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BEDNAR, PETER

2016

*Document Version:*

Publisher's PDF, also known as Version of record

[Link to publication](#)

*Citation for published version (APA):*

BEDNAR, PETER. (2016). *Complex methods of inquiry: structuring uncertainty*. Lund University Press.

*Total number of authors:*

1

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# Complex methods of inquiry: structuring uncertainty

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# Complex methods of inquiry: structuring uncertainty

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DOCTORAL DISSERTATION

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Department of Informatics, Lund University, Sweden

To be defended at EC2:101, Holger Crafoords Ekonomisentrum

Friday, 13<sup>th</sup> May, 2016 at 10:00h.

*Faculty opponent*

Seniorprofessor Per Flensburg, Ekonomi & IT, University West, Sweden

Organization LUND UNIVERSITY School of Economics and Management Department of Informatics Ole Römers väg 6, SE-223 63 Lund Author(s): <b>Peter M. Bednar</b>	Document name DOCTORAL DISSERTATION	
	Date of issue 13th May, 2016	
	Sponsoring organization	
Title and subtitle: <b>Complex methods of inquiry: structuring uncertainty</b>		
Abstract  Organizational problem spaces can be viewed as complex, uncertain and ambiguous. They can also be understood as open problem spaces. As such, any engagement with them, and any effort to intervene in order to pursue desirable change, cannot be assumed to be just a matter of 'complicatedness'. The issue is not just a need to cope with dynamics of system. It is also the perceptual 'boundedness' of multitudes of assumptions about scope of whole and limitations of organization as system. Furthermore, explicit attention to complexities of feedback loops is an extremely important aspect of any systemic discussion. How can we help teams of competent professionals to engage purposefully with such uncertain and ambiguous problem domains? The author suggests that we can only address this effectively through pragmatic efforts to incorporate a multitude of boundary-setting assumptions, explored as part of active (self-) reflection and practical engagement. This must be undertaken without resorting to an overly simplistic application of convergent thinking in our efforts to support problem solving. Instead, we need to pursue divergent thinking and 'complexification' in our effort to support problem resolving. The main contribution of this thesis is to present a collection of principles that taken together, provide support for this engagement intervention. A core feature of this result is the framework for Strategic Systemic Thinking, which includes examples of pragmatically useful methods and tools.		
Key words		
Classification system and/or index terms (if any)		
Supplementary bibliographical information	Language: English	
ISSN and key title: <b>1651-1816 Lund Studies in Informatics No14</b>	ISBN 978-91-977186-8-4 (print) ISBN 978-91-977186-9-1 (electronic)	
Recipient's notes	Number of pages <b>xxx</b>	Price
	Security classification	

Distribution by (name and address): **Department of Informatics, Ole Römers väg 6, 223 63 Lund, Sweden**

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ISBN 978-91-977186-8-4 (Print)  
ISBN 978-91-977186-9-1 (Electronic)  
ISSN 1651-1816 Lund Studies in Informatics No. 14

Printed in Sweden by Media-Tryck, Lund University  
Lund 2016



## Abstract

Organizational problem spaces can be viewed as complex, uncertain and ambiguous. They can also be understood as open problem spaces. As such, any engagement with them, and any effort to intervene in order to pursue desirable change, cannot be assumed to be just a matter of ‘complicatedness’. The issue is not just a need to cope with dynamics of system. It is also the perceptual ‘*boundedness*’ of multitudes of assumptions about scope of whole and limitations of organization as system. Furthermore, explicit attention to complexities of feedback loops is an extremely important aspect of any systemic discussion. How can we help teams of competent professionals to engage purposefully with such uncertain and ambiguous problem domains? The author suggests that we can only address this effectively through pragmatic efforts to incorporate a multitude of boundary-setting assumptions, explored as part of active (self-) reflection and practical engagement. This must be undertaken without resorting to an overly simplistic application of convergent thinking in our efforts to support problem solving. Instead, we need to pursue divergent thinking and ‘*complexification*’ in our effort to support problem resolving. The main contribution of this thesis is to present a collection of principles that taken together, provide support for this engagement intervention. A core feature of this result is the framework for Strategic Systemic Thinking, which includes examples of pragmatically useful methods and tools.

The narratives which follow form the substance of my thesis for the award of Doctor of Philosophy. They comprise a reflective commentary setting out the key themes, concepts and contribution, and five published papers to be read in conjunction with that commentary.



*In memory of my Mother who noted the positive and beautiful things in life*

*Dedicated to my Father, Sisters, Daughters and loving Wife*

## Acknowledgements

One of the key moments in my academic journey was initiated by my supervisor, Agneta Olerup. Agneta invited me to participate in a postgraduate seminar series, I had then not yet finished my undergraduate degree and was rather surprised by the whole idea. She reassured me that it would be an experience which I would both enjoy and cope with. She was correct. Since then I have found that research discussions can be significantly more rewarding than traditional academic education. Throughout the years Agneta never gave up on my efforts and gave me just the right support when needed. In my exploration of the topic Hans-Erik Nissen was one of the greatest source for inspiration and I cannot imagine anyone more academically minded than him. His enthusiastic pursuit of knowledge and his inquiring mind created amazingly challenging discussions. The lessons from the conversations with Hans-Erik could not possibly be overstated. Of course when Nimal Jayaratna in 1999 hired me to work on my own research as part of a two year project on IS Methodology (initiated together with Peter Checkland) I was very pleased. This led to my first publications in English. In the years 1999 to 2006 I got the opportunity to meet Enid Mumford several times and her comments were both insightful and pleasantly reflective. Also David Wastell and Ranulph Glanville who over the years quite enthusiastically supported the idea that research certainly does not have to be mainstream to be meaningful and interesting. Then there were the many discussion sessions organized by Gerard de Zeeuw and Raul Espejo which were always very challenging indeed, inspirational and supportive. Between the years of 2006-2008 I also had the opportunity to be involved in a series of deep and insightful discussions with Heinz Klein on Critical Systemic Thinking which were both lively and enjoyable. Additionally since 2006 until 2011 I had many helpful and re-occurring conversations with Alessandro D'Atri. Over the years I have had many challenging, deep and insightful discussions with my main research collaborator Christine Welch, it is quite certain that without the many discussions with Christine my academic life would have been much poorer. Not to mention the many papers that we wrote together as a consequence of our many conversations and explorations. Christine made a huge contribution not only in the academic sense but also in trying to translate my \*Swenglish\* into something that might pass of as English. Of course there are so many people who over the years were of great help in my endeavour and there is only so much space. I apologize for not mentioning all of you. My thanks goes to all of the people who have one way or the other been involved in my efforts.



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# Preamble

This text is about a journey. This journey began when I worked as a professional engineer, and progressed over a period of 20 years during which I worked as a professional analyst, academic and teacher, and engaged in reflective study, reading and thinking. In the sections that follow I describe the thinking by which I came to focus upon certain concepts as crucial for effective Systems Analysis/Inquiry, and to develop my own perspectives on those concepts, which later formed the foundation for a body of work comprising more than 100 publications. The work is thus the result of reflection on success and failure, thinking and re-thinking, including a consequential struggle for conceptualization and understanding.

The first section is an introduction, summarising the essence of the thesis that is elaborated in these documents. This section effectively explains the substance of the thesis and sets out my original contribution to the Information Systems field. The next section is a reflective commentary on words, assumptions and ideas influencing contextual inquiry, after which is a section on Primary Contribution, including a short summary of, and introduction to, Contextual Inquiry. An overview of the selected papers is set out, including a structured analysis of the papers that shows where the key themes are taken up and developed within the body of work. The selected full papers accompany this document.



# 1 Introduction

I must begin by pointing out that this work is not concerned with discussion of IT systems or software development. A well-designed piece of software will do what the designers intend it to do. If appropriate attention is given to design of the system for using this software, it will support those tasks that those who commissioned it wish to have supported. However, it is this system for use that is so often neglected. Too often, criteria for usefulness are ill-defined and fail to reflect the contextually-dependent nature of human work. It is on these design issues that my attention is focused. The target area for discussion in this thesis is the concept of an informing system, i.e. one that enables a person to inform himself or support others to become informed about some problem domain(s) [Paper 5]. Observation, study and reflection over a number of years have led me to perceive such systems (of which a business organization is one example) as complex, open systems subsisting from moment to moment through the interactions of the human individuals who inhabit them [Paper 3].

While I acknowledge that usability of IT/computer-based ‘systems’ is important, this is not an area on which I have chosen to focus. What is of interest to me is inquiry into, and reflection upon, support for engagement in (re-)design of organized human activity. When talking about Information Systems (IS) the focus of attention is not related to technology, but rather on human communication and interaction – on *usefulness*, rather than usability. As Langefors (1995, p.56) has pointed out, a data system can only become an informing system with the engagement of a person who interprets that data. He also suggested that interaction and exchange of data is so fundamental to the operation of all the functions of a business organization that it becomes difficult to separate the organization from its Information System conceptually – they are effectively one and the same (Langefors, 1995, p.53) [see discussion in Paper 5].

I have suggested a possible definition for the term Information System as “...systems where information technique is used for information treatment,



*which aims to transfer 'messages' in time and space"* (Bednar, 1999). However, further clarification is needed in practice. It would be possible to interpret such a definition in a restricted way - IS1 - that might be considered to refer to individuals and their use of hardware and software. Such a restricted interpretation could be expanded, however, to include the range of inter-individual communication activity - IS2. If organizations are seen as comprised of individuals, interacting within social communicational networks, then IS2 may be viewed as equivalent to the organization in context, rather than as a sub-system only. It follows that successful use of definition IS1 would need to presuppose active consideration of IS2.

Empirical studies (Bednar & Wang, 1994) highlighted problems that may arise when the information system is viewed as merely a sub-system within a business. If managers lose sight of the close connection between IS development and organizational matters, there is a danger that development becomes fragmented and the synergy of the system is also lost. Furthermore, efforts to 'align' IS design with strategic objectives can be seen to be futile. Designers are not faced with a task to create a technical system that can interact with an essentially separate social system, or even an aligned social + technical system. What is needed is to form an integrated view of a socio-technical problem space.

In essence, this work is concerned with exploring support for human inquiry into *organizational problem spaces*, by reflecting upon and going beyond the socio-technical dimension. This is realised by developing approaches to contextual analysis and inquiry; building a foundation for identifying contextual dependencies; and developing techniques to support people to explore and elaborate upon multiple levels of contextual dependencies within their own problem spaces [Paper 1].

All of the above are both theoretically grounded and based in reflection upon experience. In particular, there has been an effort to develop theory relating to contextual analysis/inquiry. NB When using the term '*contextual analysis*' in this work, I am referring into a process of inquiry into contextual dependencies. This incorporates a need not just to 'break down' as the term analysis implies, but to build up or '*complexify*' a problem space (e.g. Bednar and Welch, 2007b). To view experienced phenomena (or problem spaces as systems) from multiple systems perspectives. Theory is related to practice in order to justify and develop methods/approaches. Thus, I consider and discuss Systems Thinking and Systems theory, referring to work by Vickers (1965,

1970); Churchman (1971; 1979); Bateson (1972); Checkland (1981, 1999), Ulrich (1983; 2002) and others. I discuss theoretical underpinnings of Information Systems, drawing upon work by Langefors (1966; 1995); Mumford (1983); Checkland and Holwell (1998); Ciborra (2002); Nissen (2002); and others. I also pay attention to the nature of information, distinguishing it from data and exploring its relationship with phenomena such as human knowing (Bateson, 1972; Langefors, 1995).

Throughout my work, I pay attention to the philosophical foundations of our understanding of ‘information’ and ‘communication’, taking into account work by e.g. Radnitzky (1970); Habermas (1984); Klein and Hirschheim (1983); Klein and Myers (2012) and others [Paper 4].

This work differs from other work through incorporation of all of the following:

1. Focus is primarily on change of complex human activity systems (HAS) [Paper 1].
2. Stance is explicitly critically informed and systemic [Paper 1, 5].
3. Systems are viewed as emergent, bounded and observer dependent [Paper 2, 3].

I developed the Strategic Systemic Thinking framework (SST) in response to theoretical and practical discussions of a number of practical problems. The framework addresses a perceived difficulty in overcoming lack of understanding of methods (as outlined above). In the course of my journey, both as a student and as a professional, I have come upon many examples of potentially helpful approaches.

My concern is that the guidance on use provided by the authors of these methods appears to be either *insufficient* or *ignored* in practice. Thus, readers are not prompted successfully to recognise a need for contextualisation (see discussion in Bednar and Welch 2008c and Jackson 2010). Examples considered have included Object Oriented Analysis and Development, OOAD (Mathiassen et al, 2000), Soft Systems Methodology, SSM (Checkland, 1981) and Effective Technical and Human Implementation of Computer based work Systems, ETHICS (Mumford, 1983). These authors make efforts to promote the idea that the descriptions and exemplars given by them are for pedagogical purposes and illustration.

*‘We have now set out the basic ideas which underlie this book. The basic concept ... has been elaborated ... and the process ... has been naively illustrated using the simple model of Fig ... In the later chapters the process ... will be expressed in more sophisticated terms, and the sequence of systems studies described in Chapters ... illustrate it in action, showing it in very different contexts and making the point that the formal expression of SSM does not mean that it has to be used rigidly.’* (Checkland and Scholes, 1990, p.7)

In his 30-year retrospective, Checkland suggests that Mode 2 of SSM, in contrast to Mode 1, is situation driven:

*‘... it follows from these that there will never be a generic version of what happens in ‘near-Mode2’ studies precisely because they are situation-driven. Perhaps the best approach to understanding internalised SSM in action is through examples’* (Checkland, 2000, p S39).

Mumford also makes an effort to make this issue explicit in her overview of the ETHICS methodology:

*‘The ETHICS method described below emerged less from theory than from practice and from working with many different groups. ETHICS stands for the effective technical and human implementation of computer-based systems. It is not intended to be a blueprint for systems design but merely a set of logical procedures which design groups can use in any way they want. You may wish to follow the process as it is set out or prefer to “pick and mix” or just use parts of it. This is entirely up to you’* (Mumford, 2003 p 267).

Again the same point is made by Mathiassen et al:

*‘The OOA&D method offers two simple frameworks: the first gives readers insight into the computerized system, and the second focuses on the system’s context. These two frameworks are used throughout the book resulting in a simple, coherent presentation.*

*Nonetheless, this is not a book of recipes to be slavishly followed. The authors’ approach is pedagogical. The book’s structure, concepts, guidelines, and examples are designed to help the reader understand analysis and design practices, and to reflect critically upon them’* (Mathiassen, et al 2000, p. vii).

The proposition from author to reader is:

*please do not use the method or methodology as I have described it. These are exemplars, case studies, ideal models for communicative purposes and not to be followed as explicit recipes.*

This can be seen clearly in the comments made by Checkland (2000) and Checkland and Scholes (1998) above. Such efforts can also be seen in the works of Wittgenstein (1965) and his discussion on language games and their role in contextualisation and internalisation of meaning. Morgan's (2006) discussion of '*imaginisation*' shows that, while provision of exemplars may be important, it is essential to have a number of different illustrations in order to avoid confusion of 'map' with 'territory' in the mind of the reader. It could be argued that exemplars given within the IS texts are often too few (or too similar) and so make it more difficult for the uninitiated to overcome the stranglehold of finite boundaries. An example of good practice here can be found in Mathiassen's et al (2000) work on Object Oriented Analysis and Design, for which he gives four examples from widely varying contexts and problem types to develop the reader's understanding (e.g. conference planning, hair salon, rescue station and cruise control).

Perhaps there is a need for provision of more examples that are different but still recognizable as 'the same'. The idea is that if we want people to overcome the potential entrapment of mind, which could be the result of any one given example interpreted as a recipe, it would be necessary to introduce ambiguity and uncertainty as part of the dynamics potentially recognizable between different examples given (Bednar and Welch, 2008c). Little discussion is given to boundaries or constraints and limitations of methods, or to suggestions for how to overcome them. An exception is found in the work of Ulrich (1983) on boundary critique. This has led to other useful work in the same field, e.g. Bergvall-Kåreborn (2006).

Much critique of methods such as the Soft Systems Methodology is based on lack of clarification of the limitations, which misleads those attempting to use them. One difficulty arises from what appears to be lack of engagement and oversimplification on the part of those applying such methods (see, for example, analysis in Williams 2007, discussed in Bednar and Welch, 2009d). I perceive these to arise from a number of causes, such as fear of uncertainty, desire for a 'silver bullet' which will achieve results without effort, and exclusion or disqualification of the affective domain from interactions relating to problem spaces (Bednar and Welch, 2009e).

When working with organizations it is necessary to consider both individual and collective aspects of emergence arising from human interactions in contexts [Paper 2; 3] (Bednar, 2007; 2009). Thus, it is important to consider people as human beings, occupying and navigating life among many different human and professional aspects (see also Ciborra's discussion of 'being there' (Ciborra and Willcocks, 2006), drawing on his reflections on Heidegger (1962). The organization cannot function effectively otherwise. There is also a need to understand how industrial society has become part of knowledge society. Contextual analysis/inquiry is needed in order to improve understandings of, and by, human beings within organizational problem spaces [Paper 3].

Thus, development of the contribution described here moves from theory, to method/approach, to support for practice of method on an iterative basis (including the interrelatedness of these aspects). Development progressed through critique of assumptions upon which various methods/approaches are presented. My perspective was inspired by Hermeneutic-Dialectics (HD) (see Radnitzky, 1970; 1973), since I found none of a range of alternative approaches based on an interpretive stance to be adequate to take into account the impact of multiple understandings and purposes of individually-unique subjects [Paper 5].

Reflection upon experience suggested that too often both theory and practice are pursued with insufficient rigour by professionals who are unwilling or unable to make the necessary efforts to deepen their understandings, and who consequently make a quantitatively substantial but qualitatively simplistic effort. As US Justice Louis Brandeis (1928) once warned:

*'The greatest dangers to liberty lurk in insidious encroachment by men of zeal, well-meaning but without understanding'.*

Perhaps this is also influenced by their education? Defensive routines are often adopted which prevent effective critique of either understanding or application (see Argyris, 1990). There is a discernible difference between interpreting phenomena and taking responsibility for the results of such interpretations (Lyytinen and Klein, 1985; Klein, 2007; Myers and Klein, 2011) (See discussion in Bednar and Welch, 2008d).

As Checkland and Scholes (1990) point out in their discussion of Mode 2 SSM, it is necessary to recognise a political dimension in all organizational analysis/inquiry and change which takes place by design. Therefore, the focus

of the methodology switched from method (-ology) itself, to context (cf Checkland, 2000, S38). As Checkland expresses it:

*'... much reflection went on concerning how we went about 'reading' situations culturally and politically, and it was a significant step forward when SSM was presented as an approach embodying not only a logic-based stream of analysis (via activity models) but also a cultural and political stream which enabled judgements to be made about the accommodations between conflicting interests which might be reachable by the people concerned and which would enable action to be taken'* (Checkland, 2000 p.S21).

Thus, there are always socio-cultural barriers to be overcome [Paper 5].

Dahlbom and Mathiassen (1993) have identified a similar problem but have a different proposed solution. Practice needs to be developed. The critique set out above suggests that it is necessary to develop a toolbox containing examples of usable *methods/approaches, tools and techniques* (including the range already familiar to practitioners) with illustrations demonstrating their potential use in *context* (Bednar and Day, 2009).

However, these alone are insufficient. Guidelines are then needed to support users to develop their own context of use and create suitable *methodology* (if the critic is intending to 'walk the talk'). It is this recognition that has informed the substance of my work, and SST is an example of a framework, in which a range of methods/approaches are combined in order to meet these requirements [Paper1, 5]. Thus, the primary proposition in this thesis is that people need to have a toolbox available with which to approach their analyses/inquiries into complex problem spaces. The secondary proposition is that there is a need to address a meta-level – a system for use of that toolbox to support inquirers' engagement.

## 1.1 Research Question

Many people have attempted to produce tools, techniques, methodologies and approaches for inquiry into business systems that would represent '*best practice*', i.e. enable requirements to be specified '*accurately*' and richly in order to support design of improved systems. When people try to use methodologies (best practices), many strengths and weaknesses have been

experienced as a result of practice. However, although we have a panoply of methods/approaches available, the results of analysis/inquiry are often disappointing and the richness we desire is still elusive. This is because we lack a system for use of tools and techniques for analysis/inquiry that can enable us to uncover the elusive ‘*in-betweenness*’ – the contextually-relevant understandings that could supply a basis for the incorporation of efficacy, efficiency and effectivity as part of design practice. It could also be argued that there is a lack of ‘*breaking new ground*’, in other words lack of new thinking and creativity, when ‘*design*’ becomes an exercise in the form of conversion of old routines into new [Paper 1, 5].

The question to be addressed in this work is therefore, *what would such a system for use be like in order to surface (disclose) understandings of contextual dependencies by the unique individuals engaged in a system of work?* Actually, individuals must surely create their understandings in the process of surfacing them [Paper 1, 4, 5].

When considering this question, a problem of contextualisation arises as a consequence. Is it possible to make a description of method/approach that addresses this meta-level problem, which is at a new level of abstraction? The discussion then moves to a different level of abstraction, approaching second order learning.

Car example – when tuning the engine of a ‘mature’ car, it is no use to follow the parameters set out in the manual which were relevant for a new one. All the parts have been changed through their unique history of use leading to wear and it is necessary to try different settings and ‘listen’ to the result, i.e. to deal with contextual dependencies (e.g. ‘situated-ness’).

This effect of this realization means that the question changes. How can we (e.g. as systems analysts, business analysts etc.) help groups of organizational actors (e.g. employees) to address complex, uncertain and ambiguous problem spaces? [Paper 1, 3]. Systems Inquiry, as related to Information Systems as a subject, can be focussed on development of technological support for organizational use, i.e. development of clever technology. It can also be focussed on development of organizational behaviour, i.e. development of useful and clever use of technology. In this work, I am mainly interested in support for organizational change and development towards desirable organizational behaviour. That is, desirable from the point of view of involved organizational actors: those who are supposed to benefit from

changing their behaviour as part of their problem solving efforts [Paper 5]. While it is possible to view 'problems' experienced by some individuals as 'caused' by others (who may or may not be involved in the change project), the focus of this work is to provide support for those who are actually engaged in the change efforts concerned. The research question thus centres on ways in which people may address (their experienced) problem spaces by exploring and surfacing their understandings of multiple levels of contextual dependencies [Paper 1]. It is here important to distinguish between 'problems' (which might be understood as some kind of 'objects'), problematic situations (which might be understood as some kind of 'phenomena') and problem spaces (which is not limited to some identified or pre-defined 'problem', but is intended to highlight the lack of precision and certainty of what may or may not be a relevant problem to address).

I make the underpinning assumption that all individual people are unique and that they make sense of their world contextually. Thus, every individual's understanding may be different and no one understanding represents 'the true picture' [Paper 4]. Furthermore, people take their sense-making for granted from moment to moment and they 'know' many things tacitly, without expressing their significance to themselves or anyone else. Thus, individuals need support to explore and surface their own contextual understandings and to exchange these views with one another (and to free themselves from old pre-conceived structures).

When addressing a problem, therefore, although an individual may have a toolbox of useful techniques available, e.g. recognised and tried methods and methodologies, each person will need to create his/her unique system for using those tools in context and each group of people will need to share and explore creation of a collective system for use. The overall research question is therefore, how may people be supported to do this? This can be addressed both at a meta level in combination with situated adaptation of flexible tools and techniques [Paper 1].

### **1.1.1 Purpose**

As we are aware of both strengths and weaknesses of 'best practices' in use, the purpose of the work is to find ways to overcome experienced weaknesses. I have included '*strengths*' here intentionally, as I am not suggesting that existing 'best practices' cannot result in success. However, it can be very



difficult to learn from successful practice because the temptation is to repeat it on the assumption that it will always be equally efficacious in changing circumstances. Self-awareness is crucial in any practice if we are to move from zero to first order learning and on to second order learning (as defined by Bateson, 1972) [Paper 1, 3, 5]. If we become '*proficient*' in a certain practice, it is possible that we then see all problem spaces as opportunities to apply that practice. Thus, we cease to question the problem space with which we are faced and lose our critical awareness (Bednar and Green, 2010; Bednar and Welch, 2010).

We need to remind ourselves that all examples learnt are just that, '*exemplars*', and so not the same as the class (abstraction, generalization) which it is supposed to be an example of. As such any exemplar is also 'flawed' and any of its specific and unique limitations do not necessarily limit any other exemplar (an example can be seen in the potentially confusing and changing definition of a generic vehicle with three wheels as either a car or a motorcycle!). Similar points were explored by Wittgenstein (1965) in his discussion of 'language games'.

What needs to be unlearned is the assumption, and consequent agenda, that we can achieve excellence just by following a recipe (or 'best practice') (Bednar and Welch, 2008e).

If we are aware of strengths and weaknesses in practices, can we overcome them as part of practice? How can we contextualise application of method? In other words, the purpose of the work is to reflect on what is needed to go beyond ordinary expectation in order to approach excellence [Paper 5].

What is highlighted is what is needed to pursue excellence in context. For example, this can be related to the concept of '*extreme engineering*'. Tackling activities according to received wisdom about '*best practice*' will not always achieve excellence. Even if every step in a process is tackled in exactly the '*correct*' way, the result may be disappointing because this approach fails to address '*in-betweenness*'. This quality reflects the contextually emergent properties which are lost as soon as any process is broken down or refined in practice (i.e. subject to reductionism and generalization). Excellence must be judged through a lens of relevance in a particular context and cannot be defined in absolute or objective terms, but is influenced by purpose also [Paper 3].

What appears to be a weakness in one context might be translated into a strength in another. For an example, consider the role of spotter aircraft during World War 2 – armoured vehicles and munitions were often concealed with camouflage netting and green branches. Viewed from above, they were rendered invisible – except to a person with Daltonism (e.g. colour-blindness).

### **1.1.2 Delimitation**

As an engineer, I found myself engaging with development of manufacturing processes. I soon recognized that I was not concerned only with machines and technology, but how people interact with machines; how people interact (cooperate, co-act, co-ordinate, co-adapt etc.) with other people; and how machines interact with other machines. It is in these zones that the phenomenon I describe as '*in-betweenness*' lies. So, when developing a factory as a business system, I needed to engage and to view these manufacturing processes as forming a human activity system – not a social + technical system, but an integrated sociotechnical problem space.

Hence, I am interested in the analysis/inquiry and development of human activity systems as systems. As such, therefore, I do not address the development of artefacts, e.g. software, in my work. There are many bodies of work which deal with similar domains of interest, e.g. ergonomics, sociology, social-psychology or soft systems analysis. However, each of these is to some extent reductionist (missing the '*in-betweenness*'). Design science (Hevner, et al, 2004), which has been receiving much attention in the IS field in recent years, seeks to draw upon disciplines from the social sciences with a specific aim of perfecting development of artefacts (technology) for use.

However, my interest is in development of systems for use of technological artefacts as part of human activity systems - or in other words 'support for purposeful re-design (co-evolution) of human activity systems' (see Nissen, 2007) [Paper 5]. These could perhaps also be seen as social and/or cultural '*artefacts*', but when explored as emergent systemic phenomena it may be unhelpful to use concepts that are more often associated with '*objects*'. Every individual's engagement with their work environment is contextual – we do not experience (our own) work tasks in abstract but in doing them. Thus, any person's competence is formed through unique interactions with the system

of working. A successful system is an emergent property of interactions among the contextually relevant competences of the engaged individual actors [Paper 3]. Excellence is therefore achievable only through collaborations among engaged, unique individuals whose performance is optimised for the (emergent and changing) system as a whole, rather than for each as an individual performer (in isolation). This will usually involve compromise on the part of different individuals as sub-systems. I am interested in finding ways to support contributions of unique individual participants in a purposeful change process. In order to explore and support a dialogue about understandings made by these individuals, I look at questions through a lens of Hermeneutic Dialectics (see Radnitzky, 1970 for discussion on Hermeneutic Dialectics). This is important to analysis/inquiry as it focuses attention on exploration of multiple, individual, contextual understandings of change-oriented problem spaces [Paper 1, 4, 5].

This work lies in an interpretive paradigm and specifically questions assumptions surrounding particular problem spaces. As Checkland (1981, 1990) points out, it is important not to jump to a conclusion about the nature of a problem at the inception of an analysis/inquiry, but to question the framing of particular '*problems*'. As Pidd, drawing on Ackoff, suggests, there are puzzles that are clearly defined and require us only to apply the right technique to find a solution; however, we are often faced with problem spaces that are networks of puzzles, and also with messy situations which can be perceived as networks of problem spaces. Pidd (2009, p. 53) tells us that the worst mistake an inquirer can make is to confuse a mess with a problem, and then try to solve it as if it were simply a puzzle.

Thus, although I am aware of tools and techniques in Operations Research, designed to help structure problems and solve puzzles, these belong to the class of Hard Systems tools (Checkland, 1981, 1990). I am interested in human activity systems which involve, more often than not, messy situations (this I believe requires attention to the use of both hard and soft systems thinking).

I am interested in supporting people to engage in reflective change of human activity systems in which they are (themselves) involved. I suggest that this requires individuals to achieve some self-awareness and explore their experience of contextual, often tacit, knowledge about a problem space [Paper 2, 4]. This does not always occur without specific effort and using

tools specific to that purpose. Support is needed to engage in exploration and to overcome fears of failure.

There are a number of other lenses which are regarded as relevant by other scholars, e.g. sociological or psychological perspectives. I avoid these epistemologies, preferring to focus on an open systems approach. This must be distinguished from some other systemic approaches, e.g. Luhmann's work (e.g. Luhmann, 2012) that emphasises the influence of structure; or Foucault's work (e.g. Foucault, 1973) which highlights power in society. For me, any understanding of system is an emergent property from the multiple situated understandings that every unique individual has of/in context. Every individual has a unique and contextually created worldview from which his/her sense-making activities radiate. These are neither fixed nor objectively available, but are continually (co-/re-) created over time, as part of social and cultural interaction (i.e. a phenomenological worldview) [Paper 1, 2, 4, 5].

### **1.1.3 The answer?**

What is the best way, or method, for people to use when they need to engage with complex, uncertain and ambiguous problem spaces? If people continue to look for "*the recipe*" or "*the silver bullet*", in efforts trying to avoid instead of embracing uncertainty and ambiguity, there will be no answer. However, I try to answer the question by developing Critical Systemic Thinking about the question and experimenting with heuristics, such as those used in the SST framework e.g. brainstorming, mind mapping, rich pictures; application of para-consistent logic to create diversity networks. This does include a purposeful and organized combination of individual and organizational learning activity [Paper 1, 4, 5]. Perhaps we cannot simply reduce uncertainty and exclude ambiguity from our world, but we can engage and reflect over it, and we can (re-) organize our efforts and (re-) structure our understandings. Potentially we might be able understand some underlying phenomena.

A proposed set of Principles for Contextual Inquiry has been developed through numerous discourses around particular questions about critical exploration of problem spaces [Paper 1]. My contribution involves promotion of communicative playfulness with convergent and divergent thinking, and improvisation as part of analysis/inquiry, design and change practices.

## 1.2 Contribution Outline

The Strategic Systemic Thinking framework (introduced in [Paper 1] ), which is at the core of this work, is intended as an example of a vehicle which could be used to promote effective learning in a context of organisational change such as ISD [Paper 2; 3].

