Understanding the Situation of Information Systems Development Failure: A role for Pragmatism

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Action in Language, Organisations and Information Systems
The 3rd International Conference – ALOIS*2005
15–16 March 2005, Limerick, Ireland
Understanding the Situation of Information Systems Development

Failure: A role for Pragmatism

Abstract

Information Systems development is defective with continued patterns of failure. Positivist and interpretivist approaches to resolve these problems have only partially succeed, failing to account for situational problems. Drawing on pragmatism, reflective systems development and Nomology, and grounded in embodied cognition, we provide an account for this missing dimension in understanding information systems failure. Building on existing ALOIS research, we draw links to issues of theory and practice. The paper concludes with a proposal for linking this to the role of language and metaphor and includes an agenda for action and research.

Keywords: Pragmatism, Nomology, Reflective Systems Development, Information Systems Failure, Work Systems

Introduction: from communicating to understanding

Myth and narrative are human universals, present across all societies and cultures (Brown, 1991; Pinker, 2002). We may go so far as to say that storytelling is at the core of what makes us human (Dutton, 2004), that “telling stories precedes language since it is a condition for language” (Damasio, 1999). Our ancestors lived in a world of myth and legend. Good luck, bad weather, crop failure, were all seen evidence of the delight or wrath of the gods who could only be appeased through votive offerings. This construction of myth was a framework to explain the world, early attempts to understand the patterns of the world and to control thing not fully understood (Kaarst-Brown & Robey, 1999).

Our use of narrative frameworks continues in our personal and organisational lives (Kaarst-Brown & Robey, 1999). As systems builders and software developers we construct our own stories, our frameworks with which to understand the world. We are told to gather our requirements, build our data models and test our software. Often, too often our frameworks fail. Software development fails regularly (Standish, 1999, 2001) and sometimes catastrophically (Beynon-Davies, 1995), a concern explored by Dalcher in a previous ALOIS conference (Dalcher, 2003).

Approaches to resolving the problem of IS development have moved in two opposite directions. The initial pragmatic reaction to the problems of software development, problems - described in detail in the first Software Engineering conference in 1968 (Naur & Randall, 1969; Cockburn, 2004), - was been the move to more formality, more rigorous methods, and tighter project management in systems development. This was an attempt to turn IS development into a branch of engineering (Cockburn, 2004). The continued failure of IS development in organisational settings led to an equally pragmatic move by practitioners away from rigours definition detailed documentation to what are termed agile methods (Highsmith & Cockburn 2001; Cockburn, 2004). In academic terms the move towards more formal approaches could be termed positivist approach deriving from the natural sciences, and the move away from these approaches interpretive, deriving from the social sciences. The positivist/
Interpretivist division is the key fault-line in the study of information systems in organisations (Orlikowski & Baroudi, 1991; Ivari et al., 1998; Goldkuhl, 2003; Weber, 2004).

Concurrent with the problems of developing systems the issue of IT/Organisation Alignment is seen to be the most pressing concern for IS practice (Alter, 2002; DeMarco, 2002; Luftman & McClean, 2003). We propose that the two issues are intimately linked and we use the issue of requirements to link these ideas. Understanding requirements, indeed the very concept of requirements is a notoriously difficult topic (Parnas & Clements 1986; Brooks 1995). Increasing rates of change and increasing complexity of organisational difficulties and increasing information systems problems as organisational needs change (Cockburn, 2004), a problem predicted by Lyytinen (1987). Much of our organisational environment is emergent, a complex systems in which systems, individual and organisations act on and in turn are acted on.

Aligning or integrating IT within organisations and resolving the problems associated with software development are two aspects of the same problem, the difficulty of establishing shared understanding to enable action within organisations. Goldkuhl (2003) in a previous ALOIS conference has proposed adopting Pragmatism, as formulated by Pierce, James, Dewey and Mead, as a philosophical approach that goes beyond both positivism and interpretivism (described by Goldkuhl as antipositivism).

Charles Sanders Peirce was the first to formulate ideas about pragmatism. These were developed by William James. In describing Pragmatism James noted that "The term is derived from the same greek word Pragma, meaning action" James (1907) defined pragmatism as: "[a pragmatist] turns away from abstractions and insufficiency, from verbal solutions, from bad a priori reasons, from fixed principles, closed systems, and pretended absolutes and origins. He turns towards concreteness and adequacy, towards facts, towards action and towards power" "Grant an idea or belief to be true," it says, "what concrete difference will its being true make in anyone's actual life? How will the truth be realized? …” in short, what is the truth's cash-value in experiential terms?” (James, 1907 p 92.) John Dewey continued the development of pragmatism, seeing the truth as an instrument used by people to solve their problems. As our problems change so must truth change in our attempts to resolve our problems. “Pragmatists have been centrally concerned with doing, particularly forms of doing that entail making or producing something” (Cook & Brown, 1999). Fundamentally pragmatism is action oriented, a form of productive inquiry in which we generate theories about the world and test these in action.

