at odds with the reality of everyday practice.

2 DIFFERING METHODS

Three important schools of thought on how IS should be (or are) developed are discussed below. Broadly, they constitute philosophical positions on how people think IS development should be approached. Although the general ‘hard’ or ‘soft’ debate has been ongoing for some time now, it is a discourse that represents fundamentally different belief systems. The third and most recent school of thought is the ‘amethodical’ school, one that like the ‘soft’ approach to systems development, places little store in more structured methods.

2.1 The Normative Methods

Structured, and later object-oriented, methods have been the dominant methods used in developing systems for several decades. Their origins are in ‘scientific’ problem-solving and are of a positivist tradition. The normative approach is explicit in the more popular structured systems analysis and design methods and techniques, including process and data-oriented ones, and it is widely used by practitioners. They are taught, with the aid of popular texts, on most undergraduate IS programmes that this is the way in which IS should be developed. Ergo, young professionals enter the workplace expecting to find these approaches or some variant to be the modus operandi of ISD. The rationalist view that a system’s quality and user needs would all be improved by using methodologies is not unreasonable. Many activities like project management, systems analysis and design techniques and large programming projects require some form of structure and discipline. In reality, most systems are developed (at least outwardly) in this way. While the structured methods remain popular, there is growing evidence that practitioners are not using them slavishly (Bansler & Bodker 1993). Their findings add weight to the contention that the normative view of IS development is inconsistent with the way in which it is carried out in practice. In a recent study, it was revealed that while developers had no difficulty in using or understanding commercial methodologies for developing IS, almost two-thirds of respondents said they were very cumbersome to use (Barry & Lang 2001). Despite problems with structured methods there is, ironically perhaps, increasing pressure on organizations to formalise the ISD process (Fitzgerald, Russo & Stolterman 2002). The reasons are the attractiveness of ISO certification, the mandatory use of standardized methods by governments in certain countries and the increased dominance of the Capability Maturity Model used in software engineering.

2.2 The Problem Structuring Methods

Considered to be methods that make up a "single coherent field" (Rosenhead & Mingers 2001a p. xiii), problem structuring methods (PSMs) include Strategic Options Development and Analysis, Soft Systems Methodology, Strategic Choice Approach, Robustness Analysis and Drama Theory. They share a certain philosophical position that IS are socio-technical, made up of people, machines and processes and that the human dimension is not adequately addressed with structured methods. They deal variously with issues such as arbitration, reducing complexity, improving understanding and the resolution of social conflict. Systems are considered subjective and are therefore interpreted differently depending on the participant's agenda or bias. The methods acknowledge that "making and taking decisions, solving problems, designing and re-designing systems nowadays all have to take place in conditions of unprecedented complexity and uncertainty" (Rosenhead & Mingers 2001b p. 1). PSMs deal with problem structuring in ISD, necessary in systems analysis, but generally do not address systems design, programming and systems implementation. They have to be artificially 'fused' with other methods or techniques with which there is often a conceptual mismatch. Although they have been around for many years now, few organizations actually use them. Recent research reveals that in-house methods, structured methods and having no method account for almost all 'traditional' IS projects (Barry & Lang 2003). These findings are fairly consistent with other studies over an extended period (Jenkins, Naumann & Wetherbe 1984, Necco, Gordon & Tsai 1987, Hardy, Thompson & Edwards 1995, Fitzgerald 1996). Perhaps the greater problem with the PSMs is that they are, for the most part, inaccessible to practitioners who might use them. Senior IS executives that should perhaps be influenced by what is written in the top IS journals "…seem to want personal interaction, presentations and dialogue" (Loebbecke, Feeny, Weill, Jarke, Kambil & Filos 2003 p. 515). If this is the channel through which these key individuals communicate then it presents a huge challenge to university-based researchers to find better ways of using it.