The framework specifically promotes a combination of learning processes at individual and organizational level. This (framework) consists of three elements, which may be approached in any order: intra-analysis, inter-analysis and value analysis (see table 1.1).

**Table 1.1: Aspects of SST**

<b>Intra Analysis</b>	Expanding descriptions of a problem-space Creating possible resolutions (Creating narratives from unique individual perspectives)
<b>Inter Analysis</b>	Structuring uncertainty into ambiguity through communication with others Limiting the number of alternatives to be discussed (Puts narratives into context of problem-space)
<b>Value Analysis</b>	Creating a frame of reference with which to assess alternatives (Puts narratives into context of environment)
<i>Communication in inter analysis and reflection in value analysis together support creation of a learning spiral. While all analysis represents learning by itself, what is learnt may or may not be appreciated or recognized as 'new'.</i>	

*Intra-analysis* enables individuals within a problem space to engage in learning activities intended to surface (visualise) their contextual understandings [Paper 1, 4]. A range of tools can be used to facilitate their engagement. For example, a purposefully structured and organized combination of brainstorming, mind-mapping and use of rich pictures (Bednar and Day, 2009). In intra-analysis, each individual is invited to consider his or her relationship to their perceived problem space. They are invited to consider this both in the present and in terms of their desires for the future (Bednar and Welch, 2006a; 2010). What do they want to do and why? How could or should they pursue these desires?

All of these questions focus on who the individual perceives him or herself to be (in context) and hence reflects only that individual's (multiple) personal perspectives [Paper 2, 3, 4, 5].

*Inter-analysis* brings together these various narratives created by individual actors so that, collectively, they can create groupings of worldviews. NB this is not a search for consensus but an exploration around the range of opinion that emerges [paper 1, 4] (Bednar, Welch and Katos, 2008; Katos and Bednar, 2008). SST must be distinguished from other, apparently similar approaches in that it rejects a search for (premature) consensus and seeks instead to build a *knowledge base* from all the differing perspectives of engaged actors. Thus, it supports reframing of problem spaces by postponing decision-points until an improved collected *knowledge base* can be created. For this there are explicit examples of tools and methods/approaches, such as the elaborate use of para-consistent logic and diversity networks etc. Thus, SST supports divergent thinking and does not seek to converge on a consensus as doing so could disqualify novel or marginal views [Paper 1, 2, 3] (Bednar and Welch, 2006b; Bednar, Welch and Katos, 2008; Katos and Bednar, 2008).

*Value-analysis* involves reflection over the outcomes of the other two aspects in order to consider *feasibility*, prioritisation and control [Paper1, 2, 3] (Bednar and Welch, 2006b). It is important here that analysis/inquiry is not restricted to a limited view of *feasibility* covering economic and technical aspects only. A multi-criteria benefit analysis is required (Bednar and Welch, 2013). Value analysis is a tool for utilising the output of the other analyses, and is normative but still contextually dependent in focus (e.g. [Paper 1, 2]). The aim is to re-evaluate and expand knowledge base for continual learning (as a basis for change) and it embraces the political dimension in order to overcome any pretence at value neutrality and *scapegoating* [Paper 5].

These themes are taken up and expanded in later work (see, e.g. Bednar and Welch, 2006b; and Bednar and Welch, 2008f). The importance of interpretation is explicitly referred to [Paper 1, 2, 3], and the political dimension, in managing organisational change [Paper 4, 5]. This agenda is also supported in e.g. Walsham (1993).

In the years since the SST framework was introduced, many of the ideas presented in the introductory paper [Paper 1] have been further developed. For example, the idea of four-valued logic as a basis for exploring paraconsistent relationships in human sense-making was developed [Paper 4, 5], as were three categories of carrier for each of the analyses (table 1.2).

These are explored in in Bednar, Welch and Katos (2007; 2008). A practical application of epistemic uncertainty in cyber-crime investigation is given in Katos and Bednar, 2008.

Reflecting on work by Bateson (1972), particularly his orders of learning, have provided a catalyst in formulating and organizing the explanation for the SST framework. Churchman suggests that systemic reflection upon human experience constitutes an exercise in practical philosophy (Churchman, 1971) [Paper 5]. Especially Bateson’s work forms an example of such an exercise, as does the work of Ulrich (1983) and Argyris (1990). These ideas of learning and reflection as inherent aspects of the SST framework have been developed further in [Paper 4, 5].

**Table 1.2: Carriers of SST**

<b>Carrier</b>	<b>Inquiry and formation of</b>	<b>Character</b>	<b>Focus</b>
<b>Process</b>	a systems view regarding a problem world	Ontological	Problem re-definition, creativity and uncertainty.
<b>Dynamics</b>	a reflective systems view regarding thought processes leading to above mentioned 'process'	Epistemological	Critical reflection, learning and re-evaluation of processes of 'problem re-definition'.
<b>Perspective</b>	a responsible systems view regarding the value processes, leading to boundary setting, framing the abovementioned inquiries	Axiological	Value ethics and observational transparency.

Thus, communicative action, sense-making, reflection upon that sense-making, and making sense of one’s own sense-making processes are recurrent themes in work drawing on critical systemic thinking (Bednar and Welch, 2006c; 2007c; 2008d) [Paper 1, 2, 5]. Sense-making by individuals represents a process of meaning creation within their own socially-constructed worlds (Berger and Luckmann, 1966; Bateson, 1972). However, it is necessary to go beyond this if meaningful systems are to be generated. The assumptions and values which underpin sense-making require re-examination and questioning

(Bednar and Welch, 2006b; 2006c) [Paper 4, 5]. Such questioning is clearly related to Value Analysis in the SST framework, and is explored further in Bednar and Welch (2005a) in the context of IS as organisational change.

*“... analysis of the unknown, followed by reflection and evaluation on that which is discovered and how, are associated with a wish to move from single to multiple orders of learning. This desire is to break out of a learning circle, based on narrow assumptions, Instead, use of multiple levels of enquiry, engaging in analysis and reflection, pursue a transformation into a learning spiral in relation to a problem space (such as organizational life). The mechanism for evaluation here considers ‘what if?’ scenarios, positive and negative criticisms and competence. Through the use of the SST framework, each individual within the organizational context is recognized as an open, autonomous system whose goals, values and beliefs are expressed in an on-going construction and reconstruction of their reality” (Bednar and Welch, 2005a, p.8).*

In Bednar and Welch (2006a) the discussion is in the context of:

*“ventures in practical philosophy: Researchers who desire to support bringing about change in organizational settings require approaches to inquiry which can go beyond superficial appearances and prejudice. In order to achieve this, critically informed research needs to transcend mere examination of socio-technical systems. The authors recognize that all paradigms for analytical research involve a more or less conscious and systematic process of considering social, psychological and philosophical dimensions, and that researchers have drawn upon the social and human sciences to ground methods and assumptions in philosophical descriptions” (Bednar and Welch, 2006a, p.4).*

Then this is further discussed in Bednar and Welch 2009a [Paper 5]:

*“The term ‘sense-making’ is intended to suggest the idea that people constantly meet gaps in meaning which need to be overcome. People move through life moment-by-moment, step-by-step, by experiencing. A step can be a re-occurrence of previous behaviours but, philosophically speaking, it is always a new step since it takes place in a new moment in time and space. Sense-making relates to that moment when a step in movement is halted and hindered because of*



*all the discontinuities that surrounds us. We can reflect, like Heraclitus 'No man ever steps in the same river twice, for it is not the same river and he is not the same man'. This aspect of human experiencing creates a need to construct new meanings and understandings. In the context of our double-helix metaphor, users and designers must unravel how an individual interprets and overcomes this moment. Why was a gap experienced? How did the individual move strategically or tactically to overcome the gap? How did the individual continue her/his journey after the bridge building?" [Paper 5, p.474].*

And then again in the context of intellectual practices in Bednar and Welch (2005b):

*"When we consider the necessity to question assumptions, we often think in terms of assumptions made by others. What is more difficult, but essential, is that we as researchers (both as individuals and as members of communities) should question our own assumptions. While questioning is an essential part of our intellectual practice, which we seek to develop, it leads in turn to something even more challenging – to be consciously aware of the need to make judgements" (Bednar and Welch, 2005b, p.35).*

An important dimension of the work is explored specifically in the first three featured papers [Papers 1, 2, 3]: individual uniqueness and the contextually-dependent nature of our sense-making in organisations (Bednar and Welch, 2005b) [Paper 4, 5]. The case for a contemporary form of contextual analysis is made which seeks to surface these unique understandings of multiple levels of contextual dependencies [Papers 1, 2, 3].

Through engagement in exploratory techniques, organisational actors can be encouraged to create a body of contextual *knowledge* (table 1.3) that will help them to direct development of systems (Bednar, Welch and Graziano, 2007; Bednar and Welch, 2009b; Bednar, Welch and Katos, 2008; Katos and Bednar, 2008).

The first set of *plays* is concerned with exploration using brainstorming, mind-mapping and rich pictures in combination (Bednar and Day, 2009) [Paper 1, 2, 3]. These techniques support engaged actors to explore their subjective, contextual understandings of the problem space and begin to surface their contextual knowledge.

The second set, interpretive, critical and systemic, relates to exploration of boundaries in personal and subjective views and values (Bednar and Welch, 2005b) [Paper 3, 4, 5].

The third set of *plays*, paraconsistent logic and diversity networks, relate to recognition of unique, individual understandings of a problem space seen as an open system, through analysis/inquiry of a multitude of alternative narratives highlighting similarities and difference [Paper 4, 5].

In this way, engaged actors are supported to avoid convergent thinking leading to a premature consensus (Bednar et al, 2008; Bednar and Katos, 2009).

**Table 1.3: Dimensions of SST**

<b>Plays &amp; Support</b>	<b>Related Carrier</b>	<b>Character</b>	<b>Focus</b>
<b>Brainstorming Mind-Maps Rich Pictures</b>	Process	Praxiological & Ontological	Exploration of 'This is what I think it is' and 'This is what I think it does' etc.
<b>Interpretative Critical Systemic</b>	Dynamics	Praxiological & Axiological	Recognition of personal, subjective views and values; understanding and communication.
<b>Paraconsistent Logic Diversity Networks</b>	Perspective	Praxiological & Epistemological	Exploration of ambiguous and uncertain relationships between different understandings.

Through these *plays*, it becomes possible for systems to be co-created that will better serve the specific needs of engaged individuals and groups. The body of work highlights a need for organisational actors to engage with framing the problem space they are concerned with, i.e. to challenge and question taken-for-granted assumptions about the nature of *the problem* [Papers 1, 2, 4, 5] (Bednar and Welch, 2005a). This requires a focus of inquiry on unique individuals, their beliefs and actions in context [Paper 1]. It is pointed out that a living individual constitutes an open system through which

identity and understandings are created and recreated through experience and reflection over time – they are not to be regarded as framed, atomic entities [Paper 1, 2]. It can also be seen that it is through the complex networks of relationships among unique individuals that the idea of *an organisation* emerges, and that this construct too will be constantly created and recreated over time [Paper 3].

A number of consequences emerge from this discussion, which are crucial to the body of work discussed in the thesis.

First that a multidisciplinary, open systems perspective is required in any inquiry intended to bring about development of information systems that could be deemed *successful* by those who wish to use them [Paper 1, 2, 3].

Secondly, that such a perspective will need to seek for *complexification* of the space for inquiry, rather than seeking opportunities to simplify and close down the field of interest [Paper 4, 5].

Thirdly, methods/approaches chosen to conduct inquiries need to be uncertainty-tolerant, rather than seeking to narrow focus or achieve early consensus [Paper 1, 4] (Bednar, Welch and Katos, 2008; Katos and Bednar, 2008).

This uncertainty tolerance is not just to allow for rich descriptions (e.g. Rich Pictures) but also to explore judgements of relationships between ideas and understandings with methods allowing for expressing experiences of uncertainty explicitly (e.g. Para-consistent logic and Diversity Networks).

The practice and use of these methods/approaches needs to integrate a phenomenological and critically informed stance from a systemic point of view [Paper 4, 5].

It is the combination of these aspects *together* which makes the SST framework a significant departure from other approaches such as SSM by Peter Checkland. In Bednar, Welch and Katos (2008) an example of this departure is described with the following:

*The authors describe a methodology for innovation and analysis, which presents the idea of a diversity network. The authors recognize that complex problem spaces call for methods of inquiry which do not seek to oversimplify or apply reductionist approaches. The methodology described here draws on a strategic systemic framework which puts complexification into a systemic practice.*

*Such an application helps participants to outline their narratives, create and agree upon categories of narratives, and then use these categories to classify their narratives. In this way, clusters of narratives, reflecting innovation through diversity networks of opinion and competences, are encouraged to emerge in analytical practice (Bednar, Welch and Katos, 2008, p.360).*

In the same text the context of intellectual practice is taken into consideration:

*In order to facilitate increased capability to cope with uncertainty and complex problem situations, the process of creating a decision base for resolving appreciated problem spaces needs to include acceptance of uncertainty. Such a process therefore requires development and creation of 'new' knowledge as part of analysis. It also needs to incorporate a reflective approach to analysis, including a break from reliance on binary logic. A combination of systematic and systemic approaches to critical reflection and inquiry may yield a more developed appreciation of relevant problem space. Through critical systemic thinking, and continuous reflection on experiences, valuable lessons can be abstracted to inform ongoing actions (Bednar, Welch and Katos, 2008, p.361).*

And then also exploration of examples of actual methods/approaches and techniques is presented:

*In the first order, individually-created narratives are categorised according to four-valued logic: assertions of positive belief in alternatives, negative belief in alternatives, and possibility of alternatives or ignorance of any alternative. A second order is illustrated through an example in which all assertions of positive or optimistic possible belief are considered by participants. The model is applied in order to identify clusters of narratives which appear to have characteristics in common, by creation of diversity networks. In this way, a more focused agenda for debate can be supported to emerge. Diversity networks are used to bring forward an overview of characteristics of deviation of opinion (narratives) and a visualisation technique of a process for sense-making of relationships between opinions. (Bednar, Welch and Katos, 2008, p362).*



# 2 Methodology

## 2.1 Research Question

As stated in section 1.1 above, the question to be addressed in this work relates to creation of a system for use of methodologies/approaches available to would-be designers of Information Systems. This can be articulated as *‘How can we (e.g. as systems analysts, business analysts etc.) help groups of organizational actors (e.g. employees) to address complex, uncertain and ambiguous problem spaces? What would such a system for use be like in order to surface (disclose) understandings of contextual dependencies by the unique individuals engaged in a system of work?’*

## 2.2 Philosophical underpinning and Methodological approach

It is important to make it clear at the outset that my research has been conducted within a perspective of Hermeneutic-Dialectics (HD) (Radnitzky, 1970). Research situated within this paradigm places emphasis on transparency and relevance, supporting creation of individually unique, rich narratives. This is in contrast to research endeavours based in logical empiricism (LE), emphasising objectivity and rigour, leading to generalizable findings, which are more often preferred within Anglo-Saxon schools of meta-science. This does not, of course, mean that rigour is of no importance within my work. However, in common with other HD-informed researchers, I seek to validate my work without relying on artificial claims to objectivity or statistical sampling. Instead, I seek to test reliability and validity by discussing research activities with experts from similar fields; collaborating in group work with other researchers; relating results of inquiry back to subjects individually and in plenary; participating in communities of practice;

and presenting and publishing my work to relevant conferences, workshops and journals in order to receive feedback.

As with most HD-based inquiry, my work has not proceeded according to a predetermined, linear plan. Rather, it has proceeded through reflection in- and on-action, reading, thinking and engaging in dialogue.

My work has taken place within (and has constituted on an on-going basis) a system of iterative, productive learning spirals. It is possible to relate these to Bateson's (1972) taxonomy of learning, in which Order 0 represents attempts to solve immediate problems/issues; Order 1 represents reflection over approaches to solving and (re)solution; and Order 2 represents reflection over learning processes constituted by Order 1. Iterations of such cycles of action, reflection and reflection-over-learning lead to formation of productive spirals creating new understandings, which both overlap and help to generate further spirals.

The brief outline of points that follow contain attempts to represent my own sense-making about these inquiries, but should not be seen as ordered abstract models, time-lines or accurate descriptors of a precise research 'plans'.

- These reflections led me to read widely and to give deep consideration to issues such as the relationship of theory to practice; philosophy as practice; the nature of professional work; roles and understandings of individual practitioners within groups and organizations; systems thinking; methods and their application in context(s). Reflection on issues led on to reflection-in-practice and further reading;
- These activities led me to the first of the research outcomes discussed in this document: a working definition of Information System, elaborated into two distinct definition(s) (IS1 and IS2) useful for differing purposes (e.g. Bednar 1999);
- This productive, learning spiral continued, leading me to consider and evaluate Systems theory. I also began to gather material on a number of methods/tools/techniques for Systems Analysis, including those I had practiced and others less familiar. These included, e.g. SSM, Multiview, OO, and Agile, participatory approaches such as those of Mumford (1983), Ehn (1988), Stowell and West (1995), Friis (1991). I undertook an evaluation of their strengths and weaknesses in terms of systems for use. It became apparent that

authors of these methods often neglected to provide detailed and explicitly contextual guidance on their use.

- Reflection led to number of realisations: that usability of methods did not automatically lead to usefulness in context; that rigour in application of method did not automatically lead to usefulness of resultant systems for individuals and groups within an organizational context; that developing an Information System constituted a particular instance of organizational change rather than simply creation of an artefact; consequently of a need surface contextual dependencies experienced by organizational actors (e.g. Bednar, 1999; 2000; 2007).
- Reading and reflection in and on experience enabled me to consider my own perspective. I considered LE and HD schools of meta-science, adopting an HD perspective in relation to organizational change and a critical perspective, in order to support individuals to own and control their own problem spaces. My systems thinking focused on individual emergence within systems and socio-cultural spaces (e.g. Bednar, 1999, 2000, 2007).
- Over a number of years, these ideas and activities coalesced to enable me to formulate the Strategic Systemic Thinking framework discussed in this thesis. The focus of the framework is on supporting individuals to explore multiple levels of contextual dependencies in order to create a 'knowledge' base for change and not to rush towards premature consensus (e.g. Bednar, 2000).
- Usability and potential usefulness of this framework were validated using a field study of change within a University department. – Bednar, Eglin, Bain and Green (2004); Eglin, Bednar and Welch, (2006).
- Further validation was conducted through reading, discussion at various communities of practice, teaching activities and development of tools – Bednar and Day (2009).
- The framework was further developed and refined, e.g. to identify carriers, four-valued logic, tools and techniques (Bednar, Anderson and Welch, 2005; Bednar, Welch and Katos, 2006). Application was explored through a number of examples, e.g. crime scene investigation (e.g. Katos and Bednar, 2008; Bednar and Katos, 2009).



- Validation of the research has been conducted through publication of more than 100 peer reviewed papers and book chapters. Additionally partial validation of practical application has also been done in more than 250 (mainly Small and Medium Sized) enterprises and public sector organizations (Bednar, Sadok and Shiderova, 2014).

These points outlined above should be considered in conjunction with section 2.2, in which I expand upon my research journey. My research journey began with reflection on my own lived experiences as an engineer and as a system analyst. I reflected on concepts such as professionalism and excellence in practice and their relationships to selection and use of associated methods, tools and techniques

## 2.2 A journey of ideas

A variety of strands have contributed to the development of my thinking on complex methods of inquiry. I was originally working in several manufacturing industries, interested mainly in the continuous development of complex socio-technical production systems (e.g. factories). As I became en-cultured as an engineer, I developed a focus upon competence derived from attention to detail and a desire for perfection.

However, I also believed it necessary to go beyond competence to embrace creativity, since engineering is concerned with creation of the man-made aspects of our world. Creativity is not expressed through an approach which tries to follow step-by-step guidelines, like a recipe. It is a human trait that can only be exercised holistically and requires reflective action on the part of a real person, motivated by particular desires [Paper 1, 5].

Human progress has been achieved through a dialectic between man's thirst for understanding through inquiry and man's creative force expressed through artistic appreciation – best illustrated through the idea of Renaissance man, both artist and engineer. Similar ideas are put forward by both Lindblom (1959) and Sjostrand (1997).

It is necessary to improvise so as to find ways to make engineered processes and artefacts work in practice. However, the ability to improvise creatively is

fundamentally dependent on a basis in sound professional competence. This precept was very well known to me in my capacity as a musician. Since early childhood, I had been learning to play the piano and I knew that only by assiduous practice had I been able to reach a level of musicianship at which I could go beyond performance, to give fresh expression to the pieces I played and to extemporise.

I have found that my reflections are echoed in the work of Claudio Ciborra (2002) who discusses ‘bricolage’ in ISD, and of Friis (1991, 1995) in her work on user-controlled systems development. Levi Strauss (1966), in his work ‘The Savage Mind’, attempts to distinguish between ‘tamed’ and ‘untamed’ human thinking. He points out that ‘untamed’ thinking can be illustrated by reference to the work of a *bricoleur*, whereas ‘tamed’ thinking may be compared to the more measured approach of an engineer.

I do not disagree with his analogy, but logically, while a *bricoleur* is not necessarily an engineer, every successful engineer is by nature also a *bricoleur*. Of course, even a *bricoleur* must exercise judgment – he uses whatever materials are to hand, but not *all* of them on *every* occasion [Paper 5].

My interest in Contextual Inquiry is related to my focus on Information Systems as Human Activity Systems. Originally, I was explicitly introduced to the work of Maturana and Varela (1980) by Professor Emeritus Hans-Erik Nissen at Lund University. However, I had already touched upon some of their work as a result of collaboration with sociologists and scholars of Media and Communication Science. Due to my original interest in organizational excellence, I was particularly interested in the uniqueness of organizational problem spaces and the pursuit of beneficial change practices which could promote intended consequences.

At first, my interest had been strictly pragmatic and my agenda was to be able to develop factory production systems to a level of excellence beyond what was normally seen or recognized as possible. The reason for this was simple – as Porter (1996) tells us, a business has three basic alternative strategies: to compete on price, or on product differentiation (quality), or to create for itself a niche market which has unique demand/supply curves of its own. If a factory cannot compete on unit price of products, then in order to remain viable it must compete on quality through continuous research and development. As a factory is inherently a production system, it cannot devote

all of its R&D resources to innovative product development but must spend significant resources on development of the production system itself.

Of course, in the context of excellence in production systems, product quality may also be improved beyond what was previously thought possible so that competition on price is no longer an issue. When an improvement of the quality of the production system is made, any improvement of the product quality is not necessarily a consequence.

However as an improvement of the quality of the production system also requires an improvement of understanding of the production system, this leads to a rise in understanding of the potential for change in *possible* outcome. It is this understanding of potential for change of product as outcome (and better understanding of the production system limitations) which gives the possibility to raise the bar for the control of *which quality* is the outcome (e.g. a better match of what is to be the intended quality of the product and what is the identified / measured quality of the product).

Just as a map is not the same thing as the territory to which it relates (Bednar and Welch, 2008c), so the environment in which engineering takes place is not the same as the training workshop where first principles were learned.

In my professional practice, among others I managed and developed production processes and systems in several different industrial environments, including chemical and electronic manufacturing industries. Such industrially scaled-up processes do not always exhibit the same characteristics as their textbook, laboratory counterparts would do. Many difficulties arise and creative thinking is needed to look for '*work-a-rounds*' that will solve the problems and keep the plant productive. This extends not just to finding out what is necessary, but at times to working out what is '*unnecessary*' too.

Thus, in my professional practice, I constantly asked the questions '*How could we do things better?*' and '*How can practice be improved?*' I also became aware that all actions and decisions on '*best practice*' have consequences. Often, it transpired that over-engineering was necessary in order to achieve the desired quality of outcome, i.e. going beyond what seemed a reasonable approach in order to pay attention to every detail of practice and pursue perfection. It was a question of pursuit of excellence – or what locally was described as '*how to plan the impossible and then to actually do the impossible*'.

A useful analogy is the flight of the bumblebee. Historically, science (aerodynamics) could prove that it is impossible for a bumblebee to take off in flight (McMasters, 1989); bumblebees have been ignoring this for thousands of years and flying anyway! Inquiring engineers have since been able to discover why this is so<sup>1</sup>.

During the course of my different employments as an engineer, I experienced a number of change programmes in the companies for which I worked (from the mid 80's to the late 90's). Some of these involved redesign of processes, some involved restructuring and often they involved introduction of new IT systems. Some of the initiatives were relatively minor in their impact and others were radical. In each case, as an engaged actor, I was aware of the impact of change on my work context and reflected upon my experiences of change. During this period, I also engaged with my studies in Informatics. In doing this, I followed the same principles inculcated in me as an engineer and looked for evidence of 'best practice' in this new field. It became apparent to me that many change programmes in organizations (including my own) failed to deliver the benefits desired by those involved in them. Initially, my studies revealed that new methodologies for development of organizational information systems were becoming available which, it was suggested, would improve on the practices of the past. These seemed to offer ways to resolve experienced problems if applied correctly. Often the idea was not to be fooled in applying one approach but to engage with a suitable combination of approaches. The proposed framework and outline of the methodology called 'Multiview' (Wood-Harper et. al.1985) was initially promising (as long as the descriptions were not looked at in too much detail).

In my experience of System Analysis and Development projects, it appeared that people were quite happy to combine ideas, techniques and methods/approaches from different methodologies. For example, I have known Structured Programming (Jackson, 1983) to be combined successfully with ETHICS (Mumford, 1983; 1985) and Object Oriented Analysis and Design (Mathiassen et al, 2000) to be combined enthusiastically by analysts and developers with the Soft Systems Methodology (Checkland, 1981). Mumford herself combined ETHICS with BPR (e.g. Mumford and Beekman, 1994). Examples of other such projects can be found in Bednar, Welch and Graziano (2007). However, on closer study and reflection of (for example)

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<sup>1</sup> see 'Bumblebees finally cleared for take-off'. *Cornell Chronicle*. 20 March 2000, retrieved 16 March 2013.

the application of SSM, it became apparent to me that the same problems persisted and that these seemed to derive from practitioners confusing ‘*the map with the territory*’ (Bednar and Welch, 2008e) [Paper 4].

A new methodology may have potential to produce a useful result, but if people who apply that methodology persist in poor practice little benefit will be achieved. Thus, I could see that ‘*best practice*’ remained elusive and novel methodologies would not make a difference *in themselves*. The key appeared to be a failure to contextualise practice in the way that I had learned to do as an engineer [Paper 1].

When Checkland himself supported clients to apply SSM, beneficial results were reported to be achieved. He was already a competent analyst, well versed in ‘*hard*’ methods/approaches and aware of the need for creative thinking and improvisation in context. He was thus able to adapt application of SSM to address contextual dependencies (so also did Enid Mumford successfully contextualize her practical application of her Socio-Technical methodology ‘ETHICS’). In publishing SSM, Checkland appeared to have presumed that others would use SSM with this same understanding of contextualization of practice. However, many people saw his original 7-stage methodology as recipe to be followed. He himself commented on this in his 1990 publication of Mode 2 (Checkland and Scholes, 1990; 2007; Checkland and Holwell, 1998). The Systemic Framework (NIMSAD) presented by Jayaratna (1994) is intended to assist users in their effort to evaluate strengths and weaknesses of IS methodologies.

One of several interesting features presented by Jayaratna (1994) is his elaboration of the relationship and interplay between different conceptualizations and understandings of problem situations and stakeholders involved in a problem solving process. Examples include his discussions on the relationships between the terms problem-solver, intended problem-solver and methodology-user etc. Between 1999 and 2001, I had the opportunity to work on a research project on issues related to Information Systems Analysis without any subject related intellectual restrictions. During this time it became more and more apparent to me that use of any methodology (such as SSM) could easily become problematic for anyone without the inner authority of its creator to develop the methodology *for use in a particular context*.

Checkland himself supports this view in his 1990 work, when he describes Mode 2 use of SSM. He suggests that this is distinguished by sophisticated

understanding of use of Mode 1 that enables the user to adapt and model the methodology to his or her own specific needs in context (Checkland and Scholes, 1990). Descriptions alone are unhelpful where a potential user of any methodology does not realise the need, or lacks the underpinning competence to contextualize it [Paper 1].

Thus, my initial thoughts that poor practice was due to a lack of suitable methodologies proved to be misguided. I soon realised that availability of methods/approaches did not lead directly to improved practice, because the way in which the methodology was applied (selectively and adapted in context) was crucial. Ignorance about application of method, exacerbated by lack of coherent advice about the limitations of any given methodology, contributed to poor practice. I began to see that weak or no attempts at contextualisation were a key contributor to poor practice. (These ideas have been explored in Bednar and Welch, 2008c).

For a number of years, I wrestled with ideas about contextual dependency in search of a key to establishing ‘best practice’ in IS development [Paper 1, 2]. I read widely, embracing social sciences, including political science, sociology and media communication science. For a time, I began to lose my initial enthusiasm to engage with the Informatics community, who seemed unable or unwilling to engage with this discourse. An unwillingness to learn from the social sciences is, for instance, illustrated in Williams (2007), as discussed in Bednar and Welch (2010):

*‘Williams’ commentary on failure in IT projects is interesting here. He observes that a cognitive discourse is often used to explain behaviour which is actually only explicable through the affective domain. Williams is able to see this because he is emotionally detached himself from the situations upon which he is reflecting. However, surprisingly enough, in his conclusion he then falls into the same ‘modus operandi’ as those he criticizes; in his recommendations Williams turns to a rational proposition for “more of the same”. Engaged actors are caught in a double bind in which they cannot create those choices that would empower escape’ (Bednar and Welch, 2010, p.363).*

After a detailed and accurate analysis of reasons for widespread failure of IS projects, he nevertheless resorts to solutions based in further emphasis on rigour, over relevance in analysis (i.e. more of the same). This may be compared to a discussion by Child (1984) where he noted that this kind of

management response while common should be avoided. However, at length I realised that part of the difficulty came from situating the problem in a Logical-Empiricist (LE) paradigm. Reoccurring discussions (1997-2008) with Professor Emeritus Hans-Erik Nissen in the Department of Informatics at Lund University encouraged me to engage with an alternative way of thinking about this area, Hermeneutic-Dialectics (HD) (see Radnitzky, 1970). As a result, I continued to read further in philosophy of science and came to understand that it is questionable whether we can discover any '*universal truths*' (Bednar and Welch, 2005b) [Paper 4].

As is well-known within engineering practices and quality assurance, the good thing about standards is that there are so many of them to choose from (as discussed in my reports on quality assurance in manufacturing (Bednar, et al, 1985; Bednar and Wang, 1994)). I explore the impact of the HD paradigm in the 2005 paper 'The Standard Engineer in Paris' (Bednar and Welch, 2005b). Thus, I began to see that Systems theory was inseparable from Systems methods/approaches and practice (Bednar, 1999; Bednar and Wang, 1994) [Paper 5].

Works by authors such as Bateson and Churchman were influential on my thinking at this time. Both Bateson (1972) and Churchman (1971; 1979) pointed out that Systems Thinking can be seen as philosophy in practice. Argyris' (1990) work was also important, as he pointed out that people do not always '*walk the talk*' – the philosophies we espouse are not always those we act out in our practice (Semler, 1993) does specifically discuss his personal struggle and managerial efforts to try to overcome this issue in his company). Thus, it is necessary to question the assumptions underlying any analysis – our own as well as those of others.