Goldkuhl adopting Dewey sees in Pragmatism a reflective orientation to the world, embodied cognition that perceives a world where “when perceiving the objects around us, we perceive what they afford to us in terms of action possibilities; i.e. in what ways they are actable.” We understand the world in terms of our ability to act in and on the world, to better prosper in the world. Failures of action, such as failures of information systems development are failures of understanding the world, failures of understanding the context and failures of understanding the situation.

Following Dewey’s concept of inquiry Schön (1983) developed the concept of the reflective practice (Pakman, 2000). A key concern of Schön described by Pakman
was “the ways in which categories are used to examine “things” but are not themselves examined as ways of thinking.” We see in Goldkuhl’s adoption of Pragmatism an approach to examining the categories that underlie the problems of understanding information systems failure designed towards action, an approach also adopted by Cook & Brown (1999). We see in this the link to Nomology, the science of the laws of the mind, also rooted in practice. In reflecting on the categories used in information systems research we examine these as ways of thinking based on generic categories of the mind described by Nomology.

We do this in a number of stages. We describe the continual failure of information systems development despite an increase in knowledge over decades. We reflect on the main theoretical approaches to understanding and coping with these problems and describe that these - necessary - approaches may be insufficient for a complete understanding of the problem. We describe Nomology, the science of the laws of the mind and illustrate how concepts from Nomology, specifically the idea of convincing which takes place at a technical (positivist), contextual (interpretive) and situational (pragmatist) level provides us with generic categories within which to understand IS failure. We ground these ideas in Pragmatism taking the idea of embodied cognition as the root of language and understanding necessary for a proper synthesis of understanding in practice. We illustrate our approach with reference to a case study provided by Walsham in a previous ALOIS conference (Walsham, 2004). We draw parallels with both other theoretical and practical approaches, drawing the links between Goldkuhl’s description of Pragmatism, Reflective Systems Development (Mathiassen 1998), Nomology (Brugha, 1998a, 1998b) and the Work Systems Perspective (Alter, 2002, 2003).

In this paper we address a number of the themes of this conference. We build on work of previous conferences (Goldkuhl, 2003; Dalcher, 2003). We link the two main sub themes of the conference Action in Methods and Methods-in-Action’ with ‘Embodied IT-Mediated Action’. We suggest substantive overlap between different action-theoretic positions and propose a meta-theoretic approach to future research. We conclude by proposing links to the use of metaphor as an approach to language in action that relate embodied action and may help overcome the problems of IS failure in organisations We conclude with suggestions for developing this research and how it may benefit both theory and practice.

**Systems Development Failures: from Crisis to Chronic Disease**

Empirical evidence suggests that only 24% of Information Systems Development projects are delivered on time, on budget and with the promised functionality (Standish, 1999). Drawing on Standish (1995, 1999) and Jones (1994), in a previous ALOIS conference Dalcher (2003) points out the multibillion-dollar cost of these failures in the US alone. These problems referred to as the “Software Crisis” (Gibbs, 1994), stretch back over 30 years and are well documented in the literature (Brooks, 1987; Naur et al., 1976; Cockburn, 2004). The first NATO Software Engineering conference in 1967 was designed to explicitly address problems with the development of Information Systems. It suggested engineering reproducibility as the goal for software.

We adopt Dalcher’s (2003) approach in defining the failure broadly as encompassing both cancelled projects (failing completely) and challenged projects (those that
include projects that are late, over budget or have reduced functionality). So enduring are the problems of Systems Development that Pressman (1994) suggests the “software crisis” should better be called a “chronic affliction” in the sense of causing distress and persisting indefinitely (Pressman, 1994 p 17).

Understanding requirements is one of the critical tasks in the development process (Pressman, 1994). There is considerable support for the idea that issues in the requirements gathering is the cause of most problems with IS projects and merits serious attention (McConnell, 1998; Potts, 2001). Brooks (1995 p 199) has pointed out “The single hardest part of building a software system is deciding precisely what to build”. Parnas & Clements (1986) note “Determining the detailed requirements may well be the most difficult part of the software design process. We propose that the concept of requirements exposes the key problems faced by organisations. If we understand the organisational needs and purpose and the specific goals of the system then we can bridge the alignment gap and overcome the development disasters.