2.3 The Amethodical View

An essential purpose of method is to take away some responsibility from the practitioner so that they can concentrate on some other pressing aspect of a project. However a highly prescriptive method that guides the practitioner at the same time absolves him or her of accountability, limits engagement and yields to the method governance. As Fitzgerald et al. (2002 p. 8) put it - "this tension is at the core of development practice." In some senses the amethodical view is the antithesis of this outlook. Software development is complex, unpredictable and there is no clear procedure for resolving all the problems that arise during systems development. A growing body of opinion now sees the ISD process in defiance of method, beyond the assistance of conventional approaches and essentially amethodical (Baskerville, Travis & Truex 1992, Introna & Whitley 1997, Truex et al. 2000). From the outside the design activity may appear chaotic and perhaps slightly out of control but the process is directed by the "hidden rationality" (Stolterman & Russo 1997 p. 7) of skilled individuals. Anarchy is avoided through experienced decision-making or 'smart improvisation', articulated by Ciborra (1999). What is being described is not the absolute absence of order but reflective activity that contributes to the improved effectiveness of a project. While this view may be more intuitively attractive than a wholly rationalist one, there are problems in relying entirely on the serendipitous consequences of the absence of method. Firstly, knowledge that developers have learnt is more difficult to pass on to less experienced colleagues - if the reasoning behind particular good or bad decisions is not captured, how can apprentices be efficiently educated? Secondly, if improvisation leads to a greater degree of independence for developers then management control and project management are more difficult. A third problem is that improvisation can actually encourage developers to "embrace their biases to the point that alternative views are occluded" (McPhee 1997 p. 32).

3 DECISION-MAKING THEORY AND ISD

The discussion above suggests that subservience to method does not guarantee successful outcomes. If one accepts Iivari, Hirschheim and Klien's framework (2000) for classifying ISD methodologies and approaches, "it implies that method engineering as a combination of techniques is confined to address relatively routine aspects of ISD" (Iivari, Hirschheim & Klien 2001 p. 1033). Such an emphasis on methodology disguises other social and organizational issues equally relevant during ISD. This paper introduces an alternative, complementary, perspective of the ISD process. It is not argued here that the normative, problem-structuring or amethodical approaches are wrong or not useful, rather that they do not fully explain, or express, interactions between the plurality of decision-making during ISD and the decision-making approaches adopted by actors. Neither is it suggested that ISD is characterised solely by decision-making. The extent to which the ISD process is complex and unpredictable is revealed in recent research by Goulielmos (2004). He found that most of the issues that are characteristic of problematic projects concern the actors and their behaviour during the ISD process.

3.1 Decision-making within ISD

Schön noted that the "…situations of practice are characterized by unique events" (Schön 1983 p. 17). He cited that most of the problems a doctor comes across are not in the medical book and that engineers regularly encounter unique problems of design. Similarly, IS professionals are faced with numerous, distinctive problems for which solutions are not readily at hand. ISD may be viewed as a process that is made up of hundreds of decision-making activities. They are sometimes strategic, like replacing existing IS systems with a large outsourced ERP system, to a more trivial decision such as re-designing a Project Request Form. They can range from being wholly structured to semi-structured to being without any structure, i.e., unstructured. Examples of each of these are shown in Table 1.

	ISD Decision Examples		
Decision Type	***Operational Decisions***	***Management Decisions***	***Strategic Decisions***
Structured ISD decisions	• Re-designing a Project Request Form • Documenting agreed procedures • Programming a simple report using standardized guidelines	• Implementing new EU computer data privacy legislation • Formalising programming guidelines • Allocating ISD tasks	• Deciding on a new Web-based sales system • Business area determination • Approving an intranet system for developers
Semi-structured ISD decisions	• Requirements analysis • Data modelling with ERDs • Programming (in general)	• Evaluating and ranking vendor proposals • Project management • Selecting project team members	• Developing an IS strategy • Adopting a CASE tool • Changing from a process to an object-oriented approach
Unstructured ISD decisions	• Requirements elicitation and determination • Programming complex algorithms • Repairing major software bugs	• Hiring IS staff • Managing the IS function • Prioritising project requests	• An extensive ERP outsourcing decision • Deciding on a replacement computing platform • Approving a critical B2B system