Another influential work was Maturana and Varela's essay on autopoiesis and cognition (1980). In studying this text, I recognised the impact of their assertion that any observation must by definition be made by a particular observer. Therefore, when analysing a problem space (for the purpose of development in context) there is little value in generalisation [Paper 1, 4, 5]. It is important to take into account the perspectives of the analyst: what Vickers (1965) referred to as the '*appreciative system*'. The uniqueness in context, or what Bateson (1972) described as the difference that makes a difference.

# 3 Rationale

It is my belief that any discipline which is mature is likely to have many competing schools of thought and the number will increase through research and debate (similar ideas have been suggested by Hirschheim and Klein, 2012; Myers and Klein 2011). Schools of thought where there is universal, and perhaps dogmatic, agreement are likely to be of recent origin or else are stultified and ‘dying’ or dead. The existence of competing schools of thought are sometimes described through terms like ‘*fragmentation*’, suggesting that it is a bad thing, and that further divergence in opinions represents a worsening situation. My own view is that diversity can be seen as positive and a sign that the discipline in question is thriving and stimulating intellectual exercise and debate.

There is a danger, however, that involved stakeholders may confuse judgement of message with the messenger. This is why there is such a strong focus on exploring understandings of different narratives in the SST framework [Paper 1, 4]. By this means, engaged actors are encouraged to look at their meanings from different points of view and explore their relationships to meanings of other narratives (as opposed to exploring the value of each narrative).

## 3.1 Systems thinking?

Discussions related to human inquiries and also philosophy of science suggest that excellence in scientific endeavour is not necessarily founded on positivism (see discussions in Radnitzky, 1970; Bednar, 1999; Nissen, et al 2007) [Paper 2]. Nor is it supported by attempts to apply spurious bi-valued logic. In our daily lives, we seldom fall back upon choices between ‘Yes/No’ or ‘True/False’ but are inclined to elaborate in discussions of ‘it depends’ through creation and exchange of narratives about the situation in question



(see Bednar, Anderson and Welch, 2005; Bednar, Welch, and Katos, 2006) [Paper 2, 4, 5]. However, I have noticed that some people, who engage with complex problem spaces when fulfilling roles as professionals, seem to try to shoehorn their judgement process into just such impossible forms of logic. A similar problem is highlighted by Gilovich (1991) in his discussion of the difficulty in breaking free from prejudice of ‘common sense’. Is this due to some socio-cultural processes in educational and work environments resulting in naive and mediocre assumptions about the nature of ‘scientific analyses’? It is important to remember that, in all aspects of life, human beings are capable of coping with paraconsistent logic<sup>2</sup> [Paper 4]. Why then do some people seek to disqualify this in their scientific endeavours? For example, if we look at Socio-Technical Design (Mumford, 1983); Client-Led Design (Stowell and West, 1995); Participatory Design (Friis, 1991; 1995), the main common and reoccurring theme is the focus and the importance of ‘*Facilitation of Systems Analysis, Design and Change*’. This is a differentiation of, on one hand, interaction as intervention, i.e. an effort supporting others in their efforts to change their own practices bottom up etc., (Bednar and Bisset, 2001) [Paper 1, 2] and on the other hand a more traditional approach assuming that change is designed and implemented ‘from above’ through a practice of *managerialism* (Bednar and Welch, 2008b).

A tendency has been observed for analysts to present their clients with an elegant solution to a given problem, couched in terms of exemplars of ‘best practice’. I reflect, e.g. in [Papers 1, 2], that it requires courage to divert from the path of received wisdom (prejudice) and embrace uncertainties in complex problem spaces. In mediaeval times, a jester was sometimes employed at court, who was given unique license to disagree with the monarch. Perhaps an analyst must adopt this role of jester in the context of an analysis.

Indeed, I have observed a similar phenomenon in University teaching where there seems to be a desire to present students with elegant solutions that

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<sup>2</sup> Paraconsistent logic – the ability of human beings to go beyond binary judgements, e.g. Do you want an ice-cream? Answer: yes and no, maybe, I am not sure. Explain. Well, I am waiting for the phone to ring. If it rings in the next ten minutes and I don’t have to go out, then I would perhaps like an ice-cream. However, if it doesn’t ring in the next ten minutes, or it rings and I find that I do have to go out, then I don’t think I want, or can have, an ice-cream. i.e. the answer is ‘it depends’. There is a whole narrative to contextualise the boundary for the validity of the answer to that question.

ignore the complexity and *messiness* of real world problem spaces (Bednar, Eglin and Welch, 2007; Bednar and Welch, 2009c). This behaviour is a typical example of '*pedagogical oversimplification*', and is evidently very useful in everyday life (it is for example the way we learn language as infants and small children). But as children we discover very quickly that while any definition of a word may be correct, it is also at the same time *not necessarily completely true* in any one specific context [Paper 4]. It may be very difficult (and potentially unrewarding) to recognize a (principally similar) difference between an ideal model and the messiness of real world problem spaces [Paper 1, 5].

This situation can have two counterproductive results. First, it detracts from the possibility for clients to take ownership of the development process and thus engage with creation of resolutions which they might experience as relevant and useful in context. In the case of students, their educational experience becomes poorer as they are denied the opportunity of discovering for themselves an elegant solution and thus gain in confidence. Secondly, the elegance of the proposed solution can lead to a naive belief in the efficacy of simplistic approaches, and consequent disappointment when the desired future benefits of the system fail to materialise (Bednar and Welch, 2007a; 2009b). The impact in the case of students may be far worse, as they fail to recognize the '*elegant*' solution provided by the facilitator for what it is, thinking that they have actually achieved excellence for themselves and so developing arrogant and unrealistic faith in their own abilities when they have barely begun to develop any professional competence.

Genuine insight surely comes from both clients and students taking ownership of their problem space and making real efforts of their own in trying to solve *their* problem [Paper 2], with support of competent professionals. Similar ideas are discussed by e.g. Ulrich, 1983; Argyris and Schon, 1978; and Bateson, 1972. True appreciation of facilitated results comes from real participation in the experience, engaging with the difficulties and thinking for oneself. This appreciation requires recognition by the problem owner that the observer is part of the problem space [Paper 5] and that subjectivity defines context (Maturana and Varela, 1980). This kind of appreciation is very similar to the one discussed by Vickers (1965; 1970).

After all there are two kinds of problem at play here. Firstly, Person A cannot get a haircut on Person B's behalf. Secondly, Person A cannot get from

Person B their experience of having their hair cut (Bednar, Welch and Depaoli, 2007).

Those who do not engage in such a process (of appreciation) have no means to make a comparison, and thus cannot truly value the results or perceive the benefits gained. This would appear to be directly linked to the discussions on Systems Thinking by Bateson (1972) and Churchman (1971) about *philosophy as a practical discipline* [Paper 5].

Nissen (1984) discusses the importance of philosophical doubt in IS research, as follows:

*Within other fields studying man and his societies, a debate has been going on for quite some time on the goals and methods of scientific endeavors. The time seems almost overdue for researchers in the field of information systems to join it. We need to discuss its implications for studies in our field of study. There may be very good reasons for the history of our research so far. This does not free us from the responsibility of reflecting over and debating where we are to go from here. The debate hopefully will improve our self-understanding as researchers in different sub-areas of information systems research. It probably will set us off on a number of routes with a fair mutual understanding of our different choices. Finally, it hopefully will improve our understanding of for whom we are acquiring knowledge in the first place and why (1984, p.50).*

Also related are Checkland's exploration of what mode 2 of SSM might be (Checkland and Scholes, 1990, 2007) and Friis' discussion of Participatory Design (Friis, 1991; 1995). The link is inherent in a relation between past personal experience and individual pursuit of practical application. Thus, it is often difficult for stakeholders, e.g. *students*, clients, participants or 'users, to appreciate an activity like Systems Thinking as they do not recognize the effort it requires (a relevant exploration about appreciative inquiry has especially been done by Vickers, 1965; 1970). Value and costs in resources and engagement etc. Similar issues is also discussed by Nissen in his elaborations on the personal human cost of *unlearning* (Nissen, 2002).

This is illustrated in the experience of Nestle when first attempting to implement ERP (Worthen 2002). Initially, the project was approached as an installation of new IT. After some time the company found it impossible to make the new implementation effective – it simply would not work as

planned. It was only when a writer in the business press commented that the company's share price was falling, and that this was because the project went to *the heart of the company's culture*, that it was realised that the project was in fact a *people project*. Nestle then stopped the project and started again.

Like many disciplines, Systems thinking not only benefits from its cross-disciplinary and multi-disciplinary inheritance but also its promotion appears to suffer from a confusion of ideas among some of its adherents. Perhaps we could have suggested that the field has become contaminated by ideas from outside purporting to be systemic but failing to demonstrate true holistic thinking. However, such a suggestion does not necessarily take into account what appear to me to be a perennial problem of confusion between thinking about systems and Systems thinking (Bednar and Welch, 2008c).

This is reminiscent of an older problem in which unappetising food is produced when people confuse knowing a recipe with knowing how to cook! Of course, when combined with existing contextual knowledge, *a recipe* can be helpful in managing uncertainties associated with a task. However, it does not help a person to navigate that which is unknown in a problem space. Exchange of narratives through storytelling can be much more helpful to such navigation, e.g. people like to watch TV chefs cook as this fills in the richness of *'the story'* for them in a way a recipe could never do. In many areas of life there are people who would like to address problems by following *a recipe* – assuming that application of rigour will determine relevance.

When considering the concept *unappetising*, it is necessary to ask: Who decides? Who judges? Who cares? – does that matter? Perceptions of value can be misleading, e.g. people may feel that they need a new computer which will enable them to prepare a budget spread sheet, Skype their friend in Australia, keep in regular contact with their office, but actually when they have the machine they may use it mainly to play games. Context and personal preference also influence perceptions of value. Argyris (1990) differentiates between theories espoused (what individuals believe about their own behaviour) and theories-in-use (what it appears to other people as their guiding principles from observation of their behaviour). For example, a manager may believe himself to be approachable and democratic in his dealings with other staff, while to those staff he appears short-tempered and autocratic [Paper 2, 3].

Personal preference affects both perceptions of value and actions (which do not necessarily correspond). This is a question of perceived value as against

personal preference. Who will use any new technology or who will behave in a new way? Who will benefit from changes? Who will lose out from changes, who will suffer the consequences of change? – and from whose point of view are these factors to be judged [Paper 1, 2]? These difficulties are exacerbated where choices are made on behalf of someone else by a person who thinks they know what is needed/desired (Bednar and Welch, 2005b; 2006c; 2009c).

This undue focus on rigour is not a new phenomenon, and is based on a desire to maintain an illusion of certainty. By ignoring the inherent uncertainties in complex problem-spaces, people are enabled to stay within their *comfort zones* so that they need not take responsibility for judgement of context and relevance (Bednar and Welch, 2006b). One instance of this is the desire by many students in systems analysis and design, e.g. *systemeering* and client in client led design etc. to be provided with a method which they can simply apply in any instance of a problem space, free from uncertainties or the necessity to make contextual judgements.

This desire is not new, but it continues to pose challenges because the idea that open problem spaces are uncertain and ambiguous, and so do not have determined solutions or boundaries, appears to frighten many people [Paper 1, 5]. Thus, it is preferable to them to view objectivity and the application of rigour as virtues, and subjectivity and the exercise of judgement as problematic [Paper 1, 5]. Approaches that privilege rigour over relevance are characteristic of a Logical Empiricist world view (Radnitzky, 1970; 1973; Ciborra, 2002; Myers and Klein, 2011; Nissen, 2007) [Paper 4]. The SST framework provides support for productive exploration of subjective views (systems as perspectives, as philosophy and as approach). This is explored in Bednar, Eglin and Welch (2007); and Bednar and Welch (2009c), which discusses an approach to teaching and learning based on complex methods for inquiry:

*‘SST ... has enabled assessment to become an active part of students’ learning processes. They have been enabled to move from single-loop learning, associated with instrumental goals of ‘passing the unit’, to create a more productive learning spiral in which they gain transferable learning skills’* (Bednar and Welch, 2009c, p.30).

Despite its many years of development, I would argue that use of Systems Thinking is still only in its infancy within many scientific paradigms. It is unlikely to achieve maturity while it continues to suffer from the same weaknesses that have afflicted some other frameworks for analysing the

social world. Some users of Systems approaches attempt to define relationships between the elements of a network *statically*. Thus, an artificial boundary is created around what is considered to be system sustaining behaviour *that is itself part of a system*. The problem seems to stem from lack of recognition that boundary setting is part of Systems thinking (see also discussion by Churchman, 1971; Bateson, 1972; and Ulrich, 1983) [Paper 4, 5]. This seems to be an instance of confusion between *thinking about systems* and *Systems Thinking* and in some ways relates to a similar problem in which an observer forgets the *bounded* aspect of bounded rationality (Lindblom, 1959; Simon, 1991).

Ulrich discusses the importance of boundary setting in relation to a need for citizens to inform themselves about choices in relation to their citizenship – rather than delegating this duty to so-called (subject) *experts* (Ulrich, 1983; 1994). Katz and Kahn (1966; 1978) highlight a need for a less rigid systems view, in which open systems of processes and structures, characterised by homeostasis rather than equilibrium, form chains of events (rather than distinct, deconstructed parts). Emery's (1981) view of systems thinking is similar.

Management through rationality based on targets and goals is impossible (Brunsson and Olsen, 1993; Brunsson, 2002; Walsham, 1993; Ciborra, 2002; and Bednar and Welch, 2006b). Observers who adopt this stance are falling into a trap of regarding *a system* as a part of some objective reality, rather than a mental construct on the part of the observer. *Systems* only exist to the extent that we choose to see them, i.e. it is the observer who draws a boundary to define a system of interest [Paper 1, 4, 5]. Checkland is careful to point out to readers of SSM that a system is to be regarded as a mental construct and not a part of some *objective* reality. Those who do not grasp this point will be unsuccessful in any efforts to *use* SSM as Checkland originally intended.

For example, a person using the terminology of SSM to describe a situation to someone else might give the false impression that the aspects referred to can actually be discerned in this way in the situation as it is experienced. This is similar to the situation where SSM (vocabulary) is treated as a language, which can be used by someone to describe something – a map is not the same thing as the territory to which it refers ([paper 4] Bednar and Welch, 2008a; 2008c; Langefors (1966; 1973; 1995), Maturana and Varela (1980), Churchman (1968; 1971), Bateson (1972), Nissen (2002).

This would be an instance where lack of understanding of Philosophy of Science appears to impact significantly upon practice [Paper 4, 5]. This assertion is supported by Umpleby (2010) in his exploration of the relevance of reflexivity theory:

*‘The principle obstacle to the widespread acceptance of reflexivity theory is the need to reconsider the philosophy of science and to accept a higher level of uncertainty in scientific theorizing.’*  
(Umpleby, 2010 n p).

This is also an epistemological problem where epistemology appears to be conflated with ontology and in particular confusion between rigour and relevance in inquiry. It is clearly a mistake to assume that the degree of rigour offered by a method can alone justify the choice to apply it in context. One author who does not fall into this trap is Bateson (1972). His exploration of human thinking, complexity of sense making processes and learning taxonomy has been a great inspiration in my work. Bateson makes use of narratives, metalogues and storytelling throughout his work. His holistic attitude, and the critically informed systemic thinking approach he presents and illustrates with examples give a nice explanation of being and thinking as part of living. I find that the ideas of Bateson relate well to the works of Charles Sanders Peirce (Peirce, 1998; Bednar, Anderson and Welch, 2005) who recognised and identified the need for a more reflexive, self-critical praxis, i.e. *pragmatism*), and Wittgenstein (1965), who clearly distinguished between the ideas of formal systems, and of dynamic open systems as found in human society and language [Paper 4].

Together, these ideas expand understanding of the human ability to pursue a critically informed line of thought. In *Open Systems Thinking* (see Bednar et al, 2011) any method could be applied in principle, from perspectives based in any belief system. For example, see approaches promoted by Bateson (1972). The hammer does not decide who is using it, when, how or for what purpose. Justification of its relevance, validity, selected variables, or boundaries will all be influenced by the belief system of the person using a method and will have nothing to do with method itself [Paper 2]. It is important not to confuse *way of thinking* with *way in thinking*. From my perspective, this may sum up the difference that makes a difference in Systems Thinking (systems as perspectives, philosophy and approach).

It is important to be clear about the roles and meanings of a number of terms: *ontology* (what we know), *epistemology* (how we know), *axiology* (what we

value) and *praxeology* (how we behave and act), [Paper 1] (Bednar, Anderson and Welch, 2005). Two further terms that are important in HD-informed inquiry relate to learning and are borrowed/adapted from the field of biology. These are *phylogeny* (the living history of an organizational group from each individual's point of view) and *ontogeny* (the living histories of each particular individual). For examples of discussion of these terms and their use, see Bednar and Bisset (2001) and / or Bednar and Welch (2005b).

When the question is posed whether it is possible to *teach* Systems Thinking, discussion often turns to the question of reductionism. Reductionism refers to a philosophical position that a complex system is nothing but the sum of its parts, and that an account of it can be reduced to accounts of individual constituents. In many ways and for many reasons it would be absurd to suggest that Systemic Thinking is reductionist compared to systematic approaches. Typically, it is claimed that *a system is more than the sum of its parts*, e.g. what is often referred to as emergent properties (Bertalanffy, 1968).

However, this is an oversimplification since, when elements are combined in *a system*, the result (e.g. what is identified as emergent properties from a particular perspective) may be better, worse or just different from the sum of those parts. It is precisely for this reason that it is vital to consider contextual dependencies when framing a problem space. From a systemic point of view, a systematic view is reductionist because it conflates the idea of *system* with the sum of its parts. However, reductionist thinking is not the problem. Systemic Thinking is itself reductionist in principle, i.e. a systemic focus, in considering emergent properties, involves looking at *a whole* as a starting point – taking a ‘black box’ stance towards interacting elements within that whole (see 3.2 below and Bednar and Welch, 2014). The reason it is possible to identify emergent properties efficiently is that a focus on *the whole* temporarily ignores what is underneath (*we can see the wood because we do not stir ourselves blind on the trees*) – both the inherent complexity and complicatedness [Paper 2, 3]. It is for this reason that both systemic and systematic approaches are needed. This simplification is essentially what makes Systemic Thinking both powerful and useful.

The real origin of anxiety about reductionism lies in its application without reflection (see e.g. Ulrich's (1983; 1994) discussion of boundary questions). If those who apply reductionist thinking incorporate an inherent recognition that their thinking is reductionist, then the consequences *may be* taken into



consideration as part of the approach [Paper 1, 3, 4, 5]. It is those who apply reductionist approaches without reflection who have a problem, since this is analogous to confusion between a map and the territory to which it relates (Bednar and Mallalieu, 2001; Bednar and Welch, 2008c). It is possible therefore to highlight an essential difference between systematic reductionist thinking and systemic reductionist thinking, which is both reflective and holistic.

## 3.2 Systems and Information Systems

When examining a potential problem situation, it is possible to become bogged down in detail. There is an expression for this in English: we say that someone *cannot see the wood for the trees*. When we choose to draw a boundary around *something* in order to view it as a system, this is similar to what in engineering could be called *black-boxing*. To follow the metaphor above, the forest is our *black-box* within which trees are hidden. It could be described as a way to take a holistic perspective and simplify what is seen as a *problem space*. It can help us to focus on particular features and aspects of our selected *problem space* (the *wood/forest*) for our intended purposes, without having to suffer the consequences of dealing with disconnected details (the *trees*). We need not lose ourselves with disconnected, systematic distractions (e.g. the quantities, species and characteristics of *trees*), but neither are we oblivious that they are there. '*Black box*' properties become a focus of interest when contextually relevant. This is reflective of work by Ackoff (1974) who points out that what is referred to as a problem situation is often *a mess*, i.e. an interconnected system of problems, which themselves consist of several entwined *puzzles* each requiring a specific solution (Bednar and Welch, 2008b). Referring to Ackoff's work, Pidd (2009) suggest that decision-takers should take care not to take *a mess*, treat it as if it were a problem and then attempt to solve it directly *as a puzzle*. I suggest that it is the desire to simplify, and avoid dealing with uncertainty (Bednar and Welch, 2006b), that leads analysts to such a false step. Furthermore, Bateson (1972) points out that the experience of systemic complexity requires self-awareness, i.e. the reflection of self as part of the problem situation.

Think of the following proposition: if Information Systems are complex systems which are open, non-deterministic and temporal, then to what extent

are they dynamic and self-adapting? Does the system automatically detect trends in its environment? Does it detect parts that become superfluous and adapt themselves to new situations [Paper 3]?

In relation to this question, we can consider the Viable Systems Model (Beer, 1985) and the Law of Requisite Variety (Ashby, 1956) which underpins it. Ashby points out that for every possible system state, there must be a specific and appropriate mode of control (only variety can absorb variety). This means that, in an open system, where the boundaries are not pre-determined, there must be more flexibility in alternative approaches for resolution to deal with the greater potential variety [Paper 3]. It makes a great difference here whether we are considering information systems or sophisticated data processing systems. If what we look at as an Information System is a living human being or a Human Activity Systems (HAS), i.e. a collection of human beings (Bednar and Welch, 2005a; Nissen, et al 2007) [Paper 5] Bednar and Welch, 2009a), then the answer to the questions posed above is *potentially yes*, since otherwise survival of the human being or the HAS is likely to be compromised.

From a Soft Systems perspective, the answer is '*hopefully yes*' for the very same reason. If an individual or an organization (one specific case of an HAS) is not demonstrating ability to deal with (new or changing) contextually-appearing phenomena and situations, then it will die. This is why it is called *requisite* variety. Another significant point is the time-scale contemplated. What is requisite for the long-term (e.g. over generations, for species, HAS or businesses) could be very different from what is requisite within any one generation. This is one reason why it is important to consider ontogeny and phylogeny of systems in question (as mentioned in section 3.1). ICT based data processing systems, on the other hand, may or may not *be adaptive* to some predetermined definition of *context*. Checkland (1981) makes a distinction between a serving system and a system to be served. As a system adapts to its changing environment, there will be an impact upon its serving system(s), including ICT systems. However, this does not necessarily influence whether or not such systems are part of (or supporting) an Information System, which is using the technical system to support its own requisite variety.

In fact, a Human Activity System must be adaptive in order to survive. The question is whether or not the same applies to Computerised Information Systems, as a main focus must be *the context* (situated). An adaptive

information system must be context-sensitive in order to detect changes in the outside world (as in the case of HAS and other socio-economic systems). The question is how can this be programmed in advance and how can the required adaptation rules themselves be made adaptive? (see Bateson's (1972) conception of orders of learning, discussed in Bednar and Welch, 2005a; 2009b) [Paper 5].

It is clear that the proposition above changes when non-human systems are considered. This proposition is grounded in a different world view because it describes what appear to be sophisticated Computerised Data Processing Systems as *Information Systems*. Langefors (1966; 1973; 1995) and Nissen (2002) were careful to make efforts to distinguish between data systems and information systems for this reason [Paper 5].

To my knowledge Computerised Data Processing Systems - no matter how sophisticated - are always designed as if closed (i.e. having dynamically-closed boundaries and purpose). It is important to draw a distinction between system behaviour that is purposeful, i.e. resulting from conscious acts of will by some engaged actor[s]; and system behaviour that is purposive, i.e. that to which an observer attributes a purpose (Checkland, 1993, 1981, p119). As data processing models they are always closed in the same way as, for instance, *game theory* [Paper 5]. In my view, the prisoners' dilemma is an example of a system with dynamically-closed boundaries. The reason for my view is that because even if additional variables are included in an effort to cover *unknowns*, these (additional) variables are still defined with expected parameters, formats etc. This is why I prefer to examine problem spaces from a perspective of *possibility theories* rather than *probability theories*. (This requires the flexibility of narratives to aid sense making). So the way Computerised Data Processing Systems are *open* is outside of the model describing them – i.e. the technical system is not adaptive outside of the parameters and model which closes it. However, use of the technical system is not limited to the model of use expected or designed.

*'We suggest that only clients themselves are able to explore their desires, based on contextually-dependent factors in the system for use. Some models that attempt to explain 'user' behaviour do so in terms of acceptance ...Such models emphasise a passive role for people, who are perceived to be recipients of IT artefacts ... In our view, desire for systems that support people to inform themselves (or help others to do so) is contextually dependent and can only be*

*satisfied through a process of co-creation, owned and controlled by those people themselves' [Paper 5, p.467].*

This means that the technical system need not necessarily be adaptive, of and by itself, in order to survive. What needs to be adaptive is the use of the technical system. In other words what needs to be adaptive is the human engagement with technical systems. This is not necessarily the same thing as what is assumed to be the original intended use as conceived by designers/engineers. See further examples in discussions about use, usefulness and usability in Bednar and Welch, 2007a; and discussion of human intensive systems, as opposed to software intensive systems in Bednar and Welch, 2007b. The difference is in contextual relevance and is similar to the following: clever, flexible and dynamic use of old simple processing technology may have more requisite variety than stupid, formal and instructional use of new sophisticated and flexible technology (see Bednar and Welch, 2007a). An example is given by Ciborra (2002), who discusses how cosmonauts aboard the MIR space station were able to make use of tools and materials that happened to be to hand in order to effect repairs through 'bricolage'.

What could be meant by adaptability? Consider a Computer Data Processing System (e.g. knowledge-based system or expert system) for investment recommendations. If, in this environment, new governmental policies are traced, if it eases the input of external capital, etc., actual investment recommendations of the system must be adapted to the new situation. Can this be done automatically?

From a user perspective, if it is possible to define the type (or category) that a new situation has potential to be, it should be possible to build some adaptability for new situations into the (technical) system. A problem arises, on the other hand, if we wish to have a system which can adapt to types of change that have not been expected or predicted by the designers of that technology. The technical system is disqualified by design from adapting to such changes. One reason is that the system has been limited deterministically in terms of what is expected or permitted as an input and output (in the case above, *investment recommendation*). Other inputs and outputs are already excluded through design, so by definition many constraints have been set upon potential adaptation to *new situations*. In simplistic terms, the system has been constrained by the limitations of the imagination of the original designers, i.e. the purpose of the system is pre-deterministic and limited.

Design of technology and intended outcome is different from design of *use* of technology and flexibility of outcome.

The properties we want to emerge from the whole, e.g. *rideability* of a whole bicycle, are the ones we set out to manufacture from the beginning, and so their emergence is a self-fulfilling prophecy. Other properties that emerge from the whole (to our surprise and/or disappointment) are often undesirable errors or failures of some kind. External entities may be free to do what they like with system outputs. Unpredicted outcomes are the result of what external entities do with system outputs, not properties of the bounded system itself. (What is considered to be *rideability* depends upon the perspective of the user and not necessarily the designer; also, *rideability* may not be the user requirement at all – a different purpose entirely may be in the mind of the purchaser).

This discussion appears to be suggesting *systems* which are *closed* - not closed in terms of input and output interactions with the environment, but closed with (pre-)determined (designed, desirable, etc.) boundaries and (pre-)determined (designed, desirable) and defined types of what is to be recognized as input and output. There seems to be a conflation of emergence of system output with emergence of system boundaries [Paper 3].

Why is *rideability* the determining factor? – see example discussion of *chair* as a seat, an objet d'art or a mountain in Austria (see Bednar and Mallalieu, 2001; and Wittgenstein's (1965) discussion on languaging, and Nissen et al, 2007). It is not obvious to me that emergent boundaries of systems are equivalent to emergence of inputs and outputs - desirable or not. From my point of view, if we *design* some artefact and selectively define *the artefact* as *a system* independently of (or external to) human actors - *the emergence of system* is *closed* through our definition. This means also that such a (technical?) system is never likely to demonstrate (in isolation from an incorporated human actor) the properties required for viability (in the sense of having a required variety in its own right) see Bednar and Welch, 2009b. This kind of limiting definition will exclude anything to be viewed (holistically) as a system that includes individual human actors or groups of actors, such as an organization or a human activity system). It is a limitation on what *a system* may be, which can of course be useful and pragmatic. But if this is applied dogmatically, I think it would be rather unhelpful and also in stark contrast to *systems* definitions in much of the work which has historically been recognized as Systems Thinking. For examples, see the

Viable Systems Model (Beer, 1985); Human Activity Systems (Checkland, 1981); the Learning Organization (Senge, 2006); Infology (Lengefors, 1966; 1995) and Systems approaches (Churchman, 1971; and Vickers, 1970) – in everyday life, anyone who looks upon a collection of people as a system which has not been predefined, e.g. a person who refers to having a *family dinner* or a *family Xmas*. NB All of these exemplify practical efforts in questioning of assumptions about the nature of the problem to be addressed (see also discussion in Bednar and Welch, 2005b).

### 3.3 Thinking and experiencing

In order to be able to understand any phenomenon it is first necessary to be able to relate to it. Cognition and recognition are interdependent (Bednar and Welch, 2007a). However, there are further issues, since understanding is not just topic related. One issue concerns the depth of competence individuals have available, in any particular subject they can relate to. Suppose that they lack deep understanding even in those subjects that they comprehend? Then how can they develop an understanding of a different but equally deep subject? There are no shortcuts [Paper 1, 5].

Unfortunately in some organizational and educational environments and cultures people appear to be surface trained (without appreciating the difference). Clients, managers, students etc. are presented with *facts, methods* or *recipes* but do not (necessarily) get the opportunity to become challenged. Such experiences could promote *thoughtlessness* and a lack of *awareness* of context and perspectives of others [Paper 4]. They are not faced with a need to create their own methods, i.e. design, critically review and reflect over their approach. They do not take responsibility for the quality in context of their own methods in relation to those that they could find elsewhere. It may be that they unknowingly lack experience and awareness of those criteria of quality that would enable them to make a comparison. This could be regarded as thoughtlessness.

It is of course not possible to transmit deep understanding (e.g. tacit knowledge) by any direct means (see Bateson, 1972; Morgan, 2006), but it may be possible to provide support for the education of other people - as an analyst and facilitator. Human thinking and knowing are processes which require engagement by the subject in context [Paper 1, 4, 5].

Questions now arise whether attempts by Systems Thinkers to counteract reductionist thinking are actually counterproductive, i.e. working against acceptance of our approaches. Does it help to remove the distinction between Systems Thinking as a way *of thinking* and as a way *in thinking*? If we help people to expand the boundaries within which they think, will this naturally lead them to think more systemically? This is not a problem of reductionist thinking. It is a problem of reductionist thinking without reflection of the consequences of reductionism. Systems thinking does not apply itself; it is applied by people in context [Paper 1, 2]. It follows that it is not applied uniformly. As in any aspect of thinking, some people are generous; some are arrogant; some are reflective; some people are good communicators and some not. Some people are dogmatic; some people are empathic, and so on [Paper 4].

However, whether or not people are open-minded is not determined by their approach to thinking. We can demonstrate this by analogy to religion. Within any of the major religious movements, it is possible to find people who are generous, tolerant and generally empathic. However it would be a mistake to suggest that every individual member will *automatically* display these qualities *in-depth* just because they belong to a particular religious group.

The proposition that helping people to expand the boundaries within which they think will lead them to think more systemically is an interesting one. This suggests that the true role of an analyst is facilitation of problem redefinition. This is supported in work by Churchman (1971), Bateson (1972), Checkland and Holwell (1998), Ulrich (1993) and others. Churchman suggests that Systems thinking is a form of *languaging*. He engages with open and dynamic systems. Bateson talks about a multitude of system worlds in his discussion of therapy and *a taxonomy of learning*, focusing a discussion on questioning the process of inquiry and reflection [Paper 4, 5].