The problem of requirements is often seen as a failure of communication. The problem is we conflate communications with the signal processing problems of information theory ignoring that the “semantic aspects of communication are irrelevant to the engineering problem” (Shannon, 1948). In examining the failures of systems development Cockburn (2004) notes “Communication, which may be thought of as ‘touching into a shared experience’ with another person (Cockburn 2002a) takes forms that depends on the experiences shared between the individual people involved”. Meaning derives from the co-ordination of gesture and response through a social act. Symbolic reference (e.g. Metaphor) is central because in it involves others; it is a shared reference for people. Meaning is repeatedly created in the interaction between people (Maturana & Varela, 1992). Frequently this meaning is evoked through story critical to evoking shared meaning and shared understanding (Dalcher, 2003).

To resolve the problem of understanding in systems development we need to understand the problem. Halverson (2002) notes “much problem-solving effort is directed at structuring problems, and only a fraction of it in solving problems once they are structured” (Simon, 1996 p. 187). He describes “The problem-setting stage, where the issue is defined as a member of a certain class, as critical to understanding is the exercise of Aristotle’s concept of phronesis. Phronesis often translated as ‘prudence,’ ‘practical wisdom,’ or sometimes simply ‘ethics.’ It is an action-oriented concept, associated with doing the correct thing in a given situation, and is often characterized as wise deliberation.” It is an essentially Pragmatist concept.

There have been two broad approaches to structuring the problem of information systems failure: the systems rational or positivist approach, derived from the success of the natural sciences, and the human systems or interpretive approach, derived from ideas in sociology, philosophy and other social sciences. In the sections below we describe how these approaches have frames the problem and propose an additional frame to extend our understanding of systems development failure.

**Thesis – Positivism towards technical understanding**

Positivism can be seen as a child of the enlightenment. The project of the enlightenment was to use reason to free man from ignorance, superstition and tyranny
(xxxx). The intellectual openness of the enlightenment generated the conditions for the industrial revolution, and advances in science, medicine and technology. This positivist (modernist) paradigm is premised on the existence of ‘a priori’ fixed relationships within phenomena, which are typically investigated with structured instrumentation (Carroll, 2000). Positivism, based in the natural sciences, is premised on the view that science is a value free activity, which inevitably leads to the truth being discovered (Remenyi et al., 1997). Positivism employs a realist ontology and epistemology (Brannick & Roche, 1997 p xvi), seeing a deterministic linear, Cartesian world. It posits an objective ontology and epistemology, allows for the Cartesian division of the mind from the brain and focuses on manipulating the phenomena of nature (Pirsig, 1992).

Positivism’s success in information systems has come in addressing technical problems. The original success of Structured Systems Analysis was based on a technical problem - developing new electronic switching systems (DeMarco, 2002). Early successes in business software including the LEO project (Land, 2002) were more about resolving the technical difficulties of building a physical machine than understanding new business problems. Technical problems such as the Year 2000, and Euro conversion are easily amenable to positivistic approaches and best addressed using these approaches. Much as structural engineers deal with physical constraints when building bridges information systems are subject to the laws of physics. Issues such as data storage, transmission, processor design and development all benefit from a scientific design. From a systems perspective there is a significant class of problems, which benefit from a machine approach, typically the class of problems addressed using linear tools (Weinberg, xxxx).

Within IS, positivist dominance appears to derive from the origins of early Information Systems practitioners in the Engineering and Mathematics disciplines. The Information System profession started with a technical bias, and tools used successfully in one domain to address technical problems were adopted for more general use in commercial systems. DeMarco (2002) expressed surprise at the adaptation of Structured Methods in areas outside the control systems domain concluding that its appeal “the commercial to users was mostly due to a complete lack of a well thought out alternative”.

Positivism assumes the rationality of people and relegates social and cultural elements to the periphery. As the enlightenment freed man from the dominance of religion, it reduced his importance in the universe. Positivism begat a mechanistic view of the universe focussed on the formal rules of mathematics and “a penchant for rational mean-ends thinking, for planning, analysis, and final solutions.” (Dahlbom & Mathiassen, 1997). Man became reduced to an automaton in a clockwork universe. The logical apogee of this is embodied in the Taylorist notions of scientific management that have underpinned Western management thinking for much of the 20th Century (Remenyi et al, 1997; Introna, 1997 pp 82-117.)

Positivism in Information Systems treats all problems as technical problems and appears incapable of dealing with the contradictory and unexpected outcomes of IS Projects (Introna 1997). Much as if your only tool is a hammer all problems appear as nails the success of technical approaches. Cockburn (2004) points to the mechanistic view present in the first NATO Software Engineering Conference “Stability in our
goals, products and performances can only be achieved when accompanied by a sufficient supply of workers who are properly trained, motivated, and interchangeable."