Table 1. Examples of Categorized ISD Decisions

The ISD process is typically expressed as some form of the systems development life cycle (SDLC). For the purposes of simplicity the three essential stages - systems analysis, systems design and construction are used here. A simple version of the decision-making process (Simon 1960) is also used to illustrate the correspondences between the two 'processes'. Figure 1 below draws parallels between them, demonstrating obvious similarity. Systems analysis corresponds with the notion of intelligence gathering, leading to an established set of requirements while systems design and construction roughly equate to the design and choice stages of the decision-making process.

<table>
<tr><td><b><i>SDLC Stages</i></b></td><td>Systems Analysis</td><td>Systems Design</td><td colspan="2">Construction</td></tr>
<tr><td><b><i>Decision Making Process</i></b></td><td>Intelligence</td><td colspan="2">Design</td><td>Choice</td></tr>
</table>

Figure 1. Correspondence between the SDLC and the Decision-making Process

3.2 Models of Decision-making

In their seminal work on decision support systems (DSS), Keen and Scott Morton identified five models of decision-making (Keen & Scott Morton 1978). The models range from the wholly normative to entirely descriptive. The approaches are not mutually exclusive and some will be relevant for certain participants in the ISD process and others will not. Each view suggests important issues that should be understood by the development community, particularly management. While it has long been the case (and for many it still is) that IS developers were committed to the normative, rationalist paradigm, change has been evident in more recent times. The models are briefly summarized below in Table 2. They are the starting point for the framework developed here. Other models of decision-making could have been chosen, such as Bahl and Hunt's descriptive decision-making models (1984) or Huber's decision-making environments (1981), however the resilient and widely cited models of Keen and Scott Morton justify their use within the framework.

Decision-making Style	***Description***
The Rational View	The classical notion of objective, normative decision-making with complete information, based on early microeconomic theory.
The Satisficing Process-oriented View	This view holds that we cannot know all possible outcomes and thus can only choose a satisfactory decision based on judgement or heuristics. It also recognises constraints such as time and costs.
The Organizational Procedures View	Based on the formal and informal organization, how it operates and what are its lines of communications. The view is an extension of the rational approach that recognizes that bargaining will take place.
The Political Process View	A pluralist perspective that recognises the natural diversity of objectives, interests and views in any organization and their influence on the decision-making process. It is the antithesis of the rational approach and expressly articulates what many people intuitively sense about decision-making.
The Individual Differences Perspective	Focuses on the individual as being unique with distinct abilities and decision-making styles. For the purposes of ISD, this view informs us that people have different cognitive styles and approaches to problem solving.

Table 2. Models of Decision-making

3.3 Actors in the ISD Process

The traditional composition of those involved in an ISD project is a Management/Steering Committee, Users, IS Managers, Programmers, Systems Analysts/Designers and Network Specialists. In more recent times the individuals and groups involved in a systems development project has become more extensive. This is because of the belated recognition of the integral role of users, those affected by the system and more diverse development teams deployed in multimedia and Web-based IS. IS project might be further complicated as more widespread outsourcing of IS components brings contractors and their teams into the frame. Ironically, there may be a significantly reduced role for users if the project is a commercial Web-based one where the user base is not close at hand. However for the purpose of the work herein only in-house IS projects are the subject of the analysis.