Checkland is concerned with multiple *Weltanschauungen*, giving an analyst the opportunity to create more than one possible problem space for analysis. Ulrich promotes the idea of boundary questions, which specifically target critical reflection over a problem space. I could suggest that people who demonstrate something I recognize as *true excellence* in any area of expertise also demonstrate systemic thinking.

What is the difference between knowledge and wisdom? Wisdom or judgement in the pursuit of excellence lies, I believe, in the ability to transcend one area of expertise in order to understand when it is appropriate

to apply particular ideas or skills. The concept of Renaissance man (woman) surely relates to ability to move between at least two areas of excellence. Is this merely a coincidence? Probably it is not. However, it is more challenging to address the proposition from the opposite approach. As analysts, facilitators and educators, can we encourage people to think more systemically and if so, will this also have an impact on the quality of their performance in other areas of expertise? Only people who have developed in-depth competence and knowledge in some area of expertise would be able to form a judgement on this, through comparison and reflection [Paper 4].

However, to be able to reflect and evaluate on a higher level of abstraction, people need to have at least two areas of expertise. Without this, they have nothing to relate to which is just as deeply developed in the mind. There are no shortcuts and people cannot be taught from outside – they can only be supported in their own personal efforts and journey of discovery [Paper 1] (Bednar and Bisset, 2001; Bednar and Welch, 2005a; 2009b; Bednar, Welch and Graziano, 2007).

For example, it is possible to reflect that people who are bi- or multi-lingual may have an opportunity to engage with more than one socio-cultural space. This could relate to music, mathematics, art or science, visual or verbal – any kind of (social) *language*.

There may be a consequent advantage in development of self-reflection through direct access to discourse illuminating external views on the world, or even of themselves. A person whose experience has been confined exclusively to one *language* and mono-cultural space may find it more difficult to obtain a cognitive and emotional distance from which to reflect upon that space (see comments by e.g. Hofstede (1993) and Mead relating to cultural difference).

*‘as the traveller who has once been from home is wiser than he who has never left his own doorstep, so a knowledge of one other culture should sharpen our ability to scrutinize more steadily, to appreciate more lovingly, our own’* (Mead, 1928 p.1).

Argyris (1990) describes single loop learning as thinking about action and double loop learning as reflection over the thinking about action. Different orders of learning, as discussed by Bateson (1972) are referring to a much more sophisticated and developed distinction but draws upon similar phenomena. Zero order learning would be when an individual reflects over



alternative actions of the same type, First order learning can be represented by reflecting about selection of any alternative action drawing from previously known actions. Second order learning is to reflect over the process of making assumptions about how any particular approach to selecting any action would be relevant. For the purpose of this discussion particularly second order learning as described by Bateson (1972) is of importance (Nissen, 2007) [Paper 5].

Opportunities to develop empathy with contrasting understandings are limited for a person confined to one socio-cultural worldview and inhibited by this isolation. Experience suggests that such socio-cultural isolation can lead subjects to a view that there exists a form of unchanging reality within which individuals exist, i.e. that social systems subsist independently of the human individuals who interact. Human need for physical security and a sense of *belongingness* have long been recognised (e.g. Maslow, 1943).

If we consider pursuing purposeful change as in systems analysis and systems development, there is a need to engage with relationships between security and change. A desire for change reflects a desire to destabilise prevailing cultural norms, and it is necessary to question what is the expected gain and the expected loss from each different stakeholder's point of view [Paper 1, 2].

Observations of any phenomenon must reflect hindsight – an observed phenomenon has of necessity already been swept away in the tide of history. However, perceiving systems is another matter. As individuals, we do not perceive systems as neutral observers; but create a conceptual understanding of (what we think is) a system ourselves, for purposes we have chosen. We do this by choosing to draw a boundary around a system of interest – ‘interest’ here reflecting our differing purposes (Bednar and Welch, 2006c; 2008c).

If Systems Thinking is used as a means to inquire into complex problem spaces, then any one explanation of a particular system is irrelevant - there is *no universally defined relevant system*, i.e. one that has an objective existence independent of *subjective* inquiry [Paper 4, 5].

There may be *something*, but a description of what that something is, or is not, is another matter, dependent on subjective understanding of that description. Systems Thinking is used to make sense of something for a purpose. Making sense, from a systemic point of view, involves integration

of all of these views of *something*. There is no objective, pre-existing purpose; only one which appears meaningful to us at the time.

As we decide what we look upon *a system* and set the boundaries for what that system seems to comprise, we by definition give it a purpose through that process of boundary setting. We can obviously reflect over our own idea of *system* retrospectively, and can try to assess whether or not our reason for creating that system boundary and purpose can be reverse engineered (Ulrich, 1983; Nissen, 1989; 2007) [Paper 4, 5].

If Systems Thinking is pursued with the intention to act purposefully in bringing about a change process, then *the system* has a purpose before and not after. If you are using Systems Thinking with the intention to try to make a change *for the better* (where *better* is defined by yourself according to your own moral and subjective standards), then you may also realize you are not controlling the change process. This realisation may lead some people to abandon the effort - if you cannot be sure to bring about the desired change, why waste your time and try?

Enid Mumford (1983) famously wrote about *designing secretaries*. This was a title written tongue in cheek relating designing secretaries with secretaries who design. We cannot *design secretaries* - but together *with secretaries* we may be able to support them and facilitate a change that both they and we together believe to be positive (it could be argued that in some projects Mumford did literally *go native*). This is what Mumford was trying to achieve and how systems can be seen to have – purpose is given through boundary setting made by the ‘I’ (i.e. me the observer and/or *us*, the actors) *e.g. within a socio-cultural space such as an organization*.

Bateson (1972) reminds us that as sentient human beings, we have no choice but to think. Thus, from our infancy our innate sense-making processes engage us in continual learning, which goes on until we die (this is also reflected in the work of Langefors (1966; 1973; 1995) and his *Infological Equation*) [Paper 4].

However, when observing the behaviour of others, we often express the view that *they never learn*. What we are proposing in saying this is that we, as observers, cannot see any evidence that some people have learned that which we judge to be worthwhile or necessary. One major reason that they did *not learn in our eyes* is because they learned something else instead, which they experienced as less distracting and emotionally more valuable in context.

Unfortunately, this may sometimes include self-defeating practices due to their being caught in a double-bind (Bateson, 1972) [Paper 5].

A number of authors, (e.g. Argyris, 1990; and Senge, 2006) have discussed a phenomenon of a *learning organization* but effectively all organizations are learning organizations since they are comprised of living human beings. A learning organization is an emergent property of people who think, interact and learn as individual human beings.

There is no such thing as a *non-learning organization in this context*. If some observer (inside or outside of the organization) does not appreciate the learning which is taking place, this does not mean that there is no learning going on.

Learning may not have positive effects from a particular observer's point of view. I can easily imagine a downward spiral, e.g. *organizational stupidification* in business and society (see also Alvesson and Spicer's (2012) discussion of '*functional stupidity*').

Of course, organisational learning always takes place, but this does not mean that all stakeholders always appreciate the learning that is identified, nor is it always beneficial to organisational well-being.

Ignoring the persistence of human learning may lead to an important problem - that existing incentives for learning, and habitual consequences, can be overlooked. What is success? - *it depends* from whose point of view and in what context [Paper 1, 2, 3, 4, 5].

There is no *emptiness* within people which can be filled with learning; invisible learning is always going on (Bednar, Eglin and Welch, 2007). Change may go *unnoticed* but an illusion of non-change may have a cost, due to the *red-queen effect*, i.e. an appearance of non-change may require a lot of effort and energy (Bednar and Welch, 2006b).

The costs of efforts (both emotional and behavioural) to overcome what is already happening, e.g. efforts to defend a particular self-image, may be immense. (See also Bateson's (1972) discussion of the difficulties arising from entrapment in double-bind). It is all too easy to fail to take into consideration such matters of complexity. It might take a lot of creativity, inventiveness and effort for a human being to appear to others (and/or themselves) as uncreative ... [Paper 5].

## 3.4 Complexity in problem spaces

Ackoff (1974) distinguished between problems which are relatively well defined, and *messes* which are systems of problems with numerous possible intervention points from multiple perspectives. However, it is possible to reflect that problematic situations with apparently easy-to-understand stakeholder perspectives often yield a plethora of unconsidered complexities when subjected to closer analysis.

A mess could be described as an unbounded problem space with multiple stake holders and perspectives (see also discussion of *wicked* problems (Rittel and Webber, 1973)). Thus, the difference is in the judgment made by an observer and not in any external, dependent validity. An observer may wish to look at a problematic situation as if it has easy to understand stakeholder perspectives; alternatively, s/he may wish to approach the situation as an unbounded *mess* with multiple stake holders and perspectives (Bednar and Welch, 2007b).

I can imagine contextual inquiry to be able to focus on a multiplicity of (not necessarily compatible) individual and complex worldviews without that being a problem (see for example discussion in Bednar, 2007). The difference in judgment is in the eye of the beholder, and it is the second of these assumptions (e.g. *messes* as explored through the use of *narratives*) which is usually regarded as part of Systems thinking.

*The problem* does not determine how you approach it - or how you try to make sense of it. Any a priori assumption about a problem space may turn out to be wrong, including assumptions about its complexity (or lack of complexity) from any particular point of view. There is no objectively correct view which defines a problem - hence the common saying that history is written by the victor(s) [Paper 4].

A situation must be defined as problematic by some person who is interested in it. That interest reflects a unique perspective of that particular observer, which will inevitably differ to some degree from those of others. This perspective reflects the purpose(s) for which a person chooses to engage with the situation of interest.

Faced with a motor vehicle which does not function, a mechanic is likely to focus on its mechanical integrity in order to find and fix the fault. A designer, on the other hand, may reflect upon many reported experiences of flaws in

similar vehicles, creating multiple mental models in order to pursue more resilient designs for the future.

It is not the complexity of the problem space which defines the interest of an engaged actor, but her own purpose in taking an interest which leads her to draw a boundary around some aspects of that space. The contextually made definition of what is or is not recognized as a system is the result of (subjective) judgement [Paper 1]. A car can be described as an example of a system; but car parts in a garage can also be described together as an example of a system – e.g. car parts storage etc. [Paper 2, 3].

### 3.5 What is ‘good’ judgement?

Our inherent propensity to learn does not in any way determine the results of that learning. Social conditioning from infancy leads people to internalise certain taken-for-granted assumptions, which collectively generate norms and values through which ‘*society*’ (at whatever level this is defined) coheres.

However, social conditioning does not determine the application or understanding of norms and values. These are a matter for judgement by individuals, as research involving twins has demonstrated. This poses a problem for sentient individuals because nothing is *good* or *bad* in itself, as *judgement* of what is to be recognized and accepted as good or bad is done by a human being [Paper 4].

There is no universal and objective standard by which assumptions are validated, as there is always the matter of subjective interpretation in context. Social conditioning may prevent one from thinking holistically because it makes it difficult to deal with *common sense* in a reflective way, and to question the premises upon which such *common sense* is based (see also discussions by Churchman, 1971; Bateson, 1972; Ulrich, 1993 and Gilovich, 1991).

The recognition that what is *good* and what is *bad* is based upon some metrics (comparison with some ideal). The application of these metrics is not universal but the result of social and individual choice. It is for this reason that it is important to include consideration of axiology in any inquiry into a human system [Paper 1].

Ultimately, our relationship to any phenomenon and judgement whether or not it is good, is a personal value judgement. Human beings are not constrained by bi-valued logic – good/bad, but can make nuanced judgements involving paraconsistency (see Bednar, Anderson and Welch, 2006; Bednar, Welch and Katos, 2006; 2007).

The reason we may wish to reflect on social conditioning is that the premises upon which any judgement is based may not be what we actually agree upon. Perhaps we have taken some ideas of *goodness* for granted without reflecting upon their relevance in context, or even the underpinning assumptions in relation to our own personal beliefs (see also discussion by Fromm, 2005). We can reflect with physicist Richard Feynman on the importance of recognizing scientific doubt:

*It is our responsibility as scientist, knowing the great progress and great value of a satisfactory philosophy of ignorance, the great progress that is the fruit of freedom of thought, to proclaim the value of this freedom, to teach how doubt is not to be feared but welcomed and discussed, and to demand this freedom as our duty to all coming generations (Feynman, 1988, p.248).*

What we describe as common sense may be an unreflecting acceptance of socially-transmitted norms and values. In principle, several parties could adopt the same metric for value judgements. This does not mean that their judgements in a particular context will be identical since a problem of tolerance remains. Indeed, individuals do not necessarily apply metrics consistently across differing contexts.

Macintyre (1996), cited in Stowell and Welch (2010) discusses the question of a Government minister who promoted comprehensive education for all, while choosing to send her own child to a grammar school. This may not be an instance of hypocrisy, since it could be possible to regard one judgement as best for all people in general but a different judgement to apply in particular circumstances. This is an instance of human capacity to apply paraconsistent logic (Bednar et al, 2005).

One person can have a different threshold for pain than somebody else, though both recognize what pain is. We could have different tolerances for cruelty when we see it being committed, whilst agreeing on the nature of cruelty (with the possible exception of a sadist who finds pleasure in inflicting

it). The perceptions of all of these individuals could still be consistent with societal norms about cruel behaviour [Paper 4, 5].

There is a danger here of conflating different paradigmatic foundations (Bednar and Welch, 2006c; 2007a; c). There may be a much more complex question than whether behaviour is socially conforming. We are all immersed in vast number of competing societal norms.

It is possible to reflect that one person's terrorist is another person's freedom fighter, even where both people who judge occupy a similar socio-cultural space in other respects. Indeed, one reason why such conflicts can be very intractable is that the opposing parties understand their collective cultural space better than any of the outsiders who attempt well-meaning interventions. This can be related to Bateson's (1972) discussion of entrapment in a double-bind [Paper 5].

There is another problem within competing aspects of the same social norms [Paper 2, 4] (Bednar and Welch, 2006a). The question is not just whether we as human individuals agree upon some standardized metrics (Bednar and Welch, 2005b).

Even if we do agree on metrics, we have the rather significant problem of having so many of them that it is difficult to achieve agreement on which metrics are appropriate to any particular context. This is a significant problem with the complexity of exceptions in context.

Radnitzky (1970) discusses differences between Hermeneutic-Dialectics and Logical Empiricism in this respect, e.g. method use, as against selection and judgement of appropriateness and relevance of a method for a particular purpose [Paper 4, 5].

In life as it is lived exceptions abound - possibly all things are exceptional depending on context (Bednar, Anderson and Welch, 2005; Bednar, Welch and Katos, 2006; Katos, et al, 2006).

Another issue that arises is that we may not even agree on the metrics we would wish to apply. This is a very common problem - different value systems produce different metrics. For example, in some value systems pain is seen as beneficial, e.g. as reflected in the old maxim spare the rod and spoil the child where punishment is seen as a means to develop good character and hence future prosperity and happiness. What is cruel (or what is wonderful) is impossible to judge from an outsider perspective (Bednar and Bisset, 2001).

What in one (sub-) culture may be regarded as pornography (dirty, exploitative and abusive), might in another socio-cultural setting be regarded as erotica (i.e. as supportive and fun).

This is not simply a matter of sophistry, political correctness or permissiveness; nor is it about fatalism. Feynman (1988) reminds us of a responsibility to exercise doubt in relation to ideas and beliefs. Socio-cultural norms are not an inevitable determinant of behaviour. Many individuals and groups strive to engage and interfere for the purpose of promoting and facilitating change. However, this requires an effort to recognize that understanding of anything is not externally driven (see discussion in Bednar and Bisset, 2001).

We can perhaps also perceive similarities in discussion of phenomena seen as forbidden fruit; e.g. what is seen as dirty in one cultural context may become interesting in that particular culture but may be almost completely ignored in another. Rogers (1993) makes a similar observation regarding diffusion of innovation that requires a trigger from within a target population.

We need to remind ourselves that successful (purposeful and intended) change (in their own behaviour and practices) depends on engaged actors having a desire for their own personal pursuit of such change, i.e. not just ability and capability to change (see Bednar and Mallalieu, 2001; Bednar and Welch, 2006a; 2010; Bednar, et al, 2007) [Paper 1].

Galbraith (1984), in his discussion of compensatory power, makes this point as follows:

*‘Never in the consideration of power can we assume there is only one instrument of power at work’* (Galbraith, 1984, p.35).

How can we recognise and value benefits of change and the multiple criteria to which they are related? Ward and Daniel (2012), for example, suggest four categories of benefit that may be taken into account in the context of business IT projects: financial, quantifiable, measurable and observable benefits [Paper 5]. However, it must be for each individual engaged actor to judge which of these is most important in context, if any (Bednar and Welch, 2012).





# 4 Sexy Words Aplenty

Any meaningful engagement with Contextual Inquiry will require us to pay attention to our use of words and concepts. In the world of Systems Thinking the use of words is not a straightforward exercise even though it influences our engagement with context [Paper 1, 2, 4].

## 4.1 Rigour vs. Relevance

These terms are used as a recurrent theme in IS discourse (see e.g. Benbasat and Zmud, 1999; Desouza et al, 2006; Straub and Ang, 2011 and the 2014 special issue of Journal of Strategic Information Systems on Information Systems Strategy as Practice: Micro Strategy and Strategizing (Peppard, et al, 2014)).

When I use these terms, however, my meaning does not exactly concur with those listed. My focus is on rigour or relevance of *inquiry and intervention* as part of systemic change practice, i.e. Systems Analysis and Development, as opposed to rigour of *intervention*. I emphasise both rigour and relevance in relation to *engagement* in organizational change efforts, both from a practice-oriented viewpoint and as theory development.

My focus is on purposeful change effort, targeting unique human activity systems, and therefore inquiry into contextual dependencies (see e.g. Bednar and Welch, 2005a). Nissen has discussed similar themes in his 2002 chapter on traditions of inquiry into software practice, and Ulrich (re-)visits them throughout his work (Ulrich, 1983; 1994; 2001; 2006).

Here we come to a note about use of words. I do not think that there is any point in trying to deny from a generic point of view the existence and use of words for different *purposes* or even to try to disqualify words from different associations etc. However we should remember that words have different

usages and so when we are using words, especially key words, we might wish to make an effort to clarify what those terms mean to us. Bearing this point in mind, it is important to clarify the sense in which some words are used.

*Methodology* is used for a number of different purposes. As identified already, two main senses are commonly recognized:

- a) Methodology as a study of method in theory and use;
- b) Methodology as a *meta-level method*.

This is a key issue not limited to the term *methodology* (Churchman, 1971; Ulrich, 2001) but particularly so when it comes to words such as *information*, *knowledge* and not to forget the term *system* [Paper 1, 2, 4] (Bednar and Welch, 2006c; 2007a; 2008e; Bednar, Welch and Katos, 2006).

To clarify my point:

‘*Information*’ as a concept has at least two main and different, incompatible uses (see also similar discussion in Langefors and Dahlbom, (1995) and Radnitzky’s (1968) discussion of Logical Empiricism (LE) v Hermeneutic Dialectics (HD)):

- a) *information as an externally valid and objectively accessible ‘process’ or ‘object’*, i.e. people assume that information is available in books, journals, magazines, databases etc. (an LE focus); and
- b) *information as an internally valid and subjectively accessible ‘content’*: i.e. people assume that information cannot exist in books or databases. Information is the result of ongoing interpretation which is done inside a human mind and cannot escape it as any effort to describe such information is done through some language. Thus, such efforts result in the creation of data - excluding information from being part of objectively available content (a HD focus) [Paper 4].

*System* as a concept also has at least two main and often different, incompatible uses:

- a) *system as a ‘thing’, ‘object’ either physical or conceptual*: It is assumed that systems can be treated or interfered with directly no matter if they are physical or not as the systemic aspect is assumed to be the consequences of direct relationships (interactions) between physical objects and entities [Paper 2, 3]. Equilibrium is static (LE focus).

- b) *system as an idea (or perspective) – either apparent or conceptual:* Systems are assumed to be a way to make sense of emergent properties of a problem space which someone subjectively chooses to look at [Paper 2, 3]. Systems consist of dynamic processes and are not in-themselves physical. Thus, they cannot be interfered with directly as the systemic aspect is assumed to be the consequences of subjective worldview and purposeful boundary setting. Equilibrium is dynamic (homeostatic) (HD focus).

An illustration of this difference would be the distinction between *river* (as process) as a concept and *watercourse* (as object). As Heraclitus pointed out, no man can step into the same river twice since it as time passes it will no longer be the same watercourse, nor will he be the same man (see discussion in Crowe, 1996).

It is important to recognise the difference between descriptions of human *knowledge* and reflection upon human *knowing* as an on-going process of sense-making (Bednar and Welch, 2005b) [Paper 4]. In the same way, it is necessary to distinguish between *information* seen as an object and processes of informing [Paper 4, 5].

## 4.2 Human Activity Systems vs. Purposeful Activity Systems.

In later work by Checkland, he has substituted the term PAS (Purposeful Activity System) for the previous term HAS (Human Activity System) (e.g. Checkland and Poulter, 2006). However, I do not think that the concepts are exactly the same. I believe these authors' purpose in making this change is to emphasise the interest for practice and application.

I consider that the purpose for using SSM in the first place is to *intervene*. I am aware that Checkland might prefer to use the term *interact* (Checkland and Holwell, 1998) but I find that position unhelpful. The purpose for using SSM is, I think, to engage in a change-process, and this is why I prefer to use the term *intervene*. I reflect with Maturana and Varela (1980) that any observation must be made by someone who observes, and that therefore every human action within a problem space involves intervention. A possible definition of the term Information System might be '...systems where

information technique is used for information treatment, which aims to transfer 'messages' in time and space (Bednar, 1999). Such a definition could be interpreted as referring to individuals and their use of hardware and software. This I refer to as IS1. Such a restricted interpretation could be expanded, however, to include the range of inter-individual communication activity (IS2). If organizations are seen as comprising individuals, interacting within social communicational networks, then IS2 may not be viewed as a sub-system of the organization but as equivalent to it in context (Langefors, 1995, p.53). Successful use of IS1 would therefore need to presuppose active consideration of IS2 (Bednar and Welch, 2005a).

This engagement is intended to be done purposefully and in pursuit of change, which is desirable and sponsored by human activity. By this, I mean desire for something which some stakeholders view as *better*. The term *purposeful activity system* (PAS), I believe, gives recognition to the view that stakeholders are pursuing bounded rationality; whereas *human activity system* (HAS) could suggest serendipity. Obviously we could argue that there is no difference, as people are not purposeless in their engagements with their world. However, we are putting the focus specifically on the bounded rationality aspect by using the term *purposeful activity system* (PAS). Ackoff and Emery (1972) did also discuss that all systems are purposeful in the context of socio-technical approaches. Ackoff (1974) is re-iterating that all systems are purposeful when he is restating the outcomes of the work he had done together with C. West Churchman with the following explanation:

*'Because the Systems Age is teleologically oriented it is preoccupied with systems that are purposeful; that is, with systems that can display choice of both means and ends. Most of what interest remains in purely mechanical systems derives from their use as tools by purposeful systems. Furthermore, Systems Age man is most concerned with those purposeful systems whose parts are also purposeful, with groups - in particular those groups whose parts perform different functions, organizations.*

*All groups and organizations are parts of larger purposeful systems. Hence all of them are purposeful systems whose parts are purposeful systems and which themselves are part of a larger purposeful system. All the organizations and institutions that are part of society itself, are part of such three-level hierarchical systems.'* (Ackoff, 1974, p.18).

I agree that all phenomena viewed from a systems perspective should be viewed as being purposeful. I am however not convinced that the change from HAS to PAS is necessarily a good thing.

If we look at the work of Bateson (1972) for example, I think we will find plenty of support for the suggestion that to view something as a *purposeful activity system* as opposed to a *human activity system* might make it more difficult for us, as systems thinkers and facilitators for change to break away from our own prejudices (in this respect similarly Churchman, 1968; 1971 has a discussion about the difficulties to break away from prejudices for systems thinkers).

It is all too easy to view an organization as a purposeful activity system and then forget that the system is not necessarily purposeful by itself, as a 'system' is essentially a mental construct (perspective) formed by an observer in a particular context. In my view, no system can be purposeful independently of our subjective boundary setting (as systems thinkers), when we view a system as an emergent whole [Paper 1, 2, 3].

It may be much easier to engage with a multitude of problem space understandings within an organizational environment if we do not pre-determine (assume, or prejudge) some objective bounded rationality of what we view as the human activity system for our own purposes [Paper 1, 2, 5].

As practitioners we are not limited, in our own professional practices, by formal descriptions of methods created by ourselves or by other people (Bednar and Welch, 2005b; 2008c). We can use our own experience and successfully modify or combine different approaches in practice (see also Radnitzky's (1970) discussion of LE/HD and particularly his point that method does not determine use of method or relevance/value of method for any particular purpose). We should consider, in context, whether differences we perceive between *map* and *territory* may be significant and require adjustments to practice based on experience [Paper 2, 5].

We should make an effort to take responsibility for our own interpretations and applications (Bednar and Welch, 2007c; 2008d). Surely, when we talk about methods and methodology, we should not be promoting method over methodology as a logical consequence of experience in practice? We are, after all, advocating *informed* decision-making and not working blindly on a need-to-know basis.

A focus on methods (especially in relation to IT development and/or project management) suggests a main concern with *product*. This is a trap related to determinism, in which choice of method is expected to determine the outcome of work (see also Radnitzky, 1970). This can be misleading to managers when they attempt to exercise judgement in choosing which problem spaces are relevant to engage with (Bednar and Welch, 2009b; Bednar and Welch, 2010).

Such misunderstandings have caused all kinds of real world problems for practitioners for more than forty years, leading to a conclusion that it is inappropriate to seek to apply *method* in isolation from concerns about creation of suitable *methodology* [Paper 1. NB In this paper, I talk about creation of a ‘temporary method’ for inquiry, emphasising the need to reflect upon methodological concerns in context]. This perspective is supported by Checkland’s discussion in his 30-year Retrospective (Checkland, 1999, p 161).

Many practitioners have enjoyed more than 25 years of success in being able to integrate relevant aspects of different methods and methodologies, including SSM, in their activities (Checkland, 1999; Mumford, 1983). Nevertheless, when people refer to failure, this is often ascribed to flaws in methods and methodologies they have been using. However, our concern might be better focused on the apparent lack of excellence of those practitioners (and academics) who appear unable to use methods successfully in context (Hirschheim and Klein, 2012; Bednar and Welch, 2005b; 2008c; 2010). Sometimes, such people seem to have lived in isolation from practitioners who are experienced in applying excellence through engagement with contextualized multi-methodologies in their practice.

To be ignorant about the history *and* application of excellent practices in one’s own professional field is not a good excuse for any practitioner, including those engaged in IT related projects (Bednar and Welch, 2010). As professionals we need to take responsibility for engagement in reflection over our practices, rather than blindly following *received wisdom* (Bednar and Welch, 2008c; 2009b; 2014). We need to pursue professional and personal integrity *and* ambition for excellence in practice (Bednar and Welch, 2006a). Again, it is relevant to consider Feynman’s (1988) point about the importance of maintaining scientific doubt.

If you want to change anything, you cannot exclude your own engagement from that change. This relates back to the discussion about HAS and PAS

above and the same point is recognized in the work of Maturana and Varela (1980). You cannot engage with any human activity system without including your immersion in such a system Bednar and Welch, 2007a) [Paper 4]. In this context, I see the concept of *system* as a language and *model* as dialogue about change. The Soft Systems Methodology is intended as a vehicle to generate, not effective change, but an agenda for debate about changes which appear systemically desirable and culturally feasible (Checkland, 1981).

So any (system) model is *not the territory*, but it is also unsuitable to be used to describe a systemic change and, *at the same time*, exclude what could potentially change such a system. In other words, model of system is not the same thing as system, *and* model of system to be changed should not exclude incentives for change. I can see no point in describing change without also discussing purpose and efforts to bring about that change [Paper 1, 2] (Bednar and Welch, 2005a).

I am not referring to *action plans*. As Walsham (1993) and Lindblom (1959) have pointed out, models of rational planning have little basis in practice as the data gathering and analysis needed to support them would almost preclude any meaningful action. I am referring to genuine engagement of espoused stakeholder interest, i.e. dialogue, when *using* SSM. The dialogue between people comes about because they want to engage with a desired change *of something*. This exploration and dialogue (about HAS and PAS) is supported through discussions and co-creation of *models, rich pictures* etc. and the purpose is to make sense (informed judgement about possible action) related to *desired change* and desired potential future HAS. It is not necessarily vital that a planned outcome is achieved. Indeed, often what is wanted as a desired outcome changes during action.

Sometimes we learn more from a failed attempt than from a successful effort, and then can become more successful in our efforts in the longer term. It is necessary, here, to reflect on the meaning we attribute to the word *success*. Does success lie in achieving a prescribed outcome, e.g. requirement specification, or does it lie in experiencing usefulness in *something* which is an outcome of an effort? (Bednar and Welch, 2006a 2007a) [Paper 4, 5].

The problem of competence in understanding and applying methods is usually well recognized as part of method description (see for example, discussion in Avison and Fitzgerald, 2006; and Sommerville, 2010). Without skills and ability to apply method, use of that method may be unhelpful by definition. This is why rigour in problem solving and inquiry can only be



addressed with skill and capability in the use of method. We want *things* to work so we need to exercise rigour when we *create* those *things*. On the other hand, no matter how well or skilfully we *create a something*; no matter how well this something *works*; this does not mean that what we have done is relevant for a particular desired future situation, as seen from client and users' points of view [Paper 1, 2] (Bednar and Welch, 2005a,b; 2008c). So while the problem of how to use a method is recognized within method description, what is not very well understood is *when - in what way - under what context - when not*, etc. (Bednar and Welch, 2008c). Support for this view can be found in Vickers, 1965; Churchman, 1971; Bateson, 1972 and Ulrich, 1983.

There is a problem recognized within descriptions of many *methodologies* - that on one hand it is extremely important to understand methods well - and on the other hand it is extremely important to understand that methods should not be used without contextual adaptation and change. You really need to understand the rules, but it would be foolish to follow those rules blindly (Bednar and Welch, 2008c).

In order to be a competent practitioner, you need to be able to make a *contextual judgement* and informed decision in order to understand when to follow the rules, when to depart from those rules, and when you need to bend them: bricolage, improvisation, extemporisation [Paper 5] (Bednar and Welch, 2010). This is not to mention that other issue - which method should you draw upon in any one context? How do you know, and set the boundary of, what is a *relevant* context or problem space? This is what *methodology* is (or should be) about - to address problems of *when, why* and *in what way* method can become useful – or in other words engaging the issue of *relevance* [Paper 2] (Bednar and Welch, 2005a; 2009b). In professional endeavours, such efforts involve not only a process of reflection on usefulness of method, but reflection over processes by which such a judgement can be made. This involves what Bateson (1972) refers to as second order learning [Paper 1].