The natural science perspective, rooted in the machine metaphor of nature, has led to a situation where IS practice is predominantly focused on positivist implementations of development methodologies such as the Systems Development Life Cycle (Fitzgerald, 1996, Fitzgerald & Howcroft, 1998). (See Brugha (2001) for a re-interpretation of the SDLC along the lines of the ideas discussed in this paper.) The problem according to Jung is “science works with concepts of averages which are far to general to do justice to the subjective variety of an individual life” (Jung 1995, pp 17). It ignores the concept of bounded rationality (Clegg, 2001). The consequence is that the underlying paradigm for many Information Systems development methodologies is a scientific reductionist one (Fitzgerald, 1996; Remenyi et al, 1997; Fitzgerald & Howcroft, 1998). The “software crisis” starkly illustrates the failure of positivism to solve problems that are not technical in nature. Positivism helps to solve the technical problem, it cannot resolve the contextual problems.

**Antithesis – interpretivism towards understanding of context**

The interpretive paradigm (Orlikowski & Baroudi, 1991; Klein & Myers, 1999) assumes that people create their own subjective meanings as they interact with the world around them. Much as the romantic response to the enlightenment attempted to replace the mechanical worldview with a naturalistic perspective (Dahlbom & Mathiassen, 1997), and the post-modern view challenged the modernist perspective (Carroll, 2000) the interpretative approach to Information System has challenged positivism. Interpretive research starts out with the assumption that access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings, hence, objective, value-free data cannot be obtained (Walsham, 1995). The intent in interpretive research is to “increase understanding of the phenomenon within cultural and contextual situations” (Orlikowski & Baroudi, 1991).

Interpretivism moves beyond the technical problems defined by positivism into addressing contextual problems of power, politics and culture in organisations. Interpretive methods of research in IS are “aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context” (Walsham 1993, pp. 4-5). Interpretive research is seen as important in understanding the social context of Information Systems (Robey, 1996; Avison, 1999; Lee, 1999). Direct comparison of Positivist and Interpretive methods has shown the interpretive analysis provides a different understanding of the same evidence and new information not found in the positivist analysis (Trauth & Jessup 2000).

Interpretive research rejects the systems rational perspective of positivism, which allows little understanding of the socio-cultural dynamics in play. Interpretive research recognizes that there are multiple stakeholders in any organization. Researching social reality becomes an organised discovery of how people make sense of their perceived world and how these perceptions differ from one person or group to another (Kelin & Myers, 1999).
Interpretivism has drawn on a deep set of philosophical theories to understand how individuals interpret their world. The use of Giddens’ structuration is valuable as an attempt to go beyond the subjective-objective dichotomy, encompassing both technical and contextual concerns (Orlikowski & Baroudi, 1991). Interpretive research has made a significant contribution to the information systems field through an exploration and a deeper understanding of the problems that beset information systems and by providing approaches to resolve problems that are not amenable to a positivist solution.

In a previous ALOIS paper (2004) Walsham drew attention to a problem of Information Systems failure. Walsham used structuration theory to address the difficulties with communication in a pharmaceutical sales organisation that sells medical supplies to hospitals. In this case Sales staff were required to enter structured (date/time of meeting, customer) and non-structured (meeting observations) information into a Lotus notes application. The ostensible purpose of the latter was to improve the sales process through staff measurement. Walsham noted contextual problems with the system – the potential users of the system saw little personal benefit in entering information into the system. Walsham rightly commented on issues of power in examining the problems. However, in his approach, he ignored how the situations to do with work pressures and tasks made it difficult for sales staff to use the information system. He focused only on contextual aspects to do with how they were organised and motivated as a team.

Interpretative approaches, while necessary, are insufficient and incomplete for resolving the problems of Information Systems development, focussed as they are on understanding over action. Goldkuhl (2004) cites Recher to state that “In the human realm, praxis (doing) has primacy over theoria (understanding) because all understanding must itself be the product of doing: whatever we know (understand) is the product of inquiry, an activity of ours”. Klein & Myers (1999) in describing principles for Interpretive research refer to the “principle of multiple interpretations” that are possible. From a pragmatic perspective Goldkuhl states “It is not enough to say that an interpretation makes sense; it must make sense practically”, echoing Pirsig’s description of James that “there can be many competing truths and it is value that decides among them”.

Goldkul (2004) saw that pragmatism had much in common with interpretivist approaches, rooted as they both are in constructivist notions. In its action orientation and theory testing aspects pragmatism is significantly closer to positivism. Where interpretivism and pragmatism part company is in the ideas of action orientation and the practical test of the value of a theory. Significantly interpretive research fails to address the situational aspect of Information Systems Development.