3.4 ISD and Learning

The notion of the learning organization and how leveraging, avoiding self-limiting thinking and exploiting organizational and individual knowledge (Senge 1990), can inspire positive change at every level. Extending the ideas of organizational learning into the development of DSS was carried out by Murphy (1990 unpublished) who concluded that DSS staff who acted in a manner consistent with a learning approach had a positive impact on the decision-making process. This can be further extended into ISD in general. In the same way that Leavitt (1965) noted that managerial work can be distinguished from other types of work because of the degree of change encountered in day-to-day activities, those employed in ISD work in a continual state of flux where decision-making is often urgent and under considerable time pressure. Since many of the tasks that face ISD practitioners are not routine or repetitive, double loop learning that requires decision-makers to take a second look at the problem by questioning the relevance of operating norms (Argyris 1982) would appear to be required. Double-loop learning is considered more effective in making informed decisions about how action is implemented. The ability of those engaged in the ISD process to learn over time and thus improve the outcomes of their work is rarely addressed by organizations and only recently has knowledge management been used to try to make knowledge or 'memory' accessible within the ISD environment (Weiser & Morrison 1998). The idea that the nature of ISD is better characterised as knowledge work rather than some mechanistic application of method has gained fairly wide acceptance amongst the academic community. Iivari, Hirschheim & Klien (2001) described the knowledge work of IS personnel as non-homogenous - it may be routine, craft-like, professional or creative. They also noted that this work requires not just explicit but also tacit knowledge.

3.5 Another Perspective on ISD

The perspective considered here draws on long-standing but perhaps overlooked IS research. Management decision-making was central to intense academic activity in DSS during the 1970s and 1980s and executive information systems (EIS) during the 1980s and 1990s. Insights from decision-making theory led to frameworks and widely agreed perspectives on the nature of such systems and how they should be developed (Gorry & Scott Morton 1971, Sprague 1980, Rockart & Treacy 1982, Watson, Rainer & Koh 1991). The importance of decision-making theory in defining the activities in the DSS development process has not been generalised to yield insights into more conventional, larger-scale systems. In the same way that decision-making is a central part of management activity; ISD is continually confronted and moved forward by decision-making actions on the part of the actors in the development process. This happens whether the decision maker is guided by method or inspired by improvisation. Thus a critical context for ISD is, what is termed here, the decision-making 'posture' of all those involved in an ISD project. If this is so, how decision-making takes place is essential to our understanding of the ISD process in the same way that research into decision-making added greatly to our understanding of DSS design. When decision-making, organizational theory and the roles and motivations of various actors are considered a more complex and ambiguous ISD perspective emerges.

4 THE CONCEPTUAL FRAMEWORK

The conceptual framework put forward here combines the analysis of explicit decision-making within the SDLC, the key models of decision-making and the actors involved in the development process. It is illustrated in Figure 2(a) below. The three aspects of development are combined to construct a three-dimensional model charted on three axes X, Y and Z. The axes represent: X-axis - decision-making models; Y-axis – equivalent decision-making stages of the SDLC; and Z-axis - actors. To simplify the framework only certain individuals or groups have been included although as pointed out in section 3.3 above actors involved in some projects are increasingly diverse. Furthermore, there may be several actors within a particular category, say analysts, identified as {analyst$_1$, analyst$_2$, … analyst$_n$}.