### 4.3 What the client 'wants' is unimportant

We could say that: *What the client 'wants' is unimportant; that makes you a contractor, not a consultant.* A contractor's approach is to sell the client a 'solution' to a problem; a consultant, however, should be supporting the client to find one. Of course, as analysts, we recognise that what clients want is

important. However, for the reasons mentioned above, it is not a good idea to confuse paying due regard to client wants with trying to fulfil them! [Paper 1, 2] (Bednar and Welch, 2009b). It is appropriate to assume that what the client wants is important, especially if this is far from what the client *needs*. Without understanding what the client wants and how this *want* relates to what the client may need, there will be no evolution towards *usefulness* (Bednar and Welch, 2007a) [Paper 5].

A client has experience/expertise in contextual dependencies inherent in a particular problem space, in contrast to a professional analyst who is experienced in methodologies/methods for inquiry but lacks these contextual understandings (Bednar and Welch, 2009b). However, clients do not have expertise in the (unintended) consequences of any particular choice or resolution that might be created. On the one hand, *what the client wants* is related to what they may desire from an emotional perspective. Desire is linked to motivation (Bednar and Welch, 2006a) [Paper 2, 4] and also to (prejudiced) value judgements of any expected results of what is to be *delivered*.

So what the client *needs* might be disqualified out of hand as a direct result of a lack of attention to what the client *wants*. In other words, if we ignore the fantasies of the client - no matter how unrealistic they may appear to be, or how irrelevant - we cannot engage in the development and potential evolution of co-understanding with the client of what the client *needs*. We, as consultants, do not have the understanding of the context of use which clients have.

However, in the same way the clients do not have any understanding of the future context within which use of the proposed system will become meaningful [Paper 1, 2, 3] (Bednar and Welch, 2009b). We have to pay attention to what they want, and to what our professional understandings suggest is *what they need*.

However, we should give the client something which they will need when they get it – which they may not yet know that they want. Thus, we need to remember that we should probably seek to pursue *co-development* and *co-understanding* and *co-informing*, as facilitators and systems inquirers in support of both clients and users.

In my experience these groups are not usually the same but often appear to be confused with one another [Paper 2]. Indeed, as Nissen (2002) points out,

few people identify themselves primarily as ‘users of information systems’ and use of this term may be counterproductive. Who should be regarded as *the client* among the many stakeholders, whose interests are not identical [Paper 5]?

A useful discussion on this point can be found in the account of the Challenger disaster (Feynman, 1988). Where during his investigation he discovered that key stakeholders in the investigations also assumed different clients for their parts of their investigation. As these clients had different interest and purpose with the investigation, not only what questions to ask, and what was to be investigated (and why) but also what results should be published become issues for conflicts.

It is also necessary to consider the prejudiced understandings of *the consultant*. These also need to be reflected upon and re-evaluated. From a pragmatic point of view and in simplistic terms: a client and/or user experiences some kind of (most likely multiple) issue or *problem situation* [Paper 2]. The client (user) is therefore an expert in their experience of the problematic situation. They are not usually an expert in inquiry into a problematic situation - this is where *the consultant* comes into play.

However, the consultant is not an expert in the contextual experience of the problem space. Neither the consultant nor the client is an expert in the experience of any *future desired solution space*. So we have stakeholders who are experienced in the contextual space. We have consultants who have some competence in the facilitation of inquiries into a problem space but do not themselves have experience or competence in that unique contextual space.

We cannot predict the future, and have no experience of the future, and so we cannot know how any stakeholder will appreciate the future when / if they experience it [Paper 2, 3].

We do not know how it feels to experience something which we have not experienced. Unfortunately, consultants easily confuse experience of *talking about something* with experience of *doing something* - just like any of the other stakeholders.

Additionally, since an organization can be viewed as a dynamic, open system, at least some of the future stakeholders may not be the same people as those involved in the change activity of today [Paper 2, 3].

## 4.4 Reasons for doing anything in an organization

There are many interconnected reasons for engaging in purposeful change processes in organizations. Here are some of the possible reasons which are often taken for granted: a) it is a statutory obligation or industry practice; b) our stakeholders demand that we do it; c) it is intended to add value to our business.

These points can be good starting points, but they can also very easily become a hindrance for the very purpose they were introduced. The reason is that all of them hide the significant complexity in any specific context and business situation [Paper 3].

These categories can, of course, be turned around if looked at differently. Both a) and b) can be described as c) - intended to add value if complexity of benefits is also taken into consideration. See discussion of different categories of benefit (Ward and Daniel, 2012) and a need for holistic multi-criteria benefit management (Bednar and Welch, 2012).

- *it is a statutory obligation or industry practice*

The question is - what does this mean, i.e. how may we interpret it in context? The point is that what is done and how it is done can be justified with a reference to a statutory obligation, or industry practice. Business managers frequently weigh up the cost of compliance against the cost of paying fines, compensation etc. if they do not comply. If the balance is in favour of the latter, then they might not bother to comply. Sometimes managers do comply locally. This does not mean that exactly the same thing is done in exactly the same way in different organisations, even if they all have the same obligations.

The point is that when a new practice is introduced, the local team can ask themselves the question “How do we wish to articulate this practice within our overall activities?” Whereas the management or local team in another organization might just say “this is what we have to do”. Some obligations can be straightforward to fulfil; sometimes it is better to avoid fulfilment, e.g. by *redesigning* our practices so *we could not possibly be able to fulfil them*, or perhaps even fight against the imposition of the requirements themselves. This is a very important factor to take into consideration particularly in the IT and Media Industries. Furthermore, some obligations might have been dreamt up by administrators or politicians who perhaps had no competence

whatsoever relevant in the area they were setting these obligations for, and they might have no understanding at all about the realities of the technology or the consequences [Paper 5].

This could be the case when unreasonable reporting mechanisms in the name of “*accountability*” are implemented. Maybe because some professional group are intended to be disempowered, or management might wish to deflect blame away from themselves in the view of external stakeholders. These mechanisms may actually hamper the ability of professionals to do their job, e.g. police officers filling in so much paperwork following an arrest that they are not out catching the “next” wrongdoer and have no time for prevention initiatives. Perhaps in some cases we should just try to defend ourselves in court? It is not necessarily always appropriate to blindly implement policies / practices without reflecting on them from a professional context, recognizing individual uniqueness and contextual dependencies and taking into consideration conflicting responsibilities [Paper 2].

Ramanathan, et al (2015) point to a phenomenon where organizations find difficulty to interpret or comply with multiple and complex sets of external, environmental regulations. In these circumstances, these authors found that organization members have created and articulated their own criteria at a higher standard than any perceived, possible interpretation of external regulations, to overcome the necessity for constant vigilance about compliance and/or avoid the consequences of failure to comply. See [Paper 2, p.25] for my own discussion of project ‘contextualisation’ in relation to ISO9000.

- *our stakeholders (e.g. clients, shareholders, suppliers, owners, collaborators) demand that we do it*

This excuse can be good or bad, as it can result in being indirectly in conflict either with the previous point or with the next. This is also the area of corporate governance. Often we encounter this argument interacting (or intertwined) with the previous point. For example, there is, in the UK, a statutory requirement for company directors to consider the needs of their shareholders as paramount over other stakeholders except where other legislation applies.

Different stakeholders have different interests and there is also a difference between long-term and short-term thinking. We may be able to do a lot of things that are beneficial to both ourselves and our stakeholders. However, in

the long-term, some of those things we do for our stakeholders may create problems for our efforts to add value to our business in the future, e.g. through image problems.

Owners of a business may choose to play one stakeholder group off against another in order to gain a perceived advantage. Alternatively, we may get into trouble due to changes in obligations as a consequence of conflicts between our behaviour and societal values. What we do for some of our stakeholders may not be viewed as professionally responsible or socio-culturally acceptable by others (Bednar and Welch, 2005a) [Paper 1, 2].

- *it is intended to add value to our business*

As we have seen above, there are issues with some attempts to add value to our business. What does it mean ‘to add value’ and what is ‘our business’? What is the ‘relevant’ definition of ‘value’ and what is the ‘relevant’ definition of ‘our business’? Who decides what definition is to be ‘correct’?

We can add value to our business *by selling our soul* (to do *what a client wants*). However, this could backfire in the long-term as we may be looked upon as doing the client a disfavour, either by the client him/herself, and / or by some other stakeholders (potential clients, regulators, competitors etc.). This depends upon the approach taken – systemic or systematic; short-term or long-term. Which socio-cultural space is addressed? What is acceptable in one country or social group might not be acceptable in another and that might eventually matter to us.

Without consideration of the range of differing stakeholder perspectives, we as business analysts might mistakenly sub-optimize [Paper 2]. We might not appreciate different types of value system (what is not measured might be invisible). For example, an endeavour may have added great (short term financial) value to our business - but at what cost? I have seen examples of this as an issue on more than one occasion. One reason this is not noticed as a problem is that *the cost* is potentially of completely different type than *the value*. Value might have been viewed as financial resources and core competencies [Paper 2].

However, the cost on the business in the long-term (which potentially makes them uncompetitive) may be related to lack of reliable and high quality indirect, rather than core competencies, and flexibility due to intimate networked differentiation. In Systems Thinking terms, this is short-term as opposed to long-term *adding value* to promote evolution of *viable systems*

(see again discussion of benefits management (Ward and Daniel, 2012) and a need for holistic multi-criteria benefits analysis (Bednar and Welch, 2012). This is in line with Beer's Viable Systems Model (VSM), which emphasises the need for recursion, i.e. for the whole system to be viable; every sub-system within it must itself be viable. All the elements required for viability must be attended to at each level. Timing of feedback within system is also crucial to on-going viability (for further explanation see Hoverstadt, 2011).

## 4.5 Give them what they want!

In my view we should as professionals under no circumstances give the client what the client wants *without* making an informed decision about it for ourselves! We are *responsible* for what we do or *give* to the client [Paper 1] (Bednar and Welch, 2005b). I always say that the endeavour must be owned and controlled by those who will use the resultant system. To say that "we are responsible for what we give the client" seems to suggest that kind of professional relationship I would normally argue against.

Professionals should be working in partnership with clients to produce something that will be perceived as useful in practice. Very often "designers", analyst, change facilitators etc. are under pressure to give the client 'what the client wants', which may explain many of the issues highlighted by Williams (2007), i.e. if the boss says do this, you do it; even if you know it will fail. You are more interested in keeping your job than in whether the result is useful (for its stated purpose).

This point is also highlighted by Wastell and White (2011) in the context of the UK Register of Sex Offenders (the stated purpose of the register and its applicability were totally mismatched). The principle of personal judgement and responsibility is not strange at all - it is ingrained as part of our Western civilization. It is, for example, exactly the reason why war criminals can be brought to justice. It is not accepted to abrogate responsibility by for example stating "*I just followed orders*".

Sometimes, there are *incompetent consultants* but sometimes there are also *incompetent clients*. Sometimes people just do not have the same competence and as a result do not understand each other. However, to assume that the client should get what they ask for is also to assume that we have no

responsibility for our actions and judgements as consultants! (You got what you wanted - serves you right!) Was that what he wanted? Was it not what he said he wanted? This was perhaps a hint of something else which he really wanted but could not formulate or express [Paper 1, 2]. In principle, this is no different from what in some circles is referred to as *The Michael Jackson Phenomena*. The problem with *giving the client what the client wants* (e.g. what the client expressed that they want, this might not necessarily be exactly the same as what the client wants) has been a subject of lively discussion among medical practitioners with reference to that unfortunate singer and the consequences of his *getting what he wanted* from his doctor over many years (Gumbel, 2011).

It is a flawed assumption to think that clients know what they need, just because they know how to experience a problem space. Usually, what clients know is contextual experience of practice, but they do not usually have competence in inquiring into their experienced problem space, nor do they necessarily have competence to explore potential and unintended consequences of what they think are suitable future *solutions* [Paper 1, 5]. The intervention required of a consultant is not to focus on making decisions but to support enhancement of decision-making capability, and possibly co-creation of new problems (Bednar and Welch, 2006b; 2009b).

This is a similar relationship as between patient and doctor. Obviously, patients are competent in the experience of their *problems*. However, a patient is usually not as good as the doctor when it comes to inquiry into the problem space that s/he experiences. The patients may think that they know what will solve the experienced problem situation - and this may or may not be the case. However, it would be a really bad idea if every doctor would just assume that the patient is always right! In my view, it is a bad doctor who assumes that they know better than the patient about the contextual experience of what is assumed to be *the problem*.

What the patient experiences is one thing, what the relevant ‘problem’ is may or may not be known to the patient - or the doctor. The doctor is (hopefully) more competent than the patient in facilitating the problem inquiry and perhaps also in facilitating problem understanding. Furthermore, the doctor is (hopefully) also competent in facilitating the exploration by the patient of potentially valid future solutions e.g. in discussing what may be suitable medication and possible desirable outcomes. This point is also illustrated by the problem of antibiotics. For many years doctors appeared to succumb to



pressure to prescribe these to patients who didn't need them but felt they ought to have them. The result is now that many antibiotics no longer work because of inappropriate prescription leading to bacteria becoming resistant.

The subject at stake is a potential for misalignment between differences in understanding of context relevance [Paper 1, 2]. Due to the level of specialist competencies involved it is difficult for clients to question any specialist and external expert (such as a consultant) (Bednar and Welch, 2009b; 2009e). This is one of the main reason for why Ulrich (1983) developed 'boundary questions'. Such boundary questions have been successfully incorporated in IS analysis (Bergwall-Kareborn, 2006).

Many companies hire internal consultant not only to overcome some of the issues with 'external experts' but also to support a continuous organizational re-development – i.e. to facilitate the questioning of assumptions of what is or is not taken for granted (i.e. dominant logic) to be a relevant problem space and problem resolution space (see also Feynman's (1988) comments about the need to exercise doubt in relation to so-called received wisdom). For example, in recent years, Skandia have made significant expansions in the numbers of internal consultants they have hired for this purpose (Grant, 2007).

## 4.6 Some clients focus on what they do not want!

Sometimes I actually prefer clients who describe what they do not want. On one hand one could say it is the other side of the same coin - we switch one category of bias with another. But in my personal experience many of those people who are proposing their problem space and preferred solutions with a focus on *what they do not want* are not as quick to disqualify reflections about what they might want - compared to those who *know*. Obviously, sometimes what people do not want is what they might *need* - but I have found that it is possible to have a dialogue with a client about this [Paper 1] as part of reflections such as: *what is it that makes us (facilitator, clients and other key stakeholders) able to recognize what someone does not want - and what is it that makes something unwanted....?*

We also should remember that a *client* and *problem owner* are not necessarily always the same (Nissen, 2002), nor do they always reflect the same

stakeholder worldviews [Paper 2] (Bednar and Welch, 2005b). This can result in confusion as to which (of many possible) problem spaces we should engage with. See also my use of *Weltanschauungen*, CATWOE and stakeholder engagement as part of holistic multi-criteria benefit analysis (Bednar and Welch, 2012). Assumption of what is a *user* can also distort understandings of what is recognised as a problem space (Nissen, 2002). Generally speaking an actor who is a client is involved in a very different problem space compared to an actor who is a *user* - even if it is the same individual.... (n.b. It is for this reason that users of SSM are exhorted to make use of the mnemonic CATWOE, highlighting the need to consider differing perspectives (Checkland, 1981)). Then we have another issue with people confusing these different problem spaces with each other. Both the client and facilitator may tend to confuse the different problem spaces, often by missing out the contextual *user-actor* perspective altogether, as the focus is put on the *client-actor* perspective (Bednar and Welch, 2005b). The significance of this problem is not the issue itself, but that such a phenomenon goes on without any of the main key stakeholders noticing it [Paper 2].

## 4.7 What they want and what they need

Fromm (1976) had quite a significant discussion on what to me appeared to be the same topic as that discussed here. *Being*, according to Fromm, suggests active participation and engagement with exploring a problem space, whereas *having* suggests the possibility to *buy* a solution, regardless of the problem [Paper 5]. This would, as I see it, also be included potentially as part of a Systems perspective (Bednar and Welch, 2005b). However, as there are many different perspectives in Systems Thinking, as it is underpinned by the personal philosophical beliefs of an individual human being (or *observer*). *Systems Thinking* is not necessarily reserved to any particular tribe or party politics [Paper 4]. Totalitarian dictators and emancipatory community leaders alike can be *Systems Thinkers*. People who belong to the Flat Earth Society can be Systems Thinkers. People who are generous and people who are exclusive egoists can all be Systems Thinkers.

It is how individuals apply their Systems Thinking: for what purposes, in what way they make their judgements, in what context and on what grounds etc. – that makes a difference [Paper 4] (Bednar and Welch, 2008c). Systems

thinking is about an effort to make sense - to create an understanding of some experience. What you actually understand and what you do with that understanding is another matter. What is relevant is the combinatory effects of the results when an individual human being, reflecting over living, applies *Praxiologies* (how we behave and act), but this requires us (as analysts and facilitators of change) to take into consideration (and reflect over) our *Ontologies* (what we know), *Epistemologies* (how we know) and *Axiologies* (what we value) (see above, section 3.1).

If we wish to take contextual inquiry into consideration more seriously, I believe that we should avoid promoting statements which appear to describe convergence as supposedly something to be desired [Paper 1, 2] (Bednar and Welch, 2006b; Bednar, Welch and Katos, 2006). In my opinion, a focus on convergence is antagonistic to free will, as in principle it makes reflection and self-reflection impossible, and so sabotages purposeful action towards a change for *the better* from the actors' or observers' points of view.

Furthermore, I cannot imagine any arena in human endeavour which is not *political and/or economic* (e.g. socio-cultural), for the same reasons that all judgements and sense-making by human actors are subjective. Thus in the search for human excellence - the apparently simple question: *What is meant by desirable change?* should not therefore be given a *simple* answer but require engagement in reflection upon a variety of factors (the answer to this question can be seen as an example of a *wicked* problem) [Paper 1, 2, 3].

I do not think this is a matter of science vs. art. I see no difference between the subjectivity of appreciating something as a piece of art (or not) and appreciating something as a truth (or not). All appears to be the results of subjective judgement and subjective understanding (Bednar and Welch, 2008c) [Paper 4]. Not all individuals will agree with each other about what is and what is not to be appreciated as art. So I do not believe that there is any convergence in the appreciation of art either!

## 4.8 But we are all professional truth seekers!

Suppose that we are in a professional environment and the stakeholders and participants in the project are all a group of pragmatic *truth seekers*. The standard definition of *objective* does not (as I see it) make your *group of truth*

*seekers* successful in gaining an *objective* deep understanding of a certain situation, regardless of their proposal to *come together* and use, for example, data mining skills and agree data assessment (Bednar and Welch, 2006a) [Paper 4].

I agree that they can try to *climb the ladder of inference* and individually come to some effective solutions. They can try individually to support the creation of what they personally see as desirable results. However, this will amount to efforts to achieve some *unintended* consequences.

Let us reflect over the following proposition:

*“Take a relevant problem situation, engage a deep enough analysis and inquiry, rigorously gather correct data (for example through data mining) and assess the value of the desirable solution on effectiveness.”*

There are some significant issues with this effort. For instance, there are a number of decisions which need to be dealt with by each individual (involved) and those decisions and judgements are not available in some objective *truth* outside of those individuals [Paper 4]. Individual decisions such as:

- *What is the relevant situation that we really want to understand?* I am sure that it is unlikely that all stakeholders have some objective pre-understanding of the world which (especially within complex social systems) leads them to have ONE (common) objectively available definition of what they imagine being ‘the relevant situation’ [Paper 4, 5].
- *What is ‘deep enough’ when it comes to ‘understanding’?* It is not my experience that people agree upon *what is enough* when it comes to development of understanding of any complex situation. This experience would also put doubt on agreement (if there is one) of what is a *relevant problem situation* and what is its boundary. Is this even vaguely understood as *something common* and *objectively agreed* among the different stakeholders, or is belief in a common understanding entirely mistaken [Paper 1, 2]?
- *Data mining*. Yes, this is a powerful tool - except of course the rather important questions: *what data is it relevant to mine?* And *which selection of data is relevant for us to inquire into and to process,*

when we wish to make sense of a problem space (on which the different stakeholders probably did not agree a definition anyway) (Bednar and Welch, 2006b) [Paper 5].

- *What is to be defined as an ‘effective solution’? And by whom?* In my experience what individual stakeholder’s view as *effective* and what individual stakeholder’s view as *solution* is also not available outside of the individual stakeholder’s subjective judgement. And as such those decisions tend not to have any result that is automatically common or will necessarily be agreed upon - even if all of the stakeholders are honest - or perhaps *especially* if they are honest! Let us also assume that different stakeholders are not confusing effectiveness with efficiency (efficiency is doing things right, while effectiveness is doing the right things) – that is a potential issue which adds yet more complexity to any sense-making activity (Bednar and Welch, 2005b) [Paper 2, 4].
- *What is to be recognized as ‘desirable’? Who is to decide upon what is to be ‘desirable’ and what is to be ‘undesirable’?* Here we could talk about how efficacy (the extent to which a desired effect is achieved) is to be recognized. It has not been my experience that individual stakeholders would agree with each other, in complex social situations, that what they individually see as desirable is necessarily *common*. We are talking about *honest* stakeholders - and so we would expect them actually to be presenting what they see as their true judgement of desirability. I do not see this kind of judgement as being available outside of individual human beings... (Bednar and Welch, 2009e) [Paper 1, 2, 5].

All of these examples can be related to the discussion in [Paper 4]. As Feynman (1974) points out, it is necessary to pursue and explicitly engage a question of doubt, as part of any inquiry.

If we were living in a successful totalitarian dictatorship, then it becomes rather obvious to me that we can achieve a lot of successful and desirable consequences *objectively* with some *proper* and *rigorous* efforts, as what is to be defined and recognized as objective is dictated by one key individual.

I have imagined the foundation for what makes us humans have any potential for empathy as being within the overarching personality space that we, in generic terms, might be able to recognize as somewhat schizophrenic [Paper

2]. So our own individual, but continuous, interplay between our many internalized changing personalities may give us (as individuals), the opportunity to emulate at least some kind of pluralistic input, or perspectives. It allows for reflection on alternative perspectives and provides room for doubt [Paper 5].

## 4.9 Great Methodologies

Before discussing methodologies, it is worth considering what we mean by the term *analysis* (Avison and Fitzgerald, 2006; Mathiassen, et al, 2000; Sommerville, 2007). I often prefer to use the term *inquiry* into/engagement with *problem-spaces* (see discussion above, section 1, relating to use of the term analysis). One sense of the term suggests *breaking something down* to reveal its elements or structures - as in chemical or accounting uses of the term analysis (Oxford Dictionaries, 2013).

However, it is used here to convey something else - a detailed exploration from multiple (systemic) perspectives to examine and *build up* a picture of some interesting phenomenon. My use of the word has a background in engineering practices where *analysis* can be used to describe an exploration (potentially an explanation) of a problem space.

Thus, analysis and synthesis are not always distinguished but incorporated into one process of *inquiry*. I suggest that we need approaches which attempt a systematic, holistic *complexification*, by supporting contextual dependencies to emerge. We are not searching for some definite result but undertaking a voyage of discovery [Paper 2, 3] (Bednar and Welch, 2005a; 2006b; 2007b; 2009e).

Readers of my papers have sometimes formed the mistaken impression that I am dismissive of certain methodologies. I am aware of strengths and weaknesses of many of these approaches (see Tables 4.1; 4.2; 4.3).

Avison and Fitzgerald (2006) give examples of some of these, and I have often chosen to highlight a particular methodology which strengths I appreciate by discussing its drawbacks and ways in which it could be rendered even better in practice (e.g. Bednar and Welch, 2008c).

**Table 4.1.1 IS Methodologies with IT and Software focus**

Methodologies and schools of thought	Positive Contributions and Ideas	Useful Techniques and Methods
<p>JSP / JSD: (Jackson) Structured Programming / (Jackson) Systems Development.                      Jackson (1975) 'Structured Programming'.                      Jackson (1983), 'Systems Design'.                      (Avison and Fitzgerald 1995; 2006)</p>	<p>Mainly software centred approach where requirements analysis is expert oriented and focussed. Carefully organized overview of techniques and approaches with description of how the different design models feed into each other. Very versatile design tools and not limited to any particular category of software development project. Systems thinking is mainly represented by functionalism.</p>	<p>Specified semi formal methods and techniques with guidance and suggestions. Including techniques: ELH, ERD, DSD, PSD, DFD etc.</p>
<p>SSADM: Structured Systems Analysis and Development Methodology. SSADM v4 document 2002. (Avison and Fitzgerald 1995; 2006)</p>	<p>Mainly software centred approach drawing heavily on JSP but incorporating a semi formal project management approach (PRINCE) following a waterfall model. Includes the implementation of milestones. Systems thinking is represented by structuralism.</p>	<p>Collection of logical and formal techniques with instructions and guidelines. Including techniques: ELH, ERD, DFD etc.</p>
<p>OOA&amp;D: Object Oriented Analysis and Development                      Mathiassen et al (2000);                      Blaha &amp; Rumbaugh 2004;                      Coad &amp; Yourdon 1990;                      Rumbaugh et al 1991;                      Jacobson 1992)</p>	<p>An elaborate combination of human centred and software centred front end focussing on software development. Incorporates functionalism with structuralism but allows for review from a pluralistic and emergent systems thinking perspective.</p>	<p>Meta level outline of themes with instructions, guidelines and examples of application and documentation. Including Techniques: UML, FACTOR, Rich Pictures, etc.</p>

The point here is not that one methodology is better than another, or that a particular methodology has particular strengths or weaknesses. Instead it is about the process / criteria involved in choosing (and tailormake) a methodology and designing a system for its use in context [Paper 1, 5]. In other words, here I am again referring to aspects of your personal responsibility for your own choices (e.g. personal judgement of what contextual relevance means).

#### **4.9.1 IT and Software focus**

The benefits of using a recognised methodology when undertaking systems analysis and design are well-documented in every student text, e.g. consistency of approach, transparency for future teams attempting to maintain the same system, etc. (see for example Avison and Fitzgerald, 2006).

Some examples of Methodology with software focus and their contributions, ideas and useful techniques are given in Table 4.1. Still, much debate arises among systems professionals over the relative merits and weaknesses of the different methodologies in current use (Bednar and Welch, 2008c). For example, object oriented methodologies are recommended by some for the merit that standard modules can be *re-used* (Mathiasson, et al, 2000; Avison and Fitzgerald, 2006); soft systems methodologies are recommended by others for their flexibility and the possibility to create a learning cycle (Checkland, 1999; Checkland and Holwell, 1998).

However, it appears obvious that it is not the methodology itself that leads to good practice in systems analysis and design, but the system for use of that methodology *in context* that is the responsibility of the analyst (Bednar and Welch, 2008c) [Paper 1, 3, 5].

#### **4.9.2 Organizational focus**

There are also organizationally-focussed methodologies and many have significant and positive contributions (see Table 4.2 and 4.3 for examples).

What is best about e.g. structured (and object oriented) methodologies (methods and techniques) is the possibility to design and describe the logic of



a problem solution with a degree of coherence (Avison and Fitzgerald, 2006). Furthermore, use of structured methodologies is systematic, i.e. it reminds you of common key features of an ideal development process – or acts as an aide memoire (Bednar and Welch, 2008c). This internal coherence of approach enables the robustness of a solution to be tested for its logic.

ETHICS (Mumford, 1983), on the other hand, has different strengths (Bednar and Welch, 2008f). It is focused on the work process and provides a vehicle to analyse and engage with the development of processes. Thus, in contrast to structured methodologies, ETHICS is not always logically coherent but allows for complexity to be incorporated in order to work around logical inconsistencies. Internal compatibility within the approach allows for flexibility of description, using natural language.

Soft Systems Methodology (Checkland, 1981; Checkland and Holwell, 1998) enables reformulation and re-evaluation of the problem space in view. SSM provides a tool kit for exploration of a problem situation at a variety of levels and from differing viewpoints.

Object Oriented analysis (as set out by e.g. Yourdon, 1994) has similar benefits to structured approaches (see for example discussion by Jackson, 2010), i.e. it provides for transparency and logical coherence of problem description/solution.

OO as expounded by Mathiassen, et al (2000) takes this systematic toolset and incorporates lessons learned from soft systems methodologies (using the acronym FACTOR). Thus, it helps to address weaknesses in both object oriented and soft methodologies per se, i.e. it supports creation of a system for use by the analyst.

Clearly, all IS methodologies have both advantages and drawbacks. There are well-trying methodologies that have stood the test of time, but maybe not all for the same reasons. These methodologies would not have survived widespread use over many years unless they offered something positive to their users – still, many more proposed methodologies have been consigned to the dustbin of history (Bednar and Welch, 2008c) [Paper 4].

**Table 4.2 IS Methodologies with Organizational and Meta-level focus**

Methodologies and schools of thought	Positive Contributions and Ideas	Useful Techniques and Methods
<p>ETHICS: Effective Technological and Human Implementation of Computer supported Systems. Mumford (1985; 2003; Mumford. et al. 2006). [Sommerville (2007)] [Avison and Fitzgerald (1995;2006)]</p>	<p>Mainly human centred approach where analysis and design focus is on facilitation of participatory design of change practices. Multi-faceted techniques and methods supporting socio-technical work-design. Highly flexible socially oriented tools and not limited to any particular type of organized human activity. Could be perceived as represented through both functionalism and structuralism. However Socio-Technical Systems thinking does allow for pluralistic and emergent systems thinking.</p>	<p>Up to fifteen socio-technical 'steps' (analytical themes) with suggestions and templates for engagement, facilitation, design and documentation of analysis. Including I-O diagrams,, Work diagrams, Variance analysis, Questionnaire etc.</p>
<p>SSM: Soft Systems Methodology. Checkland (1987; 1998; 2008). [Sommerville (2007)] [Avison and Fitzgerald (1995;2006)]</p>	<p>Mainly human centred approach where problem inquiry is giving opportunity for problem space re-evaluation, reformulation and re-contextualization. Although often coloured by structuralism thinking SSM allows for pluralistic and emergent systems thinking.</p>	<p>Meta level outline of engagement 'steps' (analytical themes) with suggestions. Including techniques: Rich Pictures, Contextual Diagram, PRQ (XYZ), CATWOE etc.</p>
<p>Multiview Wood-Harper et al (1985; 1999). Avison et al (1999). [Avison and Fitzgerald (1995;2006)]</p>	<p>Initially laudable initiative to create a front end approach to combine software centred focus with human centred focus. At first (1985) the outline allowed for pluralistic and emergent systems thinking. However in the developed and more explicit descriptions (e.g. 1999) the systems thinking appear to be compounded in structuralism.</p>	<p>Structured and systematic outline combining ideas from ETHICS, SSM, JSP/ JSD, SSADM etc. With suggestions. Including techniques from the above methodologies.</p>

**Table 4.3 IS Methodologies with Organizational and Meta-level focus**

<b>Methodologies and schools of thought</b>	<b>Positive Contributions and Ideas</b>	<b>Useful Techniques and Methods</b>
<p>PD: Participatory Design. Fris (1991). Ehn (1995). Nissen (1998). Bierknes &amp; Dahlbom 1990; Schuler and Namioka 1993; Avison and Fitzgerald 1995; 2006)</p>	<p>Mainly human centred approach focussing on software artefact development. Incorporates functionalism with structuralism but allows for review from a pluralistic and emergent systems thinking perspective.</p>	<p>Meta level references to themes with some examples and reflection of application with suggestions. Including techniques: mock-up, paper based prototypes. Rich Pictures etc.</p>
<p>CLD: Client-Led Design. Stowell and West (1994) CLD</p>	<p>Mainly a human centred approach focussing on facilitation of participatory design of socio-technical systems. Ideal models based on structuralism but allows for some pluralistic and emergent systems thinking perspective in similar ways as SSM.</p>	<p>Meta level outline of themes including suggestions with some examples. Including techniques: PEARL, Clicks, etc.</p>
<p>Scandinavian tradition Langefors (1966; 1995). Olerup (1982) Sandstrom (1985) Flensburg (1986) Fris (1991) Hagerfors (1994) Ingman (1997) Eriksen (1998) Nissen (1998; 2002) Messester (2000)</p>	<p>Explicitly human-centred initiatives focussing on facilitation of problem resolution, through reformulation and re-contextualization of problem space. A pragmatic focus on relevance of solution(s), representing interests in organizational contingencies as well as groups and teams. Explicit promotion of contextual dependencies as core Information Systems issues (such as human learning and unlearning) and emergent systems thinking.</p>	<p>Meta level outlines of themes, some with exploration of practical engagement and localised design efforts of end-user collectives. Including techniques: scenarios, mock-ups, card-games etc.</p>

I am myself sceptical about the nature of commonly presumed benefits – sometimes innovative methodologies appear to be proposed, not because they are needed to improve professional practice, but because they will serve some alternative, political agenda of their chief supporters. Some careers have surely been built on promotion of *trendy* innovations (or on artificial inflation of budgets to be managed).