Synthesis: a pragmatic understanding of situations

Due to the continuing problems in information systems development, systems failure and poor organisational alignment we suggest that the approaches of positivism and interpretivism are incomplete. We propose that there is room for an additional perspective, which should be characterised as founded in the situational as distinct from the technical or the contextual concerns. The differences between the three
aspects reflect the stability of their concerns and the consequent usage of different time-frames with regard to decisions. Technical issues tend to be more stable, contextual issues in the middle, and situations tend to change frequently. The three interact with one another differently because they build on one another in layers. A sensible organisation starts by considering only what is technically feasible. Once that is done organisation then needs to determine contextual feasibility, is the solution acceptable within the organisation. (What is the point in getting organisational acceptability for many possible options when most are likely to be discarded on technical grounds?) Even after establishing technical and contextual feasibility an organisation should only proceed when the situation is right, does it make sense practically. (An idea could be great, and even acceptable to the organisation, but the time might not be opportune for its implementation.) Much as interpretivism established a new level of understanding beyond positivism we suggest that a situational approach enables a new synthesis of understanding of systems development failures in organisations. The situational approach does not subsume the others. It synthesises in the sense that it operates after the dialogue between the technical and the contextual, i.e. the technology and the organisation (the people), the scientists and the sociologists. This is difficult to understand in the abstract and we will underline our argument with reference to the Walsham case study.

In his case study Walsham focused on competing discourses of empowerment and control and almost recognised the situational aspect when he asked “Who required all this to happen and for what purpose? ... Senior management rhetoric encouraged team-working behaviour, but financial reward systems were largely on individual performance.” He ignores the business reasons for developing the information system. In focussing on context he distorts his example “by looking at the statistic of the number of contacts recorded by a salesperson. One interpretation of this measure is that it reflects how hard a particular person is working for the company. However, an alternative ‘reading’ is that what matters is whether sales are made, and that the number of contacts does nor reflect this at all. Even a simple numerical measure in a database can thus be interpreted very differently by different readers.” This view presupposes a simplistic metric, which isn’t focussed on the business concern.

In contrast to Walsham we suggest the organisation can measure - (i) contacts (ii) contacts per customer (iii) new business leads, and (iv) new business volume. It is also possible to measure the effectiveness of staff by looking at margin per deal, gross and net profitability, yield, return and any number of other metrics. These metrics are difficult to misinterpret. Significantly the sales company is not just a community. It is a business where the profit involves both money and healthy patients. We would agree with Walsham that incentives should not just be based on individual performance (self). However, there are two other candidates for inclusion: Walsham’s to do with teamwork and representation (contextual), and others to do with business success (situational). Both can be incorporated into a successful information system. We agree with Walsham that the contextual dimension was overlooked. We are unconvinced that resolving the contextual problems without including the situational concerns will lead to a successful outcome. In practice organisations have developed pragmatic methods such as balanced scorecards to address both contextual and situational aspects of success.
We see this as a shift in perception that leads to a better understanding of the organisational world. We see this approach as focused on responding to organisational goals rather than technical problems that one sees oneself or contextual concerns developed in working with others in organisations. We see in this approach a new way of looking at business problems that extends the work of both positivism and interpretivism. Consequently we see it as more attuned to business requirements. We see in this approach significant parallels with the Pragmatism described by Goldkuhl (2003), Reflective Systems Development & Work Systems (Alter, 2002)

This approach rooted in Nomology, the science of the laws of the mind is founded on the idea that there “exist regularities in human behaviour or societal processes that are common to all fields” which can be used to solve Management problems (Brugha 1998a, 1998b). The development of Nomology has focussed on Simons (1981) idea “Complexity frequently takes the form of hierarchy and that hierarchic systems some common properties independent of their specific content”, It derives from Kant’s idea that our knowledge of nature conforms to the structures of the human mind (Kant, 1985). It recognises Deweys idea that “The function of intelligence is therefore not that of copying the objects of the environment, but rather of taking account of the way in which more effective and more profitable relations with these objects may be established in the future.” (Goldkuhl, 2003)

This accords with developments in more recent biological theories of the mind and body (Maturana & Varela, 1992). Regularities in the mind, and the presence of human universals are a consequence of our evolutionary descent (Dennett, 1995). This underpinning for Nomology, has been confirmed by Neurobiology (Damasio, 1996), by the presence of human universals across all cultures (Pinker, 2002; Harris, 2000) and behaviours (Ekman, 1992). It reflects the commonality of universal grammar and the role of metaphor as a core constituent of language (Lakoff & Johnson, 2003).