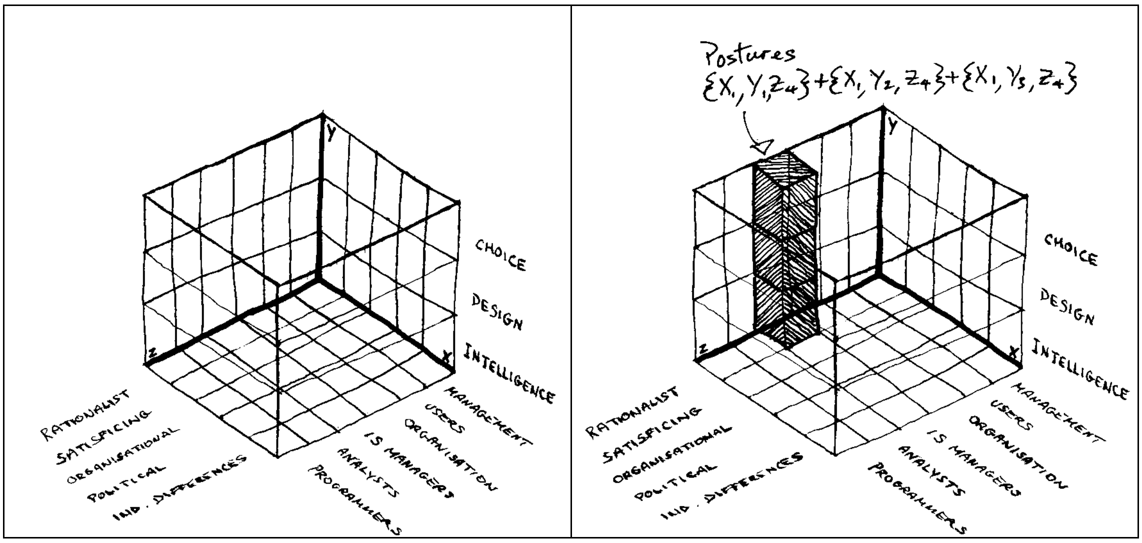

Figure 2(a) and (b). The Basic Conceptual Framework and an Illustrated Posture

For the analysis herein the totality of ISD is posited as a 'macro' decision process. At each intersection of the three axes within the framework it is possible to identify the posture of the individual or group in a given phase of the project and within the context of a decision-making style. These postures yield a rich picture of how individuals or groups hold differing perspectives depending on the decision-making model they subscribe to. An illustrated posture (in Figure 2(b)) shows an IS Manager acting wholly rationally throughout the development process. The posture is denoted as $\{X_1,Y_1,Z_4\}+\{X_1,Y_2,Z_4\}+\{X_1,Y_3,Z_4\}$. Since it is easy to conceive of another actor with a different decision-making approach, the framework immediately demonstrates that it is possible to show co-existing decision-making paradigms during an ISD project. This simultaneity of perspectives exposes postures that may agree or disagree. A profile of all actors on a project could, for example, focus on tensions that exist between actors, suggesting remedial action or identifying the general outlook that dominates an organization's posture toward ISD.

Actor: IS Manager
DM View: Rational View

DM Stage	Intelligence	Design	Choice
Illustrating	Objective	Means	End
Posture	Establish objective organizational and user needs, budget-driven	Means important, process and project management critical	- A Software Product or an IS System or Service delivered within budget and on time - Not content with an imperfect system
Actor: IS Manager			
DM View: Satisficing View			
DM Stage	Intelligence	Design	Choice
Illustrating	Objective	Means	End
Posture	Establish acceptable organizational and user needs, budget flexible depending on acceptance	Means are of reasonable importance, project management critical	Content with an acceptable, imperfect system
Actor: The Formal Organization			
DM View: The Organizational Procedures View			
DM Stage	Intelligence	Design	Choice
Illustrating	Objective	Means	End
Posture	Establish systems objectives consistent with organizational objectives	Means are unimportant	- A Software Product - An IS System - Service - Appropriate and secure organizational image

Figure 3. Sample Documented Postures of Actors

Examples of fully 'documented postures' are shown in Figure 3. For each actor, their decision-making approach and the posture they hold in each stage of ISD and aspects of the development process are shown for a single project. These aspects of the development process correspond to the simplified decision-making stages outlined earlier. For each stage the posture of the actor is illustrated regarding: what their objectives and expectations are for the system; how they view the means by which it is developed; and what end (output) they expect from the system. The illustrated posture in Figure 2(b), the rational IS Manager, corresponds with the first documented posture in Figure 3 above. It is just as likely others on the project will adopt different decision-making approaches. If we refer back to the models of decision-making described in Table 2, some of these models can be aligned with the positivist or interpretivist traditions. For example the rational decision-maker and the organizational procedures view correlate closely with positivism, while the others all share substantial characteristics with interpretivism.