What many successful approaches do have in common is their dependence upon skilled use by a non-naive practitioner [Paper 2, 4]. An example of a discussion in which I highlight positive contributions of IS methodologies can be found in Bednar and Katos (2009). NB In my view it is important to consider how the question of success in IS developments is to be judged (see Bednar and Welch, 2007b; Bednar, Welch and Depaoli, 2007; and similar discussions in e.g. Argyris, 1990 and Weick, 1995).

#### **4.9.3 Meta-level methodological and organizational focus**

There are also meta-level methodologies and frameworks which are exploring methodological issues on a different level of abstraction with their own strengths and weaknesses (see Table 4.2 and 4.3). These approaches and schools of thoughts are focussing on the application of methods (e.g. ‘methodologies’), in other words these are methods with the purpose to guide use of methods.

While these approaches may be great in many specific situations their generic use and potentially universal value is still very problematic in each unique context. These (meta-level) methodologies are intended to support choice and adaptation of methods as a result of knowledge and understanding of methods *and* context. Meta-level methodologies may come with recommendations referring to what type of potential context they may be suitable for. There may also be advice regarding which methods and techniques etc. could be used in what order and for what purposes. They may also come with generic pointers and advice for contextualization and adaptation. Unskilled or naive users of any methodology, who may regard it (the idea of a methodology) as a blueprint for success and follow each step, method or technique associated with that methodology slavishly, are likely to experience the results as unsatisfactory (Bednar and Welch, 2008c) [Paper 5]. Worse, they may find that the results are satisfactory and so hand over to clients a system that those

clients will experience as less than useful in practice [Paper 4] (Bednar and Welch, 2005b; Whittaker, 2007).

It is my belief that skilled analysts should understand that choice of a dependable methodological framework is only part of their responsibility (Bednar and Welch, 2009b) [Paper 1]. Just as a high-performance car, driven by a novice, will not perform to its potential, so a methodology requires a *skilled driver* who can adapt it to the demands of particular context of analysis [Paper 2] (Bednar and Welch, 2005a; 2007a).

Some projects appear to fail because sponsors of change hide behind the mask of '*IT development*' in order to disguise their real agendas (e.g. organizational change) (Bednar and Welch, 2009e). It is probably true to say nowadays that any organizational change, however motivated, will now involve IT-related change. The distinction has become an artificial one, Indeed, Langefors suggested a long time ago that the IS and the organization are one and the same (Langefors, 1995, p.53). To change one must be to change the other, whether IS as technologies or IS as organizations are considered (Walsham, 1993) [Paper 2]. See also discussion of differing definitions IS1 and IS2 (above p. 44 and Paper 5]. Still IT development all too often continues to be treated as separate from design of organizational behaviour and praxis (Bednar and Welch, 2005a). This can be due to fear of resistance or disruptive responses when changes will affect the work-life experience of engaged actors (Argyris, 1990; Weick, 1995; and Semler, 1993 all discuss similar issues). IT-driven change depends for success on investment elsewhere – in supporting change management (see p.157 in Ward and Daniel, 2012). In effect, business change is dealt with through stealth (Bednar and Welch, 2005a; 2007b).

Some managers may be concerned that they will have to share power more widely, and/or incur a lot of extra work, in order to push through a genuine change agenda. Sometimes managers put on a show of delegation of responsibility but do not give their delegates sufficient authority to act, preferring to micromanage activities for their own self-protection. We should be cautious of attributing motive to anonymous 'managers' (Bednar and Welch, 2005b) [Paper 4]. Failure may be due to motives such as mentioned but they may be due to sheer ineptitude or mistaken beliefs (Semler, 1993). Delegation is more difficult during periods of change and risks are increased (e.g. Hoverstadt, 2011). In my own work, I have made a similar point:

*'Consultation may take place among stakeholders about issues relating to strategy. How far this consultation is comprehensive, however, or represents a true attempt to establish dialogue, and how far the resultant opinions actually inform the decision-making processes undertaken by management is open to question. ...the views of individuals within an organizational setting are not always expressed effectively, nor are they necessarily acted upon'* (Bednar and Welch, 2007d, p25).

There may be a desire to hide these risks from stakeholders [Paper 4]; or the business press – see Nestle's first abortive attempt to develop an ERP system (Worthen, 2002; Bednar and Welch, 2007b; 2008b). This was not a case of attempting to mislead stakeholders or the Press. It was a case of naïve management who did not realise the full risks until they were pointed out by a journalist. An article in a financial magazine suggested that the company share price had fallen because the proposed changes went against the culture of the company and were not simply a 'software project'. Instances may sometimes be observed of the *Teflon-coated manager* who arrives, starts a number of change projects, makes a name for himself and then moves on before stakeholders discover the negative impact of his actions (e.g. Argyris, 1990).

Consider the London Ambulance service example. There was a spectacular failure of the initial development project in the 1990s (Tighe, 1996). When a new project was mounted fifteen years later, some similar mistakes were repeated and, where lessons had been learned, they were not applied in a way that was effectual – the project was tackled as an engineering problem as before by developing procedures without detailed consideration of contextual dependencies, with similarly disastrous consequences (King, 2011).

It is important to reflect that we cannot divorce our emotional from our rational engagement with work situations (Bednar, Welch and Depaoli, 2007; Bednar and Welch, 2006a; 2007b; 2008g) [Paper 5]. Ciborra (2006) points out (drawing upon Heidegger, 1962) that when we are, say, attending a meeting, we are there as ourselves with all our *baggage* from everyday life as it is lived. Latour (1987) makes a similar point – *the scientist does not work without being human* [Paper 2].

Radnitzky (1970) puts this into a philosophical context by distinguishing between perspectives based in Logical Empiricism and those based in Hermeneutic Dialectics, which emphasise individual uniqueness and

subjectivity [Paper 4, 5]. Maturana and Varela (1980) explicitly make the point that no observation can be made except by a particular observer. Any observer must come to the situation with all their human frailties, qualities and characteristics and not as an automaton whose perceptions are perfectly predictable [Paper 2, 3].

We can reflect that there are three different archetypes of *analyst* – those who make no mistakes (!); those who admit that others sometimes make mistakes; and those who admit that their own work is not always perfect. Knowledge work can only be managed by shared participation and judgement [Paper 1, 2]. In other words, we need management by facilitation and good leadership (Bednar and Welch, 2008g), and a culture of mindfulness [Paper 5] in which it is possible to admit mistakes [Paper 4] (Weick and Sutcliffe, 2002; Bednar and Welch, 2006b).

## 4.10 Disqualification

We all have personal experience and stories of problem topics which we have found important but were not allowed to engage with [Paper 1] (Bednar and Welch, 2006b). I think such a story is also related to what makes it possible for us as individual human beings to strive for excellence in our professional endeavour (it requires courage – [Paper 1]). It also reminds us of aspects in life which may be experienced as sabotaging and undermining our efforts [see discussion of double bind in [Paper 5].

Mumford (2003) for instance, talks about differing kinds of participation in the process of creating systems - a type which would appear to her to be ideal, as against other types that are not so efficacious, but all that it is possible to achieve in particular political contexts in which creation is situated at the time. The organizational hierarchy and power structure may not be open to empowerment of all categories of participant, and changing this may be beyond the scope of the project (Bednar and Welch, 2005a).

Williams (2007) points out that creative projects can be sabotaged by a refusal to look at the affective, as well as the cognitive aspects of work. Thus, people were willing to stick to decisions which they knew already would lead to project failure and even damage to the organisation concerned (Bednar and Welch, 2009e).

Bateson (1972) points to an entrapment that human beings can find themselves in, which he refers to as *double-bind* [Paper 5]. Here, a person perceives himself to be incurring *punishment* for certain behaviour, but when he attempts to respond to this feedback he finds himself punished again. The other people in the situation, including those who are (knowingly or unknowingly) inflicting that punishment, are entrapped by double-bind.

What is needed is courage to escape from the known, into the unknown [Paper 1]. However, the entrapment prevents the subjects from finding that impetus to change. One instance of such courage is needed when dealing with organisational issues, that is to admit that you are there as yourself - a human being with emotions - and not succumb to a discourse that treats you as a detached automaton (Bednar and Welch, 2008g) [Paper 5]. Ciborra (2002) discusses this phenomenon in relation to Heidegger's (1962) concept of *Dasein* – being-in-the-World.

It is important to have in mind both socio-cultural sabotage and undermining practices and to try to engage with them, but purposeful engagement requires the ability to recognize - and to be allowed to recognize. In some environment such recognition is not allowed - I think Argyris (1990) has a wonderfully useful way of talking about some of these matters by using the ideas of *theory in use* and *theory espoused* in the context of organizational defences.

Ulrich (1993) discusses a need for boundary critique, suggesting a range of boundary questions that an analyst might pose, not necessarily to question professional expertise but the application of that expertise in context. I recognise this as an attempt to provide support for someone to apply his own human judgement and avoid the trap of thinking that an analyst can be a *detached observer* [Paper 2, 3].

Churchman (1971) reminded us to recognise that no problem we address is *given*. This will depend upon the differing world views of participants, and in carrying out analysis, we shape the nature of the problem in context. We do not use it as a starting point for the application of method. When discussing the concept of *mindfulness* (e.g. Weick and Sutcliffe, 2002) I comment that:

*‘We also recognize that in group discussions there are two parallel issues all the time. One is the topic under debate; the other is the dynamics of the group. The latter strand includes interpersonal feelings, emotions and behaviour, some of which may be recognized in body language. The complexity of the process, and the amount of*



*information involved and created in such an inquiry, can make the whole analytical task overwhelming. The [SST] framework is developed to support users in their efforts to cope with the complexity itself* (Bednar and Welch, 2006b, p 9).

The overwhelming nature of organisational life and the politics of disqualification may be a disincentive for people to challenge, and lead them to prefer to be friendly and polite. This can unfortunately result in abusive organized behaviour which disqualifies individual actors from being allowed to address problematic issues - even if those issues are well known to a critical mass of stakeholders (Bednar and Welch, 2006b).

In many organizational situations many individuals are not allowed *to know* or *to admit* such significant issues as being openly identified as *problems...* [Paper 5].

## 4.11 Emergency and Crisis

When considering such *problems*, I think it is necessary to distinguish and differentiate between *emergency* and *crisis*. The difference lies in the role of creativity – it is the difference between choosing a solution from a range of pre-defined *best practices* and creating new solutions to satisfy contextual demands.

Emergencies are something for which we can develop routines and training exercises beforehand. Potential emergencies can be predicted.

The idea of a crisis is that it is not predicted as a potential emergency. It is not included in a risk assessment as a possibility. Borodzicz echoes this point:

*‘For the emergency services, there is a long tradition of training decision makers to manage emergency events using a variety of well-rehearsed and structured response techniques. Although these agencies are generally very good at responding to emergency events, there are acknowledged difficulties in managing crisis events where there is a need to operate outside of this framework’* (Borodzicz, 2004, p.415).

Also in the context of need and want:

- We want to be able to cope with emergencies and crisis - and it is easy to confuse crisis with emergencies (it gives us the illusion of expedience). We would so very much like to be able to have a simple 'action plan' or prepared 'problem solution' for crisis - in the same way as we can prepare for emergencies. Ciborra, following Heidegger, discusses formal models and approaches that are enthusiastically espoused by some managers as 'illusory appearances' (Ciborra 2002, p. 177) [Paper 2].
- We need to be able to cope with emergencies and crisis, but we can only do that if we manage to understand the fundamental differences between these two very different phenomena. Crisis brings with it uncertainty and ambiguity due to its unpredictability and this appear to be something which for many people is very uncomfortable to accept as an idea and tolerate (Bednar and Welch, 2009e).

It is essential to this discussion to recognise that uncertainty and unpredictability are the norm, not the exception in all organisational situations and that rather than making efforts to eschew them, we need to consider how to embrace and address them.

Brunsson (2002) has even suggested that the presence of seemingly insoluble problems can be beneficial to organizational health, as it presents repeated opportunities for individual and collective learning [Paper 5].

## 4.12 The Power of Being Imperfect: a quest for excellence

What does it mean to do a really good job in Contextual Inquiry, Systems Analysis or indeed engineering? It means managing acceptance of ambiguity and uncertainty [Paper 1, 5], not resigning to imperfection; it means not settling for what you know you can achieve, but striving for something more. Thus, analysis/inquiry involves not a simplification but a systematic 'complexification' (Bednar and Welch, 2007b).

I think that the driving force for *making the impossible possible* is part of the search for excellence (Bednar and Welch, 2008c). It involves questioning of

taken-for-granted assumptions (Bednar and Welch, 2005b). It is also what gives joy in living life as a professional being and is a great source for personal achievement. It is part of life as an everyday emotional adventure: work-practices as research and life-long learning - to go where no-one has been before; to enjoy your work and life; to go beyond the *just necessary*, rather than going to work to do a job *because I get paid for it*. Such a job would hold little enjoyment or satisfaction for me.

This is similarly reflected upon by Fromm in his discussion of the difference between having happiness and being happy (Fromm 1976). There is an element of *desire* that is often neglected in discourse about professional work, including Systems Analysis [Paper 1, 2] (Bednar and Welch, 2005b; 2006a; 2008c).

Efforts to go beyond the *just necessary* should not be confused with *over-engineering*. The latter can be seen as negative or positive, depending upon context. In my world of engineering experience, over-engineering *is very much expressed as* equivalent to imperfection, but may be perceived instead as pursuit of perfection, where an individual engineer chooses to extend boundaries of effort as part of a journey towards excellence (see Bednar and Welch, 2008c).

When breaking new ground, over-engineering may support progress towards new goals. I was mentored in the idea of recognizing professional engineering excellence and engineering perfection as an *art-form*. This involves *going the extra mile* in pursuit of simplicity, and thus engineering *elegance*. The difference between mediocre engineering (i.e. acceptance of imperfection, resulting in *over-engineering with a negative purpose*) and excellent engineering (i.e. *moving towards* perfection, resulting in ‘over-engineering’ with a positive connotation) lies in pursuit of elegance and simplicity (achievement of which may require *complexification* of process (Bednar and Welch, 2007b)).

One of the purposes of this work is to highlight to organizations that achievement of excellence is possible by setting free the potential of individuals, and through application of tools in a productive, continuous spiral of design, re-design and change [Paper 5].

# 5 Primary Contribution

This section gives an overview of the main contribution provided by the body of work presented. In this section the principles relating to different elements of contextual inquiry are presented. The first table (5.1) presents the element of reflection, the second table (5.2) presents the element of carriers, while the last table (5.3) presents the element of practice.

The starting point for this work is the idea of Information Systems analysis as a special case of purposeful organizational change (Walsham, 1993) [Paper 1]. The significance of individual perspectives is highlighted in a context in which current authorities tended to treat ‘the organisation’ as an opaque and homogenous entity. See also discussion of ‘black boxing’ in sections 3.1 and 3.2 above [Paper 2, 3]. I believe that Individual stakeholders embracing this complexity benefit from the application of an element of reflection (Table 5.1). The complexity of organisational life, and consequent impact of multiple levels of contextual dependencies on individual and collective sense-making and learning, form the focus of the work [Paper 1; 2; 3]. It is important to emphasize that this is about engaging with dynamic complexity, i.e. open systems which are created and recreated on a continuing basis by on-going interactions among a changing body of people.

The discussion considers human activity systems within a framework of Information Systems [Paper 1, 2, 3]. The work draws upon a variety of sources, e.g. sociotechnical analysis and design (Mumford, 1983) and soft systems thinking in relation to information systems and problem-reframing (Checkland and Holwell, 1998). The discussion is linked to earlier work specific to the field of Information Systems, particularly that of Langefors (1966), who’s Infological Equation draws specific attention to the role of experience over time in shaping human interpretive processes [Paper 1, 5]. My use of systems thinking was developed by reflection upon work by Bateson (1972), and by Maturana and Varela (1980) which place emphasis on the individual perspective [Paper 4; 5].

**Table 5.1: A proposed set of principles for contextual inquiry: The Element of Reflection**

<p style="text-align: center;"><b>The principle of using core concepts from Systems Thinking</b></p> <p>This principle suggests that Systems Analysts should organize their data collection and analysis around core concepts and ideas from one or more critical theorists. <i>Example:</i> [Paper 1, 2] use core concepts from Gregory Bateson (orders of learning, self-reflection and emancipation through systemic thinking); and Borje Langefors (the distinction of information as a subjective construct); Chris Argyris (distinction between theories in use and espoused theories and organisational defences); Peter Checkland (<i>Weltanschauungen</i> and focus on relevance – critiquing assumptions about the nature of the problem space); Umberto Maturana and Francisco Varela (suggestion that any observation must be made by a person who observes). These points are further developed in Papers 3, 4 and 5.</p>
<p style="text-align: center;"><b>The principle of an ethically-based stance</b></p> <p>Systems Analysts advocate values such as open democracy, equal opportunity, or discursive ethics. These values drive or provide the basis for action. <i>Example:</i> [Paper 1 and 2] looks at how participatory design and socio-technical perspectives can be incorporated in systems analysis and practice, using core concepts and techniques from Peter Checkland (rich pictures and conceptual models) and Gregory Bateson (concept of double bind and orders of learning). These issues are pursued further in Paper 5, where the concept of ‘user’ is problematized and the need to consider whole work systems, rather than artefacts, is discussed.</p>
<p style="text-align: center;"><b>The principle of revealing and challenging prevailing beliefs</b></p> <p>This principle suggests that critical researchers should identify important beliefs, values and assumptions, make them explicit, and challenge them with potentially conflicting arguments and evidence. <i>Example:</i> [Paper 1, 2] considers how a technical information system was supposed to help to ensure efficiency and financial viability, but he challenges the underlying beliefs and assumptions of the system using concepts from Peter Checkland (<i>Weltanschauungen</i>, critique of assumptions about the problem space); Borje Langefors (assumptions about information; impact of individual life history on interpretation of data); Gregory Bateson (challenging prevailing beliefs; escaping from double bind); Chris Argyris (reflection upon the differences between potential desired action and action taken). Paper 4 addresses bias in all its forms, while Paper 5 discusses problems of entrapment in double bind (Bateson, 1972) and how human interpretation is mediated by paraconsistent logic.</p>
<p style="text-align: center;"><b>The principle of revealing and challenging established organizational practices</b></p> <p>Whereas the previous principle focuses on beliefs, this principle suggests that organizational practices should also be revealed and challenged. <i>Example:</i> [Paper 1 and 2] use Chris Argyris (theory of practice); Peter Checkland (Soft Systems Methodology) and Gregory Bateson (double bind) to look at how the analysts’ practices maintained their integrity, status and privileges. Paper 3 extends this discussion to include consideration of socio-cultural context. Paper 4 discusses phenomena of disinformation and misinformation in relation to organizational discourse. Paper 5 shows examples of application of paraconsistent logic among participants to support recognition of ambiguity/uncertainty.</p>

Bateson's discussion of e.g. orders of learning and 'double bind' led me to focus upon the complexity of individual uniqueness. Maturana and Varela give support to the idea that any observation must be made by a unique observer, who is at the same time a sense-maker interpreting and reflecting on the situation within which the observation occurs.

At the same time, I considered that contextuality (including the time dimension) is a key factor [Paper 1, 5] (Bednar and Welch, 2005a). Organisational context, as perceived by an individual, is in a continual state of change and the impact on that individual is reflexive, since individual sense-making cannot be separated from organizational context and culture (see Weick, 1995; Bednar and Welch, 2005b) [Paper 2, 3].

Uncertainty is highlighted as an active element of situated learning [Paper 5]. Since sense-making takes place within a context of ever-changing uncertainty, rational approaches to decision-making are rendered impossible (Bednar and Welch, 2006b; Bednar, Welch and Katos, 2008) and hence irrational decision-making (attempting to structure uncertainty into ambiguity) becomes rational (Sjöstrand, (1997).

Thus, while Systems perspectives were clearly relevant to my work, they were insufficient in themselves. Work by Argyris (1990) appeared more congruent with my mind set of critical inquiry. I then brought in discussion by Churchman (1971), Ulrich (1983) and others to my reflections upon individual uniqueness in IS analysis practice [Paper 2].

Radnitzky's distinction between logical empiricist (LE) and hermeneutic dialectic (HD) schools of metascience was found helpful in focusing on uniqueness, and on a distinction between method and philosophy (Bednar and Welch, 2005b; Nissen, et al, 2007; Bednar and Welch, 2007a; Radnitzky, 1970) [Paper 5].

A consistent theme throughout the work is a focus on barriers to successful change (Bednar and Welch, 2006b; 2007e), arising from a lack of attention to contextual dependencies and individual and collective sense-making processes [Paper 1, 2, 3], (see also e.g. Argyris, 1990), and puts a case for approaches which can empower engaged actors to enrich their understandings of contextual dependencies through visualisation techniques. The aim is suggested to be creation of a productive learning spiral (see Bateson, 1972) from individual and collective sense-making processes in order to facilitate beneficial change (Bednar and Welch, 2007b).

The discussion [Paper 1, 2, 3] incorporates organisational learning and the concept of a learning organisation (Argyris, 1990; Weick and Sutcliffe, 2006; Alvesson and Spicer, 2012) in order to suggest a need for individuals and groups to reflect upon and re-evaluate knowledge that they create in the organisational context. The organization is then changed as a result of that re-evaluation of knowledge (Bednar, Welch and Katos, 2008).

It is necessary for these reflections to embrace Bateson's (1972) second order of learning, not just the first level, if meaningful change is to be achieved [Paper 1] (Bednar and Welch, 2007b). The concept of what is *meaningful* in relation to IS development and organisational change has been explored [Paper 4] (Bednar and Welch, 2009b).

There is emphasis on the need for an Open Systems approach, since organizational structures are both dynamic and temporary [Paper 1, 2, 3]. In such an approach, methods are needed to promote constructive dialogue among organisational actors, since successful change requires engagement by people (Bednar, Welch and Katos, 2008; Katos and Bednar, 2008).

Furthermore, the common belief that successful IS developments can be carried out by experts on behalf of *users* is fundamentally flawed (Bednar, Welch and Graziano, 2007). Commitment is required from all those with relevant contextual knowledge and management cannot force *meaningful* change to happen. Rather, managers need to recognize that individuals can/should/must contribute their contextual knowledge in order to bring about *success* [Paper 1, 2] (Bednar and Welch, 2009b).

Too often, managers are ignorant of the varied contextual knowledge possessed by their team members. Bednar and Mallalieu, (2001), use the metaphor of a rock found on a beach – this rock could be ignored by a passer-by, but to a geologist it may hold interest as a specimen of mineral deposit. By implication, it could be seen by different individuals as a weapon to throw, a weight to use in fishing, a building material, or a pretty souvenir, depending upon their perspectives.

A need is recognised for external consultants, whose role is to promote dialogue and learning activity among engaged actors [Paper 1, 2, 3] (Bednar, Welch and Graziano, 2007). Change management requires intervention, not just interaction as suggested by some contributors to the ISD field e.g. Checkland, 1981. It is implicit in the discussion that both interaction and intervention are required, since communication is highlighted as crucial

element in sense-making and learning [Paper 1, 2, 3]. Vehicles are needed through which consultants can help to promote broadening of perspectives – i.e. help to surface the contextual knowledge available within the group – it is not just managers who can *overlook* this but the people who hold that knowledge (Bednar and Welch, 2007b; Katos and Bednar, 2008; Bednar, Welch and Katos 2008) [Paper 1].

Frequently, approaches to ISD emphasise goal seeking, but what happens if goals are misaligned and IT *projects* become isolated from mainstream of business? There is a need to integrate all aspects of change-related decision-making [Paper 2] (Bednar and Mallalieu, 2001; Bednar and Welch, 2008b).

Brunsson and Olsen's (1993) discussion of dyadic versus atomistic approaches to research highlight a need to support continual construction or reconstruction of meaning in sense-making, i.e. dialectics between micro and macro levels of analysis [Paper 1, 2, 3].

It is important that engaged actors are not inhibited from expressing their contextual knowledge through fear of uncertainties and risks associated with organisational life (Bednar and Welch, 2006b; Bednar, Welch and Katos, 2008; Katos and Bednar, 2008). Vehicles for collaborative inquiry can only be effective where there is constructive support from external consultants and management and an accepting culture.

## 5.1 Contextual Inquiry

SST is a vehicle for contextual inquiry, recognising that every individual's experience of their environment is unique and contextually-created. In order to bring about beneficial change in any situation, therefore, we need to ask questions: how do you experience this situation? Are your experiences similar/different to mine, and if so in what ways? What kind(s) of change would you (and I) consider to be *beneficial* here? According to what scale of values would you or I (we) judge a particular transformation to be beneficial or not [Paper 1]?

SST is intended to support creation of a productive, collective learning spiral owned by engaged actors within a given problem space, in order to facilitate situated transformation.



Purposeful transformation in any problem space can only be addressed through recognition that there are multiple levels of contextual dependencies created through human perceptions of that space [Paper 1, 2]. These levels cannot be directly accessed all at the same time and it is necessary for analysis to start somewhere. Indeed, perceptions may not be accessible at all without support to explore and surface them (Bednar and Day, 2009) [Paper 1, 2]. Such support can be given to individual stakeholders through the use of the element of carriers (Table 5.2) (Bednar, Welch and Katos, 2007).

**Table 5.2: A proposed set of principles for contextual inquiry: The Element of Carriers**

<p><b>The principle of individual emancipation</b></p>
<p>All critically informed systems analysis in practice is oriented towards intervention in the form of facilitating the realization of human needs and potential, critical self-reflection, and associated self-transformation. <i>Example:</i> [paper 1; 2] (Bednar and Welch, 2009b) show how individuals can be helped to shape their own requirements and take control over their own inquiry. Individual emergence is discussed in Paper 2 and Paper 3 extends this discussion to consider emergence within socio-cultural context or organization. Paper 5 explicitly introduces the concepts of ambiguity and uncertainty in relation to decision spaces.</p>
<p><b>The principle of improvements in organization</b></p>
<p>This principle suggests that improvements in organization are possible. The goal is not just to reveal the current forms of domination, but to <i>suggest</i> how unwarranted organizational inefficiencies might be overcome. Most systems theorists assume that organizational improvements are possible, although to very differing degrees. <i>Example:</i> [Paper 1; 2] make recommendations with regard to how the provision of desired organizational learning might be improved. Paper 3 looks into socio-cultural spaces; Paper 4 addresses problems of bias in organizational discourse; while Paper 5 supports a dialogue with help of the concepts of ambiguity and uncertainty and paraconsistent logic.</p>
<p><b>The principle of improvements in theories for practice</b></p>
<p>All critically informed systems theorists believe that our theories are fallible and that improvements in theories for practice are possible. Critically informed systems practitioners entertain the possibility of competing truth claims arising from alternative contextually dependent worldviews, which can guide systems analysts in their analyses and interventions. <i>Example:</i> Paper 3 modified a version of SST framework for the application in practice. In Paper 4, multiplicity of truth claims is discussed, while Paper 5 addresses relationships between truth claims in context through paraconsistent logic.</p>

Logically, the starting point for analysis is individuals' unique understandings of the context in which they find themselves, but human beings do not necessarily *know what they know* in terms they can readily express (see e.g. Polyani, 1967; Nonaka, 1991; Bateson, 1972). Bateson's (1972) work

suggests that understanding human sense-making is unlikely to be improved through a lens of (classical) bi-valued logic.

One of the suggestions in my work is to break away from limitations of bi-valued logic and embrace para-consistency (Bednar, Anderson and Welch, 2005; Bednar, Welch and Katos, 2008) [paper 5].

Therefore, intra-analysis makes use of tools and techniques which allow individuals to explore their *knowing* and surface their perceptions (Bednar and Day, 2009). How to engage with the complexities of contextual analysis in practice is supported by the use of guides, techniques and methods (Table 5.3).

This assists individuals to reflect upon these perceptions in order to participate in a meaningful analysis and dialogue. Having said this, it is not intended to suggest that individual perspectives necessarily have primacy over collective views of a problem space. While I choose to begin with individual views in my description of SST, I would not necessarily start with intra-analysis in any given inquiry [Paper 1, 2, 3].

The purpose of intra-analysis is to support each individual to create his/her own unique narrative reflecting his/her contextually-dependent understanding(s) of a problem space. This will involve exploring perceptions of the problem space; inquiring into the individual's own value system, including inquiry into potential transformation(s) within the context of that problem space. This analysis therefore involves both convergent and divergent thinking.

Consideration will be given to ontology (what an individual perceives to be going on in context), epistemology (how s/he is forming contextually-dependent perceptions and understandings) and axiology (how personal values are shaping individual understandings and preferences about context and possible transformation) [Paper 4, 5].

The purpose of inter-analysis is to support individuals to explain their contextually-developed narratives to one another within a group context, actively listening to one another; to share appreciation of those narratives and to recognise similarities and differences within the range of narratives offered by different individuals, without disqualifying any, i.e. to enter into dialogue [Paper 1, 2].