Nomology is focussed on understanding the nature of problems. It works on the basis that people attempt to resolve complex problems by breaking them down into less complex ones using simple questions (Brugha, 1998a), reflecting our common mental structures. The answers to these questions are structured in terms of dichotomies, either/or answers (Brugha, 1998a). Nomology recognises that every system involving qualitative understanding will have an inbuilt tendency to try to find balance between all the relevant dichotomies. Nomology’s idea of balance parallels that of Fitzgerald & Howcraft (1998) who proposed the metaphor of polarity to analyse the notion of meaning, an idea also used by Carroll (2001). The idea being that magnets have both a north and south pole. Neither can exist without the other—remove the North Pole section of a magnet and a new magnet is created from this section with both north and south poles. “These poles exist not in isolation of each other, but by virtue of each other” (Fitzgerald & Howcroft 1998; Carroll, 2001). We much learn to live with these contraries (our dialectic paradoxes or dichotomies), which generates creative tension (Carroll, 2001).

In attempting to understand a problem we must be convinced of our understanding of the problem. Nomology shows that convincing is a three stage process. In understanding the requirements of a system we must be convinced that the solution is technically feasible. Many of the designs of Leonardo Da Vinci failed due to technical limitations of the 15th Century. Natural science is essentially technical and positivist;
it supports simple rules and models such as Brugha’s contention that there are a
limited number of simple qualitative structures. Information Systems can fail
technically. The failures of the Ariane 5 Rocket were technical (Lehman, 1998).
Understanding the nature of the problem must also convince contextually, taking into
account the perceptions of others. The social studies tradition is essentially contextual
and supporting multiple viewpoints (Brugha, 2001). Unless the problem is mainly
technical in nature, i.e. Year 2000, it is critical to understand the current organisational system. The work on power and politics within many studies has illustrated many of the contextual problems of information systems within organisations.

The structure of convincing includes a third branch that focuses on goals and
situations. This points to the need for a formal theoretical base for management
theory that is neither positivist nor interpretivist, but that relates to situations that arise
in management practice (Brugha, 2000, 2001). In line with the dialectical language of
thesis, antithesis and synthesis this third approach can be described as *synthesist*, in
that it contains aspects of positivism and of interpretivism, and more. Confining
one’s justifications either to a technical-positivist or a contextual-interpretivist
approach is not enough. Management is more than the proving of a case to oneself, or
of getting others to see the decisions made as acceptable to them. It also requires a
synthesis that leads to the achievement of goals in the light of the organisational
situations faced (Brugha, 2001). The situational aspect is inherently pragmatic.

The basic inference of Nomology is that qualitative structures are not unique to
particular subjects, times and regions. They are central to how the mind works and are
the reason for similarities between languages and cultures and academic fields. Nomology does not fit into any field; it is a meta-modelling approach that suggests
that the generic categorisations of human activities should be applicable to every field
including Information Systems (Brugha, 2001). The main point from Nomology is
that Technical / Contextual / Situational are three of a set. Each supports the others
and gives meaning to them. The positivist approach rooted in technical problems has
seen all issues as essentially technical in nature. The interpretivist approach has added
the contextual dimension to ensure that the concerns of people in organisations are
adequately addressed. The interpretivist approach in allowing for positivist solutions
to technical problems has seen all other issues as contextual and has failed to properly
address the situational issues. The synthesist approach is that you cannot separate the
context from the situations it deals with. Sometimes understanding the situation is the
best way to understand the tensions in the context.

**Understanding Information Systems Theory**

Iivari *et al.*, (1998) reviewed the fundamental philosophical assumptions of five
contrasting information systems development (ISD) approaches. Iivari *et al.*, (1998)
derive their classification categories from Burrell & Morgan (1979). Burrell &
Morgan classify social and organisational theories into four “incommensurable”
paradigms split on the basis of two dichotomies subjective-objective and order-
conflict. These classifications lead to four paradigms Functionalism (objective, order),
Social relativism (subjective, order), Radical structuralism (objective, conflict), Neohumanism (subjective, conflict).
Burrell & Morgan in stating the paradigms were “incommensurable” create significant problems for their approach and for theory that builds on their work. The first issue that that their dichotomies are not “incommensurable”. Orlikowski & Robey (1991) illustrate that interpretative research can encompass both objective and subjective positions through the use of strucruration theory. Kavanagh (1997), in a discussion of Actor Network Theory, points out some of the problems with Burrell & Morgan. Kavanagh notes that they co-opt Pirsig (1991) into the radical humanist school. Pirsig (1991, 1992) treated the subjective-objective distinction as parts of a spectrum generated by interaction of subject and object, a viewpoint incompatible with Burrell & Morgan taxonomy. Using Nomology we suggest that the dimensions of objective-subjective and order-conflict reflect interdependent polarities, commensurable with each other and ever present in practice.