4.1 Atypical Postures

The model can be further elaborated to illustrate various phenomena: three of these demonstrate the flexibility of the framework. They are essentially atypical postures, difficult to represent or conceptualize with any of the three general approaches discussed earlier. Firstly, during the development process the decision-making models used by various actors may undergo change. For example, at an early stage of development an analyst may adopt a rationalist decision-making stance while later in design a satisficing one becomes more realistic. This phenomenon is illustrated in Figure 3(a). It represents postures taken consecutively $(\{X_1,Y_1,Z_5\}+\{X_2,Y_2,Z_5\})$ by the actor. The second phenomena the framework can reveal, illustrated in Figure 3(b), is that an actor may appear to hold different decision-making styles simultaneously. This may happen for a number of reasons. A programmer, during design, who might outwardly subscribe to the software engineering line on rationalism and structured development methods may in fact, as Parnas and Clements put it (1986 p. 252) be "faking a rational design process." The programmer may be taking short cuts, not documenting the system or even ‘borrowing’ code from elsewhere - void of the ‘rationality resonance’ described by Stolterman and Russo (Stolterman & Russo 1997). For whatever reason this actor is caught between overt and covert decision-making styles. The simultaneously held postures are denoted as $\{X_1,Y_2,Z_6\}+\{X_2,Y_2,Z_6\}$. In a somewhat similar way a systems analyst may hold a firm set of beliefs about how ISD should be carried out, let’s say a wholly political one, but act in a completely different manner because the commissioning organization has decreed that SSADM must be used for the systems development project.