**Table 5.3: A proposed set of principles for contextual inquiry: The Element of Practice**

<p style="text-align: center;"><b>The principle of Systematic Organization</b></p> <p>Critically informed application of systemic thinking in practice need facilitate pragmatic sense-making and comprehension. The intention is to support explorations into problem spaces that are possible, sustainable and re-traceable. <i>Example:</i> Paper 1, 2 show how individuals and teams can organize and structure their own inquiry and interaction as an ongoing systematic process. Paper 3 brings this discussion into a socio-cultural space. Bednar and Day (2009) make suggestions for how unstructured methods can be organized in a systematic way to draw upon each other strengths. Specifically how to systematically combine notes from Brainstorming Sessions, with Mind-Mapping workshops and then move on to dialogues supported by ongoing revising of Rich Pictures. Paper 4 provides a discussion of possible incidence of bias in discourse, while Paper 5 supports creation of ambiguity from uncertainty in a structured way, using paraconsistent logic.</p>
<p style="text-align: center;"><b>The principle of Systemic Freedom</b></p> <p>This principle suggests that there is a need to engage with the idea of a multiplicity of open and dynamic systems. The purpose is to reveal the diversity of understandings of emergent properties of a complex and uncertain environment and problem space. <i>Example:</i> Paper 1, 2 make recommendations, with example models and guiding questions, with regard to how the practical reflection over, organization of multiple competing system boundaries and problem space definitions can be clarified and engaged with. Paper 3 extends this to a discussion of open, dynamic socio-cultural spaces. Paper 4 opens up possibilities for actors to explore multiple perspectives, and so cross boundaries, while Paper 5 proposes a vehicle to deal with organizational ambiguity/uncertainty using paraconsistent logic.</p>
<p style="text-align: center;"><b>The principle of Paraconsistency</b></p> <p>Critically informed systems thinkers recognize the emergence of competing truth claims arising from different worldviews. The practical implication is that there is a need not only to recognize this, but also to be able to incorporate that recognition in viable and understandable problem space descriptions. Paper 1 introduces how individuals experience multiple levels of contextual dependencies within any organizational problem space, and how open systems thinking enables us to explore differences but avoid paradox. Paper 2 explores individual emergence and Paper 3 extends this discussion to competing perspectives within open, dynamic socio-cultural spaces. The purpose is to allow alternative problem space descriptions to be explored and to avoid a pre-emptive disqualification practices to surface. The discourse on bias, communication and informing efforts in Paper 4 supports this. <i>Example:</i> Bednar, Welch and Katos (2006; 2007) show how four-valued logic can be used to engage with logical inconsistencies as part of exploration of complexity in alternative understandings of problem spaces. Bednar, Welch and Katos (2008) presents a method (Diversity Networks) to organize and visualise multiplicity/characteristics of understandings of relationships between paraconsistent alternative problem space descriptions. Paraconsistency is explicitly discussed in Paper 5.</p>

Thus, again, both convergent and divergent thinking are required. Reflective questions need to be asked, for example:

- *Do I understand your narrative(s)?*
- *Do I think you understand my narrative(s)?*
- *Do we interpret any of these narratives as similar?*
- *Do we interpret any of these narratives as showing differences?*
- *Can we cluster any of the narratives to form a range (or many) according to some agreed pattern(s) or scale(s)?*

Again, participants are (collectively and separately) inquiring into personal and contextual understandings of the problem space; inquiring into processes of interpretation; and inquiring into a value system within which similarities, differences and relationships between narratives make sense. It may be important to reflect how these understandings are created within a context of ontogeny and phylogeny for those individuals and groups involved (as mentioned in section 3.1 above).

Value analysis relates the results of these individual and collective exploratory ventures to possible transformations that could be brought about by owners of the problem space. This involves engaging in second order learning in order to reflect upon the processes of inquiry generated in the other two aspects (intra- and inter-analyses). Personal and collective viewpoints are explored in order to create a value system within which any described-understanding of transformation can be deemed beneficial from particular points of view, illuminated by the analyses (axiology). Thus, again, there is both convergent and divergent thinking involved.

A discussion of human knowing, as a facet both of being and informing, is important when considering Systems Thinking. It is important here to distinguish between knowing as a process and a concept of *knowledge* as a product of this process.

There is a potential problem in focussing on knowledge (or information) as if it were an object (Bednar, Welch and Katos, 2006). When we reflect on systems or processes (e.g. knowledge creation or decision support for action) we may unwittingly ignore the epistemological differences between ways of thinking [Paper 4]. We must not lose sight of the underpinning problems people experience when engaging in discussion over these matters.

Some thinkers, who have been encultured to Anglo-Saxon schools of thought (see Radnitzky, 1970), may focus unduly on ontology and fail to recognise the importance of epistemology, praxiology and axiology in such discussions [Paper 1]. Perhaps this paradigm is less prevalent among the Systems community than in some other spheres of academic work, but it is still relevant to bring this problem to the fore (Bednar and Welch, 2005b).

Work by Radnitzky (1970) is most helpful in highlighting differences between Anglo Saxon and Continental traditions in philosophy. Some Continental schools of thought, such as Hermeneutic Dialectics (and also aspects of *American Pragmatism*) are relevant to consider when talking about Systems Thinking (e.g. Nissen, 2007; Nissen, Bednar and Welch, 2007), as we may wish to keep in mind that different pieces of work, which on the surface might use very similar ontological frameworks and language can confuse us as observers because they hide very wide epistemological, praxiological *and* axiological differences. For example, works by Bateson (1972) and by von Foerster (1972) could well be used as references by Systems researchers, while the epistemological, praxiological and axiological foundations of their approaches could easily be overlooked.

I believe that *we*, as human beings, are *applying philosophy* in our (conscious and purposeful) practices. *We* are thinking (using philosophy) about *our* world, life, science and scientific methods. Therefore, practitioners, scientists (like all of us) are thinking about their understandings of their world. It is possible that there is some dominant logic in some domains of practice or scientific endeavour (communities and networks of practice) [Paper 5].

However, because all human practices and sciences are applied by individual human beings - those people could, in principle at least, have any belief system available to human beings - independently of what may or may not be a *dominant logic* within a particular discipline (or community). While this may lead those who are recognized as different to be ostracized - it is not necessarily academically unsound [Paper 4]. After all it is, in my opinion, also what supports academic development and the evolution of disciplines.

*Worldview (Weltanschauung)* could be described as an *epistemology* held by an individual human being [Papers 2, 3, 4 and 5]. People may use an *ontology* in efforts to describe it; people may use *praxiology* in efforts to use it or demonstrate it; people may use *axiology* for efforts to try to reflect over their worldview or validate it. It is the reflection of these aspects *together* that makes a difference.

Each individual human being is a complex collection of intertwined *personas* and as such each individual may have a multitude of *worldviews*. Also, as human beings, we engage in creating abstractions when we try to make sense of *the world* as we see it. So we also have different categories of *worldviews* as dependent not only on our experience of context but also our judgement and assumption of scale of context [Paper 2, 3].

Could we say that our multitude of worldviews, at a (much) less abstract level, constitute a unique worldview for each individual human being? It depends on what we wish to use the concept of *worldview* for. We could use it and say that each unique individual has a unique individual worldview. While this can appear to be neat and tidy and potentially become a popular use, such simplification will make it more difficult to address the complexities of multiple individual worldviews.

Consider that we are engaging with real, living, individual human beings, each one of whom has a multitude of worldviews. If those worldviews are not necessarily always compatible with each other or not appropriate to be conflated with each other, it would be very easy to talk about any one worldview and become blind to the exclusivity of such a description. We risk missing out the uniqueness of *the emergent worldview* of the individual, which is an emergent property of a shifting collection of individually held worldviews - see discussion of individual emergence in [Paper 2].

If we miss out on the contextually dependent uniqueness of individuals in a knowledge-based organization, we also risk missing out on those very aspects which make the organization unique, different, special, and so gives it a potential competitive advantage compared to other organizations, which on the surface may *appear* to be *exactly the same*.



# 6 Concluding Remarks and Opportunities for Further Research

Where does value of this work lie? Who is informed by it? How does it support emancipation in the critical sense?

As pointed out by Davenport and Prusak (2000), the only genuine source of competitive advantage that a company has is the know-how of its staff. However too often much of this is lost because it is tacit, embedded and contextually dependent and no support is available to help individuals to surface what they know.

Clearly therefore a vehicle such as SST (Framework for Strategic Systemic Thinking) could be of enormous value. Furthermore decision making can often be flawed due to a premature rush to achieve consensus.

A further quality of SST is that it enables participants to build a rich knowledge base and exchange views without rushing to a decision. This research addresses anyone in a decision making environment. It can be adapted for many different uses, for instance in my own university a department in a faculty not my own, has adapted SST to provide a framework for all of their final year students to reflect upon and manage their own learning.

Many practitioners in organizations have been engaged via a local community of practice (more than fifty practitioners in the community of practice), I have also used these ideas with my students and (mainly) local industry (more than 250 companies / organizations have been engaged over the years).

Additionally to this there have been some examples of international larger companies who have also been involved. Lessons learnt suggest that often people in organizations have no voice because their contextual knowledge is invisible (not surfaced and shared).



Use of SST and engagement with the research presented in this text supports them to be more fully engaged in a bottom up perspective. My ideas have over the years been in practical use in quite a few organizations, not only in the UK, but also for example in Italy, France, Sweden, Czech Republic, UAE and Hong Kong.

What would be relevant for me to do next in relation to SST? What are the opportunities for practical validation in order to refine system for use?

All of the mentioned interactions with industry and students have given opportunities for feedback. I will be able to use this on a continuous basis to make improvement and modification to both usability and usefulness of the framework and supporting tools.

The research experience also suggest the value of a community of practice as being a worthwhile socio-technical forum as the system for future research and development

Overall the ideas in this thesis can be seen to relate to the Socio-Technical principles formulated in the Tavistok Institute after World War Two. These were extended by Enid Mumford into the field of Information Systems during the 1980's with an emphasis on job enrichment and improvement of the working life of ordinary people.

However, from the late 1990s and onwards a Socio-Technical perspective could be seen to inform development in Operation Management e.g. the Toyota System / Lean. Here it was viewed as essential to maximize efficiency and effectiveness by enabling people and technology to work in harmony.

The challenge for today, therefore is to draw upon these developments to re-invigorate socio technical perspectives in IS towards achievement of organizational excellence. Among others I have also chaired Socio-Technical Tracks and related themes in major conferences (e.g. ECIS 2015, 2016) dedicated workshops (e.g. STPIS 2015, 2016), Special Issues in international journals (e.g. *Informing Science* Vol 10, 2007; *International Journal of Systems and Society* 2016, Vol 3, issue 1) devoted to Contemporary and Critically Informed Socio-Technical Inquiry from a Systemic Perspective.

I am actively promoting a contemporary extension (from a critically informed systemic perspective) of the ST agenda both in my own work and beyond. I have been a member of the Information Systems Methodology Specialist Group of the British Computing Society for many years. I am currently a

member of the Specialist Panel of the British Computing Society on Socio-Technical Approaches.

How can further development of tools and techniques be supported, e.g. tools for Inter and Intra analysis; socio-technical toolbox; software to support paraconsistent logic and diversity networks?

One direction for future development and research, is the ongoing inquiry into the Socio-Technical bases of Personal Decision Support Systems. Mainstream work on DSS had taken up the agenda of Big Data in recent years.

However by means of paraconsistent logic and contextualization the important and often neglected area of Little Data will be further addressed in my future research. Other directions which have been of interest to me over the years are problematic contextually dependent socio-technical perspectives in Human Aspects of Information Systems Security, Cyber-Security and also Digital Forensics.



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# Appended Papers

The core contribution set out in this text relates to the development of an approach to contextual inquiry – the Strategic Systemic Thinking framework.

The content of this contribution is set out in five selected papers.

- Paper 1. Bednar P. M. (2000). **A Contextual Integration of Individual and Organizational Learning Perspectives as Part of IS Analysis.** *Informing Science: the International Journal of an Emerging Transdiscipline.* Volume 3 No 3. p145 - 156. Accessible at <http://www.informingscience.org/Publications/590>
- Paper 2. Bednar P. M. (2007). **Individual Emergence in Contextual Analysis.** Problems of Individual Emergence. Amsterdam, 12th bi-annual ‘Problems of...’ Systems Conference, in *Systemica*, (14)1-7, p23 - 38.
- Paper 3. Bednar P. (2009). **Contextual Analysis – a Multiperspective Inquiry into Emergence of Complex Socio-cultural Systems,** in G. Minati, M. Abram and E. Pessa (editors), *Processes of Emergence of Systems and Systemic Properties: Towards a General Theory of Emergence*, World Scientific. p299 - 312.
- Paper 4. Bednar P. M. and Welch C. (2008). **Bias, Misinformation and the Paradox of Neutrality.** *Informing Science: the International Journal of an Emerging Transdiscipline.* (11), 2008. p85 - 106. Accessible at <http://www.informingscience.org/Publications/441>
- Paper 5. Bednar P.M. and Welch, C. (2009). **Inquiry into Informing Systems: critical systemic thinking in practice.** Chapter 14 in G. Gill, editor, *Foundations of Informing Science: 1999-2008.* Santa Rosa, California: Informing Science Press. p459 - 501.



# Paper 1: A Contextual Integration of Individual and Organizational Learning Perspectives as Part of IS Analysis

Bednar P. M. (2000). **A Contextual Integration of Individual and Organizational Learning Perspectives as Part of IS Analysis**. *Informing Science: the International Journal of an Emerging Transdiscipline*. Volume 3 No 3. p145 - 156. Accessible at <http://www.informingscience.org/Publications/590>

*The Strategic Systemic Thinking (SST) framework is presented as a stepping stone towards enabling the refocusing of organizational analysis in Information Systems (IS). The paper introduces some of the fundamental assumptions regarding the objectives of the SST framework; such as sense making as learning processes built upon communicative actions. The main concepts of the SST framework are presented, which are focused on developing a learning organization inclusive of having a constructive dialogue mechanism. The SST framework includes constructive dialogue as a means of gaining access to the existing but unreleased individual and group competencies for improved IS analysis.*

**Key Themes:** Emergence, Individual emergence, Systemic thinking, Communicative practice, [Critical systemic thinking, Systemic practice, Contextual inquiry].

**Character (Focus):** Ontology, Epistemology, Axiology, Praxiology

**Theoretical Influences:** Bateson (1972), Argyris (1974; 1990; 2006), Langefors (1966; 1995), Checkland (1981), Checkland and Holwell (1998), Maturana & Varela (1980).

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# A Contextual Integration of Individual and Organizational Learning Perspectives as Part of IS Analysis

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## Abstract

*The Strategic Systemic Thinking (SST) framework is presented as a stepping stone towards enabling the refocusing of organizational analysis in Information Systems (IS). The paper introduces some of the fundamental assumptions regarding the objectives of the SST framework; such as sense making as learning processes build upon communicative actions. The main concepts of the SST framework are presented, which are focused on developing a learning organization inclusive of having a constructive dialogue mechanism. The SST framework includes constructive dialogue as a means of gaining access to the existing but unreleased individual and group competencies for improved IS analysis.*

Keywords: Information systems, organizational analysis, organizational learning, sense making.

## Introduction

Most everyone in the information systems field would agree that systems development work typically requires an analysis of existing organizational practices and procedures (Checkland, 1981; Avison & Fitzgerald, 1988). This is the case because any new implementation or change to an existing information system can have a significant impact on the organization (Checkland & Holwell, 1998). The importance of studying organizational change, as a result of information systems development, was recognized back in the 1960's. Early work identified the significance of the individual in the organizational infrastructure. This work was described in the "Theoretical Analysis of Information Systems" where the infological equation was presented (Langefors, 1995).

*"The infological equation (Langefors, 1966):  $I=i(D, S, t)$ ": where  $I$  is the information (or knowledge) produced from the*

*data  $D$  and the pre-knowledge  $S$ , by the interpretation process  $i$ , during the time  $t$ .[ ...] In the general case,  $S$  in the equation is the result of the total life experience of the individual. It is obvious, from this, that not every individual will receive the intended information from even simple data." (Langefors, 1995, p.144).*

The infological equation suggests that information systems include complex, intra-individual and inter-individual dimensions. With the inclusion of personal pre-knowledge, some of the ground work was laid (see Langefors, 1966), for what today is called soft systems development or social informatics. The infological equation includes the suggestion that individuals and their sense-making activities are to be included in the information system, (Langefors, 1995).

Although there is a wealth of literature on both organizational change (Child, 1984; Cash et al, 1994; Daft, 1998; Groth, 1999) and information systems development (Checkland, 1981; Avison & Fitzgerald, 1988; Yourdon, 1989; Alter, 1996), the focus has been on the organization as a whole. Though we have recognized the individual's contribution in the organization, there has been little research done on the individual perspective of learning especially within the context of information systems (IS) development.

Much of the current research in IS has focused primarily on various aspects of structured learning in an organization

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## Strategic Systemic Framework

(Senge, 1990; Agre & Shuler, 1997; Travica, 1999; Eriksen, 1998; Zack, 1999). This can be exemplified by Senge's popular statement on organizational learning (1990, p. 69):

*"I call systems thinking the fifth discipline because it is the conceptual cornerstone that underlies all of the five learning disciplines of this book. All are concerned with a shift of mind from seeing parts to seeing wholes, from seeing people as helpless reactors to seeing them as active participants in shaping their reality, from reacting to the present to creating the future. Without systems thinking, there is neither the incentive nor the means to integrate the learning disciplines once they come into practice. As the fifth discipline systems thinking is the cornerstone of how learning organizations think about their world."*

This description stresses systems thinking and integration within learning disciplines. However, it doesn't address an individual perspective in terms of reflective personal learning processes. The composition of these low-level processes may have a major impact on the organization (and information system) as a whole. It is argued in this paper that organizations, from an individual perspective, would benefit from a more formalised cross-fertilisation between ideas of organizational analysis and learning. What is needed is a systemic process for personal learning that is based on contextually dependent systems thinking.

Contextuality has to do with what Langefors (1966) describes as individual pre-knowledge as a result of the total life experience at a given point in time. This time-dependency as a part of learning is important since the understanding of a certain situation is dependent on the total life experience. Contextuality includes the impact of changes in the personal sense-making processes due to changes in the personal understanding of life experience.

In the theory of autopoiesis, the objective of a system is described as an effort to uphold individual forms of identity (Maturana & Varela, 1980). As such, as a systemic entity's understanding of itself changes, the system's sense making and understanding of the environment also changes. Contextual dependency is an effort to describe an ever changing understanding which is dependent upon a continual co-play among an "observer", "observation" and the "referential framework" (Maturana & Varela, 1980). The "referential framework" can be viewed as the personal understanding of the "total life experience" at a given point in time (Langefors, 1966).

## Organizational Analysis

Organizational analysis can be defined as a composition of both individual and organizational learning processes (Senge, 1990; Walsham, 1993; Argyris & Schön, 1996). In this sense, the organization is constantly changing as individuals continually change their perception of the organization through learning processes. As a result, individual and organization learning cannot be separated as independent entities because they are intertwined.

What is needed is a study of learning mechanisms that support individual analysis activities (Senge, 1990; Argyris & Schön, 1996). An important area of study associated with individual analysis is the sense making process, which is built upon communication and learning (Weick, 1995). The sense making process is an individual activity of "figuring out" or "problem-solving" within the context of the organization, its goals, and its strategies. The individual's sense making is also dependent on the organizational culture as a whole.

One of the problems with today's organizations is that individual sense making in the form of lessons learned are not shared within the organization. There are several explanations as to why lessons learned are taken for granted but not practised. According to Argyris (1990), one of the explanations has to do with "skilled incompetence". This is the case when managerial and professional behaviour creates habits of self-denial, which inhibit certain kinds of progress within organizations.

Irrational decision-making can be attributed to the experience of overwhelming uncertainty connected to existing sense making activities. When viewed in this way, irrational decision-making becomes a "rational" or explained activity (Sjöstrand, 1997). With this in mind, questionable decisions cannot be universally blamed on a lack of individual competence within an organization. This is an example of the complexities and controversies that impact the facilitation of organizational learning. Argyris (1990) describes these roadblocks as "organizational defense" mechanisms. Other related controversies have to do with "organizational sense making" activities and the "Janus Factor" of rational decision-making (refer to Weick (1995) and Sjöstrand (1997); respectively, for an in-depth discussion of these organizational impediments to learning).

There are examples of industrial projects that failed even though existing competencies should have been enough and, if those same competencies had been employed, might have prevented the failures from occurring. There seems to be a consensus that organizational barriers to success are associated with learning styles, individual autonomy, and

contextual-dependency but are relatively easy to overcome. There are suggested strategies on how to prevent these types of organizational failures (Handy, 1994; Senge, 1990), though there is still much work to be done. It is proposed in this paper that there are individual learning processes that will help ideas to surface. This is accomplished through an enrichment and visualization process for individual (and team-based) decision-making.

The objective of this work is to provide a proposal for an initial strategic systemic framework, which could be used instead of (or to challenge) the use of more traditional approaches to IS analysis. By using this framework, individual and organizational learning perspectives can be integrated in the IS analysis process.

## Learning Organization

The concept of the learning organization, as presented by Argyris and Schön (1978; 1996), is defined as a means to reflect upon, and re-evaluate the knowledge that is created by individuals within the organizational context. The organization is changed as a result of this learning process. The learning process can be viewed as an ongoing sense making activity based on the collective knowledge of the individuals.

The objective of the proposed strategic systemic thinking (SST) framework is to incorporate adaptation and change as a sense making process. This would be accomplished via a collective reflection of decision-making activities in the learning environment. This approach is similar to (but not equal with) the systemic five "disciplines" applied in a learning organization (refer to Senge (1990) for an in-depth discussion of the five disciplines). It is also similar to an organizational facilitation for double loop learning (Argyris, 1990; Argyris & Schön, 1996). Double loop learning includes a reflection of the learning process whereby an effort is made to try to break out from prejudices and assumptions that individuals might have from past organizational experiences.

It is not sufficient for an organization to focus only on lessons learned or improve current practices in order to have this level of a sense making, learning strategy. Such an approach is referred to as a "first-order change" (Bateson, 1972) or "lessons learned" strategy. The major issue associated with being a learning organization includes "second-order change", which requires changes in fundamental organizing principles and basic assumptions (Bateson, 1972). Neither intra-individual nor inter-individual relationships are seen upon as being static. Thus organizational structures are viewed as dynamic and temporary open systems.

Organizations, when viewed as multi-individual, interactive (open) subsystems, are quite complex, as each subsystem exists as a separate entity. These subsystems are composed of individuals with skills, experience, and knowledge that unfortunately may not be recognized or taken advantage of. Hastings (1996, p. 127) provides a summary of this sentiment:

*"If managers actually mean it when they say, 'people are our greatest asset', and 'in the future it's our knowledge that we will be selling' then there should be many around who are seriously concerned about the poor return and utilization level that they are achieving from this knowledge asset lying invisible and under-utilized in peoples heads. Maximizing the return on an organization's know-how investment will be the most significant source of competitive edge in the future."*

## Constructive Dialogues

According to Checkland & Holwell (1998), organizational change and improvement could only be successful when the organizational actors (individuals) are engaged in that change. Without incorporating these individuals in the change process, it is probable that a management-imposed solution will fail. Individuals that are not involved typically lack the commitment necessary for successful decision-making (Brunsson & Olsen, 1997). Too often, management is unaware of the opportunity of inside resources and as a result try to tell these individual what to do. In addition, the insider knowledge-base and sense making experience may not be viewed as an asset or is unknown by the organization.

An example of this phenomenon is illustrated as follows. If an individual walks on a beach and picks up a stone, the individual might see a generic rock with no special features or characteristics. But if the individual were a geology student, he or she might recognize different kinds of minerals in that piece of rock. That is to say, an individual can only see what he or she knows and what he or she perceives as interesting.

Thus it is not enough for management to use an interventional approach that focuses on situations without regard for the individuals involved. This is relying only on what management knows and not utilizing the knowledge of the inside resources. Yet, these resources are necessary for the long-term growth and stability of an organization.

When a problem arises, it is important to engage the actors in reflecting on their experience when problem-solving during similar situations. But it is also important to involve active intervention external to the individuals or group performing the problem-solving activity. That intervention would aim for broadening the problem-solving perspectives of the organizational members.



## Strategic Systemic Framework

An intervention by an external party (e.g., researcher, consultant, or management) is an enquiry into the beliefs of the actors and the interviewee. This enquiry, via an intervention, would necessitate a dialogue and learning activity. The interviewee would have to address issues that are in need of a more active involvement by the individual participants. All parties, inclusive of the interviewee, would have increased responsibility in the problem-solving process. The actors, within the context of the problem situation, should carry out the enquiry. The interviewee would have limited responsibility in terms of offering support and guidance for the ongoing enquiry. This is a stronger form of intervention and call for more external responsibility taking than the more "non-interventionistic" approach or "interaction" as suggested by Checkland & Holwell (1998).

Support should also be provided for broadening the possibilities of interpreting the problem and understanding the possibility that it might be highly unstructured. The broadening activity component of such an intervention is a complex learning activity. It is believed that a broadening activity needs to be undertaken before any other approach to intervention is made. As a result, a constructive dialogue is essential among all participants inclusive of the actors and interviewee to promote an effective learning process. A dialogue must be based on trust as a result of actors feeling empowered and safe, in their respective fields of professional expertise and responsibility.

## Background of the SST Objectives

As many as 90% of IT (information and communication technology) projects fail to meet their goals due to a misalignment of goals and organizational activities (Clegg et al., 1996). This misalignment may be due to goal-setting activities or the processes associated with IT development or implementation activities. In either case, it is difficult to gain an understanding of what caused the failure. It may be just as difficult to understand the successful components of a project. Both failure and success factors are difficult to extract as part of the learning process without effective communication among the actors and interviewees.

One recent example of project failure is provided in the article "Grasping the ERP nettle" (Anon, 2000). The article discussed £500,000 investment in an enterprise resource system (SAP R/3) for the UK-based telecommunication consultancy company called Touchbase. The authors claim that the implemented enterprise resource system was seen as providing extremely good support for core business processes such as accounting. However, the article reports that the sales force found the new system disturbingly unsupportive of their work and the sales force resorted to previous, partly paper-based,

practices following the introduction of the system. As a result, Touchbase chose to solve the surfaced precarious inadequacy by adding a tailor-made smaller system designed to provide better support for the business sales process. The total implementation was presented in the article as, on the whole, a success story. Though one could attribute the lack of success of this project as a direct result of a lack of participation by the individuals with the knowledge and experience necessary to problem-solve.

One major issue regarding the success or failure of a project is that IS development tends to be isolated within the organization as a separate entity from other projects. Bednar and Wang (1994) discuss this whereby several partly parallel system development processes were investigated over a period of two years. One of the system development processes was interconnected with ISO 9000, another one was closely related to organizational strategy and TQM, and a third one was associated with organizational IS. Though they were all IS projects, they were more or less isolated from each other in terms of organizational analysis.

IS development is supposed to consider organizational issues but too often IS is looked upon as a subsystem external or separate from the rest of the organization. Bednar (1999) provides a way to resolve this disparate view of IS development by viewing the organization itself as an information system. By taking this view, IS becomes an inherent part of an organization including its actors, and its supporting processes, and not a separate entity that exists external to these components. All organizational actors are, in this perspective, interactive, social members of the IS.

## A Contextually-Dependent Possibility

What is needed is an organizational perspective that integrates IS (analysis, development and evaluation) into the decision-making process associated with organizational change. This might require a greater awareness of the need for integration between "macro" and "micro" perspectives of organizational change. The macro perspective can be related to open system theory as follows:

*"Open system theory influenced organization researchers to focus on a new set of within organization variables, and especially to move from an atomistic research focus on individuals as units of analysis to dyadic or other relational units of analysis in which communication relationships were a priority focus, and to more systems-level concerns, in which communication network analysis was often utilized" (Rogers & Agarwala-Rogers, 1976, p. 116).*

The "micro" perspective is related to what Rogers & Agarwala-Rogers (1976) describes as "an atomistic" research focus. This means that the main unit in the organizational analysis is the individual, not the work group or the communicational structure. The focus is on how the individual perceives the structure. The atomistic perspective "can only explain behavior as a product of individual-level independent variables" (Rogers & Agarwala-Rogers, 1976, p.117). However the "micro" perspective is not fully equal to the atomistic one. The micro perspective includes an analysis of the inter-individual sense making where the individual entity is also seen as an open subsystem. This kind of individual sense making process can be explained with the theory of autopoiesis in terms of a subsystem's efforts in understanding itself as an entity with relations to a "super-system" or surrounding "world" (Maturana & Varela, 1980).

IS analysis and individual contexts are also about communicational contextual influences for systems and information system development. Thus, an information system can be viewed in terms of its continual construction and reconstruction whereby reflections over perceptions can be seen as an ongoing learning process (Walsham, 1993; Argyris & Schön, 1996).

How could the needed changes in approaches to IS analysis

be done? Through combining the knowledge-base underpinning the two diverse areas of micro and macro perspectives and integrating these approaches in one framework. The "micro" area might be based upon an individual learning perspective and cognition, which is sometimes represented in HCI (human computer interaction) as philosophical, psychological and management research. The "macro" perspective relates to IS strategy, organizational learning, organizational information systems and information systems methodology research.

The proposed SST framework integrates macro and micro aspects of organizational change. This framework aims to assist users in applying techniques such as brainstorming, rich pictures and conceptual models from Soft System Methodology (refer to Checkland, 1981; Checkland & Scholes, 1990; for an in-depth discussion of this methodology) and mental constructs from NIMSAD (Jayaratna, 1994) into useful methods for organizational analysis. The SST framework, shown in Figure 1, has been developed to support viable approaches (e.g., brainstorming), while trying to adapt specific methods used within the scope of contextually dependent problems.

SST offers a means of structuring highly unstructured, uncertain situations typically found in systems analysis work (though not limited to these activities). The framework could

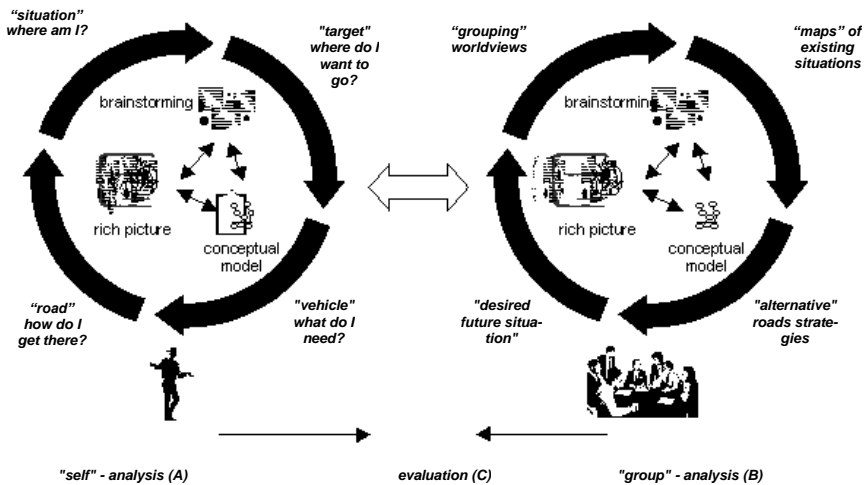


Figure 1: Overview of the SST framework.

### Strategic Systemic Framework

also be adapted to be used in conjunction with a specific approach currently being used in the organization. It is particularly useful when the problematic scope is highly uncertain and provides a basis for decision-making in this environment.

The contextual realities associated with sense making differ for each individual, based on an individual's understanding of the specific situation (e.g. contingency). The (intra-individual) relationships that might be reflected upon while trying to contextually transform the framework to a method, are not only related to experience and competence but also have to do with autonomy, initiative and risk taking. This is shown in Figure 2.

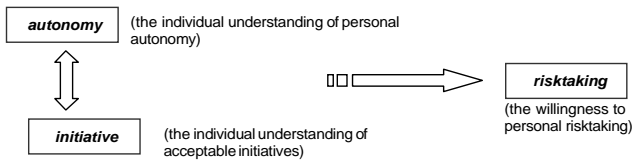
To be able to take any kind of personal initiative, the individual has to feel professionally safe and have autonomy within the group. However, autonomy means differentiating individuals from others in the group. The existing culture has a strong influence on what kind of autonomy is acceptable (Ahrne, 1994). From an individual perspective there might be great insecurity associated with autonomy because of the organizational consequences. Initiatives that are not previously taken might have been dismissed without being presented because of notions of insecurity. Also there might exist experiences with earlier initiatives, which have failed in one way or another, and these negative experiences could have a prohibitive impact on proposing new ones. Initiatives, in this perspective, are clearly individual risk taking activities, which are dependent on the level of individual autonomy within the group.

that innovations and creativity suffer. It is difficult for a risk taking individual to flourish in this environment, as there are few rewards and perhaps great penalties for doing so.