Iivari et al., use Burrell & Morgan to compare a number of non-fucntionalist IS development approach including Professional Work Practice (PWP) (Andersen et al., 1990). The PWP approach emerged from empirical analysis of what systems practitioners actually do in practice. It has been influenced by organisational learning theory and led to the usage of maps for diagnosing problem situations and metaphors for generating visions to help guide practitioners. (Brugha, 2001). In an overlap with Nomology PWP includes the use of principles that are controlled via numerous dualities such as performance versus management, and planning versus evaluation. These mutually dependent dualities parallel the dichotomies of Nomology, either/or questions that must be addressed to fully understand the problem under consideration.

Iivari et al., have difficulty placing PWP into one of the four paradigms due to an “absence of an underlying philosophical framework” Brughs(2001). Iivari et al, by focussing on Andersen rather than Mathiassen, another primary contributor, appear to have missed or misunderstood the philosophical basis of the PWP approach. Mathiassen describe his approach as Reflective Systems Development, (RSD) and relates it to Schön’s concept of “Reflective Practice” (Schön, 1983).

Mathiassen (1998) make his philosophical approach explicit. He noted that it has significant elements of Functionalism Social relativism (subjective, order) and Neohumanism (subjective, conflict). We submit that this is a flaw in Burrell & Morgan taxonomy rather than a problem with PWP/RSD. We propose that by adopting Schön Mathiassen has adopted Dewey’s concept of inquiry and is firmly in the Pragmatic tradition. This is reflected in Mathiassens use of Pirsig1 (Greenbaum & Mathiassen, 1990) to illustrate the practice of teaching Information Systems Development. In his concern with first principles Mathiassen based his approach on a metaphysics2 of practice, situated in dialectics. Mathiassen’s use of dialectics is focussed “on contradictions, the relations between them, and the opposites and relations that constitute them.” Mathiassen approach is Nomological and is supported by Nomology.

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1 Pirsig (1992) draws explicit links between his approach and William James’s pragmatism
2 Metaphysics is defined as “the branch of philosophy that deals with first principles, esp. of being and knowing”
Nomology, Pragmatism, from Information Systems Theory to Work Systems Practice

In linking Reflective Systems Development, with Nomology we recognise deep links between the development of Nomology and Pragmatism. Nomology derived from the evaluation of practical problems in Management Science, which led to the development of the generic structures. Nomology and Reflective Systems Development embody the virtues of pragmatism as described by Goldkuhl (2003) who points to “the fundamental dialectic of pragmatism, the dialectic between knowledge and action: “Proper action is knowledgeable action. Proper knowledge is actable knowledge.”

The is a restatement of Aristotle’s phronesis:, doing the correct thing in the correct situation; pragmatism taking account of technical, contextual and situational concerns. Information Systems are not an end in themselves for organisations, instead they are a means towards an end. In seeking a core for the IS profession Bacon & Fitzgerald (1997) describe this as “Information for Knowledge Work, Customer Satisfaction & Business Performance”, and see it as a underlying theme for the Information Systems field. In a parallel approach Alter (2002, 2003) has developed the work systems framework to address the specific issues of information systems failure and IT/organisational alignment. Alter’s framework is based on practice, and in both Alter and Cook & Fitzgerald we see the concern with the situational aspect of Information Systems.

Alter (2003) defines a work system as “a system in which human participants and/or machines perform business processes using information, technologies, and other resources to produce products and/or services for internal or external customers.” Alter’s framework grew from knowledge of the failure of information systems in organisations and of the poor integration between IT and the wider organisation (Alter, 2002). Alter recognises the contribution of interpretivism with its contextual focus on “multiple priorities, objectives, and measures of performance related to different components and from different stakeholder viewpoints”. (Alter, 2003). In parallel with Nomology Alter proposes the need to move beyond the pro-humanist pro-management dichotomy.

Understanding requirements thus focuses on understanding the situation the Work System must serve. Developing successful systems this means addressing technical, contextual and situational concerns. Alter recognises the importance of measurement (a positivist/technical view), social organisation (an interpretive/contextual view) and organisation situation (a synthesist view) in his description of Work Systems. It appears to encapsulate the Pragmatic ideas of Goldkuhl (2003), the Reflective Systems of Mathiassen and the Nomological concerns of Brugha (2000), into an Action oriented approach to Systems Development

Summary, Conclusions and Suggestions for Action & Research in Organisations

In this paper we have considered the problem of Information Systems development and the integration of IS and broader organisation. We have addressed this as a problem of understanding, and used the concept of requirements to aid this
description. We have described the approaches of positivism & interpretivism and how they have addressed these issues. We described how their success has been circumscribed due to a failure to address situational factors. We have described the existence - explained by Nomology - of generic structures which allow us understand the elements of technical, contextual and situational factors which must be addressed in developing information systems.