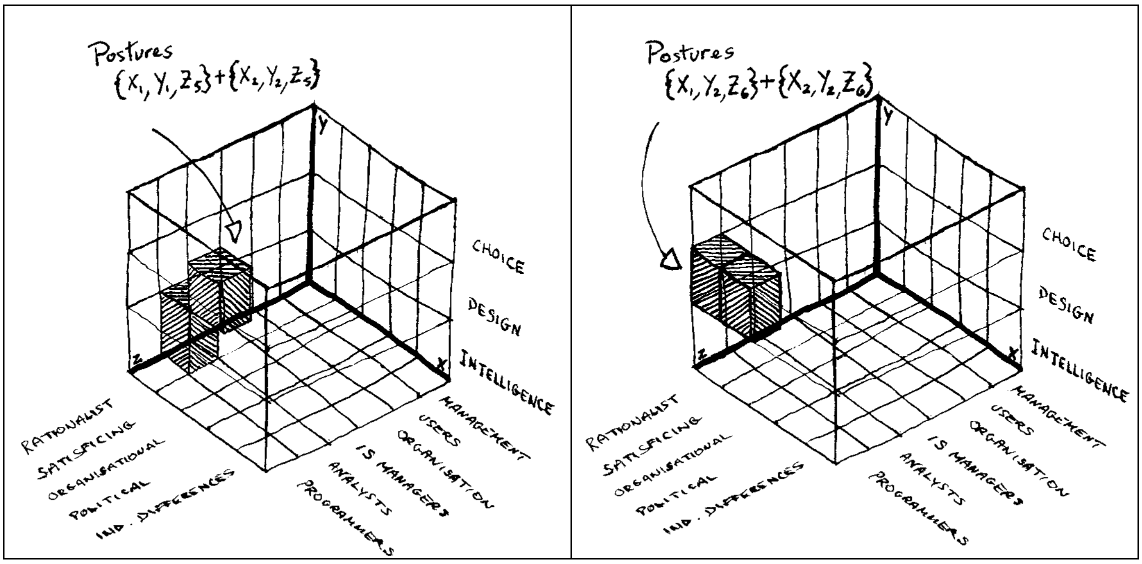

Figure 3(a) and (b). Atypical Postures within the Framework

While some actors are wholly conscious of the contradiction in their outward posture during development, it does not necessarily follow that all such contradictions are made knowingly. Argyris and Schön (1974) examined conscious and unconscious reasoning processes. Their work suggests people are designers of action that is intended to achieve consequences and while doing so monitor the process to ‘learn’ whether their actions are effective. It is further asserted that few people are actually aware that the mental maps of decision-makers are not necessarily the theories they explicitly espouse (Argyris 1980). Thus the concepts of espoused theory (values that people think their behaviour is based on) and theory-in-use (values implied by behaviour or the maps they use to take action). These concepts can be reflected in the framework as ‘espoused posture’ and ‘posture-in-use’. Consider the ‘formal’ organizational posture as deterministic based upon a rationalist paradigm, embraced by management at one level but who, for the most part, unconsciously digress from an idealised vision. In practice this might mean that an organization believes strongly in the overt use of ‘method-ism’ (Whitley 1998) while using social, political, arbitration and improvisational techniques to resolve problem situations. In effect they are using satisficing, organizational and political decision-making strategies to effect change. This third, atypical espoused posture is illustrated in Figures 4(a) as $\{X_1,Y_1,Z_3\}+\{X_1,Y_2,Z_3\}+\{X_1,Y_3,Z_3\}$ while the ‘negating’ posture-in-use is denoted in Figure 4(b) as $\{X_2,Y_1,Z_3\}+\{X_2Y_2,Z_3\}+\{X_2,Y_3,Z_3\}$ + $\{X_3,Y_1,Z_3\}+\{X_3Y_2,Z_3\}+\{X_3,Y_3,Z_3\}$ + $\{X_4,Y_1,Z_3\}+\{X_4Y_2,Z_3\}+\{X_4,Y_3,Z_3\}$. While the differences between the espoused posture and posture-in-use is not greatly surprising, it is however difficult to express their conceptual significance graphically. It is suggested that the framework can usefully demonstrate both the pragmatic incrementalism and the plurality of organizational decision-making in developing IS and the range of overlapping, explicit or perhaps hidden perspectives that actors might hold during development.