Based on our work here we believe there are a number of areas of further theoretical action oriented research. Dalhbom & Mathiassen (1992) describe the focus of Information Systems as based on Artefact, a concern with the technical. They see the other focuses as being a culture and a power focus, both concerns of context. We agree with Alter (2002) that a a focus n the IT Artefact) is a regressive move for the study and practice of Information Systems in organisations. We suggest that we need to expand the focus of the Information Systems field to a Work System serving situational needs within an organisation as well as technical and contextual needs.

C. K. Chesterton wrote, “The essence of the picture is the frame.” For organisations the essence of their reality is their organisational framing. In Information Systems the immediate question is how do we alter the framing around systems failure, adding the dimension of Situation to that of Technical and Contextual understanding. Nomology proposes there are regularities in the human mind that are present in every field. The overlap between Reflective Systems, Work Systems, Nomology and Pragmatics points to preexisting structures we need to understand to successfully develop information systems. We point to this approach as a Metaphysics of Practice. We believe this advances the theoretical framing information systems.

We see the central role of language, not for communicating information but for guiding behaviour both of the self and of others to action. Flores and Ludlow introduced the concept of Language Action perspective, arguing that human beings are “fundamentally linguistic and act through language” (Schoop, 2001). We propose that the presence of generics in language is illustrated by the central role of metaphor (Lakoff & Johnson, 2003). Building on the idea of generic structures we believe that we can best resolve these problems by addressing generic structures of communication: metaphor. We suggest a need to understand the links between metaphor, human understanding, action and systems development. There has been scattered recognition of the role metaphor in Information Systems. Winograd and Flores (1986) recognised “the role of analogy and metaphor will be more central when the focus is on patterns of discourse between individuals what a shared background rather than on deductive inference from axioms”.

We suggest this approach, as our aim is not simply to understand failure, we wish to limit the future incidence of information systems failure. Understanding is the first step in resolving the problem. Understanding is defined as firstly comprehending and secondly grasping a concept. Comprehending is perceiving, comprising or embracing. In this simple example we illustrate the physical and metaphorical nature of understanding and reflection and how it can be an aid to communication.

We propose that to understand situation and to deepen our understanding of context we need to understand the metaphors that individuals and organisations use. Metaphor is central in enables people to understand, reason about and explain abstract concepts.
Describing the conceptual difficulties that can arise when groups are working with different metaphorical concepts grounded in their personal experience can, we believe, highlight poor communications. We also suggest how that metaphor can provide a way of “partially communicating unshared experiences” (Lakoff & Johnson, 2003) and can form an aid for improving communication particularly in cross-cultural situations. To develop this research requires an overview of metaphor theory from the perspective of communications in Information Systems. Potts (2001) comments “Metaphors suggest ways to translate the authoritative specification into more accessible, local descriptions.” This research will require consideration of technical, situational and contextual issues related to metaphor. We also see the need to develop the concept of applied metaphor theory as a technique for developing understanding of requirements in organisations. We see the need to build on the theoretical work through the development of case studies and action research. The development and use of metaphor should be compared and contrasted with Professional Work Practices which uses Metaphor to guide to generating organisational vision.

A further significant piece of action research suggested by this paper is to test the Work Systems Approach in practice to determine if it fully addresses the situational aspect of Information Systems development. This research should also determine if its treatment of language and understanding is the same as Reflective Systems Development and Nomology. Work resulting from this approach can be combined with the results of the investigation of metaphor as Nomological structures for shared understanding.

A recent development of practice has been Agile Software Development (Fowler, 2002; Highsmith & Cockburn, 2001). Cockburn (2004) suggests the need for an adjunct model, picking up aspects of a mental craft, needs to be added to Agile Development. “This adjunct model will want to incorporate Peter Naur's consideration of programming as "theory building," Donald Schön's idea of "reflective conversation with a situation," and the issues of efficiency, manipulability and aesthetics of the program”. We believe that Reflective Systems Development and Nomology may address his need. Agile methods also incorporate the use of narrative into systems development. Dalcher (2003) proposes that “Combining case histories with narrative descriptions is likely to lead to clearer failure stories”. We suggest that there are some shared presence of narrative, together with its general presence in human life is worthy of investigation as route to enhanced understanding of IS development in organisations.

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