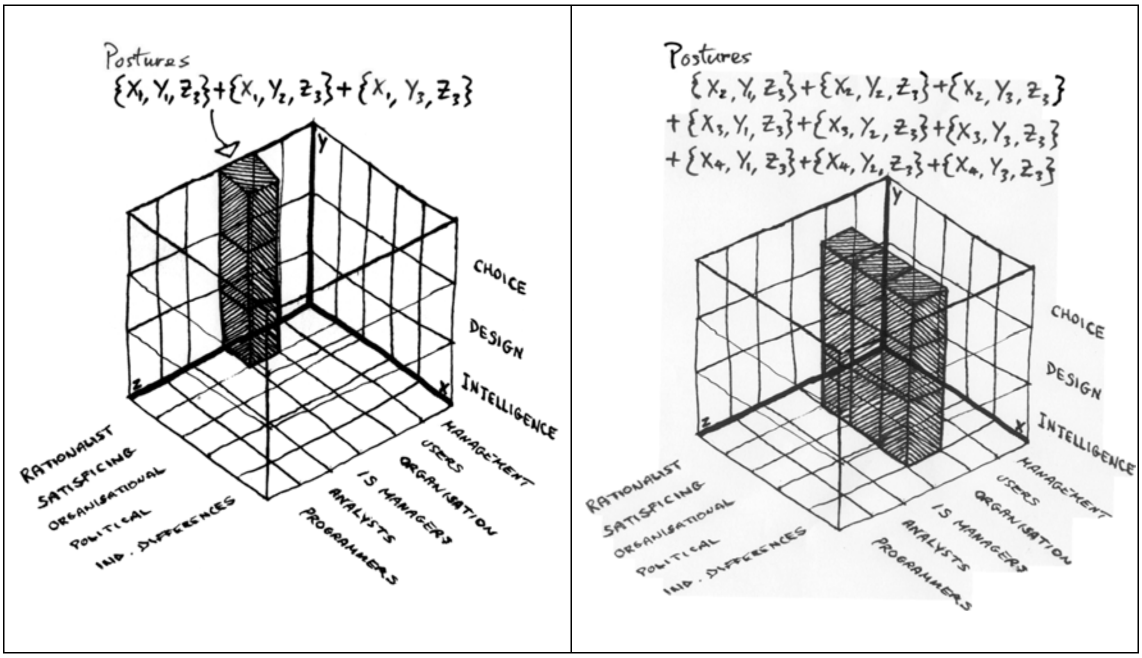

Figure 4(a) and (b). Illustrated espoused posture and posture-in-use

Another aspect of ISD that can be observed is that as a system’s progress advances, design elements change from abstract constructs to concrete artefacts. The shift in some actors’ decision-making behaviour may mimic the way a development process is generally abstract early on, because user requirements are unclear or unknown but eventually becomes tangible. For example, analysts may be more political or satisficing early in a project because much of what they do requires social interaction, conflict resolution skills and political astuteness. The framework can be used to illustrate this sort of observation.

5 DISCUSSION AND CONCLUSIONS

The paper discussed earlier the main perspectives on how IS project should be (or are) developed and how these approaches do not fully explain or express the complexity of ISD. It is contented here that ISD is, in essence, a problem-solving and decision-making process and that the framework can demonstrate a deeper understanding of differing viewpoints held by actors as well as other phenomena. The framework conceptualizes actors as active, not passive, subjects in the process who may change their decision-making style during the process as they ‘learn’ from contingent circumstances. This ‘individual’ rather than organizational learning is articulated in the posture of actors in the development process. Expressing decision-making postures that IS professionals and others involved in ISD hold should improve our understanding of how the ‘knowledge work’, discussed earlier, is applied. The framework can illustrate that learning is not always the explicit form of change and that actors can have a variety of motives for changing their behaviour during the ISD process.

It is an analytical and explanatory framework rather than a prescriptive one, clearly illustrating that systems development may be in part deterministic, in part without structure, creative yet somewhat ordered, improvisational yet explicit, and both rational and political. Earlier the framework was used to: demonstrate simultaneity in decision-making paradigms; changing actor’s perspectives; espoused postures and postures-in-use; the reality of incremental decision-making; and the benefit of being able to visualise configurations of postures. It was also suggested that actors might not be aware they are digressing from the decision-making approach they explicitly espouse. The author believes the framework has the flexibility to further analyse the ISD process to: reveal the operating circumstances within the IS unit to contribute toward a learning paradigm for ISD; illustrate actors views of how the process was (or even might be) traversed - effectively ‘perceptual trajectories’ through the process; how decisions might change in reaction to stimulants such as time, cost or shifting user needs; demonstrate different compositions of postures reflecting differing types of IS; and how the permeating influence of management on the process depends on their leadership style and the organizational culture.

The framework also suggests that competing ISD positions, positivism and interpretivism, co-exist within projects and within actors working on them. Rather than an alternative to the schools of thought on ISD outlined above in sections 2.1 to 2.3, the framework can be used to illustrate their co-existence and various phenomena that are manifest during systems development projects. Debates, often heated, over which general approach might be most useful has at times clouded the reality of just how complex, and sometimes contradictory, IS development really is. The framework demonstrates the pluralism of ISD - the normative view explicit in the conventional methodological approach contrasts with the descriptive reality that underlies the PSMs. Similarly, while structured methodologies can be overly visible the opposite is the case with improvisational decision-making, but they too may still co-exist.

There are limitations with the framework: it has not yet been empirically tested; it is conceptual and by its nature is not going to be a tool or method of analysis for practitioners; and it would be useful to demonstrate how social control is exercised over ISD decisions. Despite these shortcomings the framework can yield, through the analysis of postures, rich representations of complex interactions between actors, their decision-making approach and the ISD process itself.

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