## A Framework for Strategic Systemic Thinking (SST)

The components of the framework, shown in Figure 1, are for illustrative purposes. It is not intended that they have to be performed in a certain order. The organization would select the approaches that are appropriate for individuals and groups in order to create, use, and adapt contextually dependent methods. The framework should not be considered a questionnaire, which is to be answered by individuals in the organization. *All questions are for illustrative purposes only.* The systemic thinking itself should result in appropriate questions that are contextual in nature. A major impact is made by the so-called "timing loop" shown in the figure (e.g. all analysis are dependent on the contextual timing constraints). Contextual timing constraints are those constraints which individuals impose on themselves while deciding how much time they think is meaningful (and possible) to spend on a specific activity. For example, the time allotted to work on activity A may be re-evaluated by an individual when it is determined that more time is needed for activity B.

Brainstorming, rich picture, mental constructs and conceptual models, as represented in Figure 1, can be viewed as vehicles for discussion by individuals and the team as a whole. They can also be considered learning exercises focused on evaluation and feedback in connection with the analysis work. They



**Figure 2: Relationships among understandings of autonomy and initiative as influences on risk taking activities.**

Such individual risk taking activities and autonomy are mirrored in organizational cultures and prohibited or supported accordingly (Ahrne, 1994; Walsham, 1993). If the organizational climate does not support a high level of individual autonomy, the willingness to take the risk is minimized such

can be used as constructive support activities for raising quality issues. Since the work is done both individually (analysis A e.g. intra-individually) and within the group (analysis B e.g. inter-individually), direct feedback is necessary to avoid adding work via miscommunication or redundancy of effort.

Observation, group dynamics, drama transfers and roles can become part of the mechanisms for conducting analysis work thus supporting the visualization and communication of mental models and worldviews.

A transformation of the framework to an organizational method used to assist teams in problem solving can be viewed as a sense making process. The end result of this sense making process is an enhanced basis for decision-making, not a canned solution. The objective is to structure uncertainty and to promote self-reflection and evaluation of individual and group processes. It also encourages innovation via the visualization of mental models, worldviews and other communication and explanatory tools selected when using the framework.

**Analysis A: Individual**

Another objective associated with the SST framework is to create an individual process for structuring a problem in order to enhance decision-making capabilities. This is illustrated in Figure 3. Each participating individual creates a personal "map" of resources and competencies, as well as, identifies possibilities and the feasibility of achieving them. Since this is an "intra-individual" study, the word "I" is used within the framework.

- (i) **"Situation"**: Where am I? What do I know about my own competence in this situation? What is my personal context at this moment? What tools, options, and resources do I have available to assist me in this situation? What are the possible solutions and are they feasible? The individual's experience is included in this analysis in addition to his or her physical skills and knowledge. *Dynamics: What might the current activities be? What might be happening now? Why might I believe that? Might I be happy with these beliefs?*
- (ii) **"Target"**: What do I see as the ultimate aim for my work in this situation? Where is the horizon for accomplishing my goals? *Dynamics: What might I be willing or able to do? What assumptions might I be making?*
- (iii) **"Vehicle"**: Is there any reason to why I am where I am? Am I in a situation where I am expected to contribute to something? If yes, why? What is possible given the current situation? What do I need that I don't have to achieve my objectives (e.g. what do I miss)? The individual's experience is included in this analysis in addition to his or her physical skills and knowledge. *Dynamics: What might I be going to use or /what might I need to achieve this objective? Why might that be correct?*

<p>(i). <b>"Situation"</b></p> <p>"Why am I here?"</p> <p>"What do I know?"</p> <p><i>Issues: (information, experience, resources, knowledge)</i></p>	<p>(ii). <b>"Target"</b></p> <p>"Where do I want to go?"</p> <p>"What does this mean?"</p> <p>"What do I want?"</p> <p><i>Issues: (aim, orientation)</i></p>
<p>(iii). <b>"Vehicle"</b></p> <p>"What can I get?"</p> <p>"What do I need?"</p> <p><i>Issues: (possibilities, resources, competencies)</i></p>	<p>(iv). <b>"Road"</b></p> <p>"How do I get there?"</p> <p>"How shall I approach the situation?"</p> <p><i>Issues: (strategy, approaches)</i></p>

**Figure 3: Analysis A.**

Strategic Systemic Framework

(iv) **"Road"**: How does the road look? How shall I set the strategy to be able to use my competence and the available resources? (Note: This is also a valid discussion about my possibilities to cooperate with other people.) How shall I bring it all together into a meaningful strategy so I can create a road leading forward for myself as an interventee? I try to create and adapt a method to the context, which is demanded by the problem situation. I create a strategy for my use in terms of feasible methods and based on the problem description. *Dynamics: What changes might I need to make? Why would these changes be trustworthy by the group or organization?*

(i) **"Grouping of worldviews"**: What differences between worldviews and mental constructs are there in the organization? What are the alternative and extreme views? What are the commonly held views? What are the main "mental constructs"? Differences among group members are kept in order to promote innovation. A synopsis of the various worldviews is noted thus limiting the number of alternatives without forcing a consensus. *Dynamics: Why eliminate ideas before we actually believe that we are in a position to evaluate them? Why not keep several ideas even if they are viewed incompatible with each other?*

**Analysis B: Group – Individual Span**

A group of individuals (and their expressed worldviews), referred to as common grouping, is intended to be a support mechanism for understanding the problem statement and promoting communication among individuals. The use of groups is not intended to promote the dictatorial belief in a consensus. In a group setting, brainstorming and other tools help to uncover various solutions, some of which may seem extreme. These solutions are all considered viable in order to promote innovation in the group setting. Notice that the focus has shifted from intra-individual to inter-individual whereby the organizational actors work together to achieve a common goal. This is represented in Figure 4.

(ii) **"Maps of existing situations"**: Where are we today within the context of the organization? What do we know about the different individual understandings of the organizational situation? What are the different personal views of the organizational context at this moment? What tools, techniques, and resources are available to us? What are the possibilities? Personal experiences are included, not only physical resources. *Dynamics: Why should the current assumptions of organizational resources, inclusive of individual experience and skill set, not be evaluated?*

(iii) **"Desired future situations"**: What do we think are the future situations in terms of organizational accomplishments? What would be the optimal future

<p>(i). <b>"Grouping of worldviews"</b></p> <p>"What are our extreme views?"</p> <p>"What are the common views?"</p> <p><i>Issues: (participants, stakeholders, "differentiation of mental constructs")</i></p>	<p>(ii). <b>"Map of existing situation"</b></p> <p>"Where are we?"</p> <p>"How do we understand our context?"</p> <p><i>Issues: (experiences, resources, skills)</i></p>
<p>(iii). <b>"Desired future situation"</b></p> <p>"Where do we want to go?"</p> <p>"What does this mean?"</p> <p>"What do we want?"</p> <p><i>Issues: (orientation, aim)</i></p>	<p>(iv). <b>"The alternative roads"</b></p> <p>"How can we get there?"</p> <p>"How shall we approach the situation?"</p> <p><i>Issues: (strategy, approaches)</i></p>

Figure 4: Analysis B.

situations? Where do we want us to be in terms of personal achievements? What do we see as the ultimate aim for our work here? Where are the horizons?  
*Dynamics: Why should the solution set of intended outcomes be seen as correct?*

- (iv) **"The alternative roads"**: What are the alternative goals that could be pursued within the organization? How shall we determine what strategy to pursue to work towards our common goals? These questions are also valid for evaluating alternative solutions. What is politically feasible? What is possible to achieve with the existing resources in the existing culture and context? How shall we bring it all together to a meaningful strategy so that we can create a meaningful roadmap for goal accomplishment in our organization? *Dynamics: Why should the assumptions of existing action strategies not be re-evaluated?*

### Evaluation (C) of Analysis Processes

One major reason why evaluation of the results of both A and B activities is necessary is that when the analysis part of the framework is done, a question of feasibility arises. This evaluation process stems from the pursuit of quality in order to benefit the organization as a whole. In the SST framework, the evaluation is tied to reflections over the outcomes of analysis A and B. During this analysis process, it is important to note that differences in personal competencies, experiences, and contexts have a major impact on the understanding of shared experiences. This type of analysis is commonly found in qualitative research methods, which focuses on understanding multiple perspectives and the in depth understanding of unique individual and contextually dependent processes (Patton, 1987; Miles & Huberman, 1994).

A systematic approach to an evaluation of the outcome of A and B activities can be viewed as a tool for utilizing the information that is made available in order to make effective organizational decisions. Such decision-making capabilities provide an impetus for organizational change in a positive manner. It is recognized, however, that evaluation also can be used as a tool for controlling activities. In such a perspective, the evaluation results become a viable basis for prioritization of chosen and evaluated activities. There is a close relationship between analysis and the evaluation of analysis activities. In practice, the difference between them is diffused.

The evaluation activity is not necessarily a straightforward process as there are personal influences that impact it. In the proposed SST framework, the evaluation activity is as a form of judgmental activity performed by the group. The objective

of the evaluation process in this framework is to collect information about activities in order to achieve a judgmental base for a certain purpose. The purpose part of evaluation has a major influence on all evaluation activities. In this respect, it is important to have an understanding by all participants as to what this purpose is (e.g., what are the commonly defined goals being pursued by the group).

Evaluations can be seen as a normative activity and the only thing that they have in common with other evaluations is contextual dependence. This means that all evaluations are dependent on the contextual issues that surround them and these issues may be constantly changing. Patton (1987) suggests an understanding of the contextual dependency is to be seen as cardinal to evaluations based upon qualitative methods.

Questions and issues that might be of interest as part of the evaluation process associated with the SST framework include:

- (i) **Constructive "what if?"**. What if my understanding is completely wrong? What if there are several "correct" understandings of reality even if they are incompatible with each other?
- (ii) **Positive (and constructive) criticisms**. Descriptions, analysis might have underestimated the real benefits, values, and possibilities. What might have been forgotten? What about group dynamics aspects? Are there organizational issues, contexts, and other factors that might have had an impact?
- (iii) **Negative (and constructive) criticisms**. Descriptions and analysis data might have missed relevant information, which could have identified more problematic issues. What possible issues might have been overlooked? What about risk analysis?
- (iv) **Competence**. What about the limitations of personal knowledge? How are personal views, biases, and perspectives limiting the analysis process? (e.g., I can only see what I recognize.)

*Not perfect*. Even if the analysis process was of high quality, errors may have been introduced. Since this most probably is the case, critical evaluation becomes a necessary activity to search for errors, misperceptions, or other factors that will negatively impact the outcome of the analysis process.

Typically, the objective of the evaluation process is to provide a control structure for ongoing improvements of analysis activities. This means, for example, that there is a plan and a

## Strategic Systemic Framework

structure for certain processes that need to be followed. In this sense, evaluations may be used in several different ways including (but not limited to) a more traditional approach of questioning and correcting development plans.

According to Patton (1987), the challenge in evaluation is not only to uncover relevant information but also to get people to actually *use* it. That is to say that evaluation practices do not automatically result in learning activities and correction of less than perfect planning. An outcome of the evaluation process should be gained knowledge about the impact of individual and group decisions regarding development activities and other decisions that were made. The overall objective of the evaluation process in the SST framework is to re-evaluate and expand a knowledgebase for continuous learning.

In a cultural and sociological perspective, all evaluations can be analyzed as having political purposes. This is not always presented or even accepted to be transparent. In IS research, Walsham (1993) has commented on similar political behavior related to IT implementation. An example of organizational politics is when evaluations are used to make people responsible for some specific actions (e.g. "scapegoating"). At the same time, evaluation can be used to avoid being held responsible for the same actions, depending on how the evaluation is made, interpreted and acted upon. The purpose of evaluation, as proposed in this paper, has to do with aspect blindness. What this means is that the tendency can be described as the problem with finding what you look for, and not much more.

The orientation on usefulness of an evaluation has to do with trials or values of certain activities and their dependencies with regard to both the existing and future context. In any case, evaluations are to be looked upon as strategic activities. These strategic activities may be viewed as organizational change agents.

Evaluation as part of the SST framework can describe the meaningfulness, efficiency and ability to change in a certain activity context. Although evaluation of effects according to previously assumed realities might be the most actually used, there should certainly be a focus on the need to re-evaluate the many diversified versions of the sense making process itself. There is no such thing as a neutral or objective evaluation.

## Steps Forward

There has been much talk about the "Information Society" creating social changes, and putting strain on both the modernistic competitive strategies and traditional business strategies (Rogers, 1986). At the same time, the attempts to implement these ideas in practice have either been relatively invisible or oversimplified. Weick (1995) points this out in his

discussion about sense making in organizations whereby there is a large gap between ideas of interpretation and construction.

The strategies people seem to fall back upon, when dealing with these inconsistencies, are well explained by Weick (1995) in his sense making theoretical framework. These sense making activities can be described as being based upon organizing processes where communication and learning are central issues. The SST framework as presented here, can be seen as an example of a quest for the expansion of existing sense making processes in organizations. However, all sense making processes are intimately intertwined with their context and environment (Weick, 1995).

It is important to reiterate that the SST framework promotes contextually dependent adaptability. SST is meant to support a *creation* of a systems thinking process; that is, a form of contextual systems thinking process in action. This systems thinking part can be described concisely in the words of Senge (1990, p. 68):

*Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static "snapshots."* he also adds (p. 69): *And systems thinking is a sensibility - for the subtle interconnectedness that gives living systems their unique character. Today, systems thinking is needed more than ever because we are becoming overwhelmed by complexity.*

Systems thinking, as described by Senge, is insufficient to support stronger relationships with contextual dependencies. One possibly complementary approach to expand this kind of systems thinking is the ANT (Actor-Network Theory) as suggested by Latour (1987, 1999). Although ANT does claim to create a bridge between micro (intra-individual) and macro (inter-individual) perspectives, it has a tendency to underestimate contextual complexities in both. An example of a major problem in ANT is that the metaphysical part of the individual sense making processes (involved in double loop learning), does not seem to be supported.

Making sense of one's own sense making processes could, therefore, be seen as being in need of elements of rational explanation such as those offered by traditional positivist theories. However interpretation and sense making activities as such would still, by necessity, be under siege from communicative distortions (conscious and unconscious variants of "misunderstanding"). Inter-individual and intra-individual understanding as a possibility, but not as a necessity, which could be built upon strong argumentation has been suggested by Habermas (1984).

This possibility of undistorted communication is seemingly built upon a belief in a communicative rationality, which is not evaluated according to more traditional positivistic rational criteria. A belief in any intelligible communicative act is thus based upon assumptions of a reality or some kind of self-imposed belief of a "common" consensus as a necessity. This belief in a basic consensus differs from Habermas (1984) in that it is individual, temporal and ad hoc which, when there surfaces a belief that a "misunderstanding" exists, might be questioned and re-evaluated.

Such a re-evaluation is the enhanced basis for the communicative refinement and a strengthening of argumentational efforts as proposed by Habermas (1984). In this way, traditional (positivist) understanding of meaning is rejected since within the realms of contextually dependent sense making processes a discovery of meaning is an individual personal creation and re-creation process based on assumptions and values rather than an undeviated relation to some objective reality.

## Conclusion

The SST framework, presented in this paper, is mainly concerned with providing support for active sense making processes from intra and inter-individual perspectives. The SST framework is quite flexible in that it supports the temporary construction of an analysis method, but doesn't require the use of a pre-selected one. The SST, when applied by individuals and groups provides a communication structure within a specific organizational context. The theory that personal understanding of a "reality" varies with context (epistemological contextualism) is related to contextual dependency. This kind of contextualism is the basis for taking clues from contextual sense making activities. As a result, a useful but temporary SST method is created where processes and dynamics, in specific organizational contexts, are not eliminated up front due to a conceptually questionable illustration of elements or attributes.

This work attempts to present the SST framework as a support mechanism for inter- and intra-individual activities. It does not seek a compromise between sociological reductionism and psychological reductionism, but rather pursues the possibility of eliminating these types of reductionism. (Note: Sociological reductionism can be viewed as an assumption that psychology could be reduced to sociology. Psychological reductionism, on the other hand, can be seen as trying to reduce sociology to psychology.) This paper avoids any definition of analysis that gives priority to either of these two reductionisms, nor does it seek to form a synergy between them. With this in mind, the focus of this work is on the possible spin-offs accruing from the combinations of strengths in both discourses. In other words, it is an attempt to use the focus of a

multiple perspective on our human sociability and our individuality as a driving force in the efforts to contextually integrate the otherwise polarised learning perspectives.

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## Paper 2: Individual Emergence in Contextual Analysis. Problems of Individual Emergence

*This paper is a corrected post publication draft with minor changes to content, page numbering and to publication layout. An earlier version of the paper was initially presented at the 12<sup>th</sup> bi-annual conference in Amsterdam, then, after peer review, published in Systemica in 2007 (recommended reference below).*

Bednar P. M. (2007). **Individual Emergence in Contextual Analysis. Problems of Individual Emergence.** Amsterdam, 12th bi-annual 'Problems of...' Systems Conference, published in Systemica, Volume 14 No 1-7. p23 - 38.

*Within the tradition of Hermeneutic Dialectics (HD), this paper offers an approach that can further an analysis of a fit between information and organizational systems. Drawn upon Information Systems Development (ISD) projects a relationship between theory and practice is aided through a multi-disciplinary approach to sense making activity. A contemporary version of contextual analysis is used to understand the way individuals construct, adapt and create meaning from their environment. It offers a way to improve the systems analysis process. This type of enquiry into contextual dependencies of knowledge creation can help direct a development of systems that intend to serve specific organizational actors and their needs. Combining methods outside of a traditional polar divide, sense making research undertaken within a system thinking arena can enrich understanding by complementing qualitative and/or quantitative analysis with reflective depth. Drawing together interdisciplinary strands through a critical systems thinking approach offers new levels of professionalism for management, practitioners and researchers in the 21<sup>st</sup> century.*

**Key Themes:** Individual emergence, Systemic thinking, [*Emergence, Critical systemic thinking, Systemic practice, Communicative practice, Contextual inquiry*]

**Character (Focus):** Epistemology, Axiology, [*Ontology, Praxiology*]

**Theoretical Influences:** Bateson (1972), Argyris (1974; 1990; 2006), Argyris & Schon (1978, 1996), Langefors (1966; 1995), Dervin (1989a; b), Nissen (1998).



# Individual Emergence in Contextual Analysis

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## Abstract

*Located within the tradition of Hermeneutic Dialectics (HD) this paper offers an approach which can further an analysis of a fit between information and organizational systems. Drawn upon Information Systems Development projects a relationship between theory and practice is aided through a multi-disciplinary approach to sense making activity. Using a contemporary version of contextual analysis to understand a way in which individuals construct adapt and create meaning from their environment offers a route to improve a systems analysis process. This type of enquiry into contextual dependencies of knowledge creation can help direct a development of systems that have the intention to serve specific organizational actors and their needs. Combining methods outside of a traditional polar divide, sense making research undertaken within a systems thinking arena can enrich understanding by complementing qualitative and/or quantitative analysis with reflective depth. Drawing together interdisciplinary strands through a critical systems thinking approach offers new levels of professionalism for computer- and management-, practitioners or researchers in the 21st Century.*

*Keywords: Contextual Dependencies, Sense making, Systems Thinking.*

## Introduction

Research in the development of support for information systems analysis generally aims to explore different theoretical and methodological approaches to the analysis of the fit between information systems and organizational systems. Contextual analysis might be considered as an approach with a particular focus on the way in which complexification and uncertainty pose apparently insuperable epistemological problems to foundational approaches to knowledge and implications of this for research in information systems. Having considered a relativity of knowledge, an analyst might have to look critically at a series of exemplary approaches, which might use different ontologies. The area of Informatics has continued to evolve and some of the recent efforts to research development of approaches for information systems analysis have targeted following problematic issues (see for example Bednar, 1999; 2000):

- To engage with different ways in which individual and organizational identities, structures and cultures emerge and develop.
- To develop and evolve conceptual and empirical understandings of selected issues such as informational vs. organizational systems, subjectivity and objectivity, and to place these issues in a multidisciplinary perspective.
- To consider relations between multiple levels of contextual dependencies in perceptions of organizational activities.

The aim of research in Information Systems is to develop analytical and intellectual ability to apply all these aspects to selected substantive issues connected to Information and Communication Technology implementations.

If one of the defining features of (understanding) a contemporary world is (a combination of) contingency and uncertainty it might make perfect sense to support efforts which try to intertwine the research content and context of computer science with a great number of other research areas. There might also be a need to consider radical shifts in the nature of information systems implementations, tradition and 'de-traditionalisation' and their effects on professional knowledge.

Information systems research on contextual dependencies attempts among others, to build on previous core research in information systems and by exploring how, for example, contemporary open systems thinking can be applied to specific critical issues. Particular stress is placed on a multiplicity of sense making processes and ways these are played out within the frameworks of learning organizations and information systems. A focus is then to be centred on several major problematic themes currently debated in diverse Information Systems research communities: 'new' individual and organizational identities and organizational politics, aspects of new information and communication technology and the nature of its implementation.

## **Background**

The main purpose of this section is to introduce the reader to industrial project contexts. The following descriptions of project characteristics are simplified and generalized, drawn upon previous IS research and industrial experiences by the author. Research, which partly is based upon inquiries into a number of Information Systems Development (ISD) project in a European multinational corporation. Some of which was done over a period of approximately two years and the analysis was based upon semi-structured interviews, participatory observation and project documentation (e.g. Bednar & Wang, 1994).

There are a great number of ideas, recommendations and theories regarding project management, some of which are for example discussed by Yeates and Cadle (1996) or more 'post-modern' theories as presented by Boje et al (1996). There are also 'standards' like PRINCE2 (Projects in Controlled Environment) which was developed in 1989 by the CCTA (Central Computer and Telecommunications Agency, UK). But even if these and similar (structured, semi-structured, formal or formalized) descriptions of project management are widely distributed, contain theory, practice (narratives) and advice - which at first might look very promising - their applicability might be questioned. The experiences from ISD projects (e.g. Bednar & Wang, 1994) even though they were related to ISO9000, TQM and other quality assurance programs, suggests that these kind of projects are not necessarily themselves formalized and managed according to any specific project management 'strategy' (i.e. 'label').

Of course, such a conclusion does not mean that projects have been 'mismanaged'. On the contrary, projects could be seen as both flexible and adaptable in a 'struggle' to respond to ongoing changes in organizational contexts. The 'lack' of specific (formalized) project management was justified by the managers and participants with reflections over organizational culture and previous experiences (Bednar & Wang, 1994). Thus a project could be characterized by continually recurring negotiations and

re-evaluations of contingency 'plans'. Another way to describe such phenomena is as processes of practiced distributed decision making regarding project participation and activity.

Major ISD projects had officially been initiated following corporate meetings, at different levels within the organizational hierarchy, where decisions about which areas of a specific business might be enhanced by the support of Information and Communication Technology (ICT). According to their own description at least, managers in the organization would thus make efforts to refocus their business and management strategy to expand business capacity in growth areas (for example - quality assurance in both product development and process development were seen as key business growth areas). Identified changes in business might have been seen as putting a much stronger emphasis on promoting and enabling enterprise and business process development (e.g. Bednar & Wang, 1994). Decisions of changes affecting an organization under those circumstances, might have been taken in a wider context of:

- Responding to new business circumstances.
- Repositioning the organization and its learning opportunities.
- Strengthening professionalism with staff development.
- Opening new opportunities for business excellence and specialisms, as opposed to generic and mainstream production.
- Developing new approaches in the efforts to meet clients and partners present and future needs.
- Investing in research and consulting more directly linked to the organizational know-how.
- Concentrating organizational resources and activities to promote organizational regeneration.

With such objectives in view, recommendations about a contribution of different and various areas of current activities within a specific organization would be made. Following a business and risk analysis by a specific management group in charge. In all these areas however, measures ought to be put in place to ensure that current organizational agents would be able to continue to contribute on a basis of their contextually dependent framework of competence and skills (e.g. Bednar & Wang, 1994).

It might be deemed as obvious which part of an organization is intended to be most affected by a business-process revitalization and an intended ICT supported business enhancement. This means that a definition of areas that initially are intended to be involved on a basis of assumptions of existing business and business 'pre-analysis' (assertions of existing business process made by 'managers'), might be necessary to extend after a more in-depth and thorough business analysis (e.g. Bednar & Wang, 1994). Throughout a process of change and development, it can be reasonable to assume, a project group would be seen as committed to provide maximum support for other organizational staff members. This would include counselling where appropriate. Over the duration of a project, at least within the timeframe of a 'system' development, every possible effort by a project group would be expected to influence redeployment of resources and staff retraining as appropriate. Especially professional and support staff from specific areas that are seen as being affected. Once such a process is initiated it would be hoped that the number of compulsory staff retraining might be kept to a

minimum. It might be valuable to note here that projects in the study were actually not officially 'ended' - a more appropriate description would be that projects 'faded' away... The involved managers in general described projects as successful, especially as they also were described as great organizational learning experiences (Bednar & Wang, 1994).

An organization (as described by its 'members' and / or 'actors') might be committed to ensure a continued quality of business activities for all major organizational agents. A reason would be to safeguard standards and value of business relationships. All relevant customers would have to be considered as soon as possible, to reassure that business processes would not be interrupted and that any queries and concerns that organizational customers may have would be properly dealt with. Such issues have also been targeted with 'strategic contingency' by researchers in organization theory like Child (1984).

Business and management development might also include a goal to remain totally committed to business and staff development. If this is seen as being a continuing core part of everyday business activities and relevant provision, a further step might be to pursue the idea of learning organization (see for example Argyris & Schon, 1978; 1996). Forthcoming organizational developments as a result of a refocusing of existing efforts on emerging enterprises agendas would offer opportunities for both management and other organizational agents (e.g. Argyris, 1990; Schon 1999). To reiterate it very briefly, expected developments would be in areas including:

- Promoting organizational competitiveness.
- Promoting customer and staff experience.
- Enabling business process development and expansion.

Further positive developments would be expected as resulting from wide ranging spin-of effects provided by a business change which had been initiated by organizational and project management boards. Of course just because there might be opportunities there is no reason to believe that these would realize themselves or become anything else except a possibly 'marketing' exercises. Such phenomena of organizational 'self-handicapping' activities have been thoroughly presented by Argyris in his work on 'organizational defences' (Argyris, 1990).

## **Individual Focus**

The major purpose of this section is to introduce the reader to academic contexts and reflections. There is a strong tradition in IS research to look into different versions of contextual dependencies. As for example Andersen et al (1990), points out it is important to consider that there is no obvious or necessary consensus over requirements or objectives for an information system and therefore they go on to suggest user oriented (participatory) managerial approaches. Not only individual focus in a managerial perspective (where a business manager is a 'user', e.g. Carlsson, 1993) but even national, cultural and political contexts has slightly been touched upon (e.g. Baark, 1986).

A breakthrough for the individual focus had already been initiated in the sixties when Langefors started to develop the 'infological equation' (e.g. Langefors, 1966). This work as it is presented in the 'Theoretical Analysis of Information Systems' did identify some of the significance of those interpretations made by unique individuals within specific

organizational contexts (e.g. Langefors, 1995). Even if it could be argued that the significance of it might not have been realized at the time.

While some IS research in the early eighties (e.g. Olerup, 1982) focused on organizational contingencies and contexts, other research (e.g. Sandstrom, 1985; Flensburgs, 1986) related to ideas of interpretations in local contexts (individuals and groups). However in research on continuous development ideas surrounding Contextual Analysis and its relations to individuals, groups and teams would become even more pronounced (see for example Agner-Sigbo & Ingman, 1992; Agner-Sigbo et al, 1993). Other examples with individual and group focus are visible in research on prototyping (e.g. Friis, 1991), individual and team learning in participative design of information systems (Hagerfors, 1994). Efforts have also been made to target intra-individual contexts like sense-making and ethical aspects in information systems design (Ingman, 1997; Eriksen, 1998; Zhang).

The aim with a contemporary version of Contextual Analysis (e.g. Bednar, 2000) is, through application and use of specifically adapted methods, to study how people construct understanding and meaning, and how information needs and information use are created within this process by individuals. A reason why a notion of contextual dependency is of interest is because it supports a focus of inquiry on unique individuals, individual beliefs, thoughts and actions in specific situations and contexts. This kind of inquiry is intended to support a contextually dependent creation of necessary knowledge, for successful communication, IS analysis and eventually IS development to occur.

Contextual Analysis (in the sense in which the term is used here) as such does not by default disqualify all traditional approaches of IS development. There is however sometimes a conflict related to unproblematic assumptions of ontological beliefs and logical empiricism for example unquestioned beliefs of unproblematic objectivity and truths. Other issues have to do with assumptions, comparable to some of the traditional communicational theories, that focus on a 'sender-receiver' perspective while Contextual Analysis instead is intended to focus on a user oriented perspective. An oversimplified example is when an inquiry instead of focusing on what company A wants to achieve with their information and communication system, would asks what the users want to achieve and what roles and specific purposes their activities in organizational contexts might have.

- What makes their unique situation recognizable?
- What specific role do they give information and the organizational business?

The inquiry is therefore to be seen as an inquiry into user assumptions and needs within the space of an open information system (an 'organization'). This could also be described as a bottom up perspective on information and communication systems. Systems, which are shaped with the intention to serve specific organizational actors and their needs.

Approaches like Contextual Analysis which try to take contextual dependencies into consideration on systems projects might be seen as strategies to cope with escalation in complexity when it becomes recognized that 'projects':



- a) Are not easily concerned with production of products.
- b) There is no known way to clarify or predefine a specific set of activities to produce these 'products'.
- c) Since if it is not seen as viable, or meaningful to predetermine a finite lifespan of a particular project neither will there be an exact specification of possible resources consumed.
- d) Are not under a formalized control of an organizational hierarchical structure.

## **Framing a Problem Space**

It could be argued that IS analysis and IS development is dependent on how a problem space is framed, and by whom. Soft Systems Methodology (SSM) is Checkland's main contribution to IS and organizational analysis and problem solving (see for example Checkland, 1991). SSM has a quite distinguished character in that it criticizes a phenomena in IS analysis which results in problem spaces being taken for granted (or for example assumed to be predefined and 'understood' by 'clients' and 'users' and 'only' in need to be interpreted by analysts). Researchers have also recognized that even if technical problems can be of great significance, behavioral issues can be of even greater importance (Avison & Fitzgerald, 1995; Checkland & Holwell, 1998; Kling, 1999). It is not necessary to (only) discuss a dichotomy which suggests a relationship between IS analyst and user (individuals or groups). Some researchers have presented approaches which open up possibilities for studies of more complex frameworks of relationships (see for example Jayaratna, 1994; Bednar, 1999; 2000). Relationships can thus with the help of analysis regarding (narratives of) 'mental constructs' be discussed within a more context dependent framework of a rationality. One example is that problem spaces can be discussed within a relation between a) 'clients', b) 'users' and c) IS 'analysts' etc. This type of difference is quite relevant since a framing activity itself contributes to an understanding of a problem space in specific contexts.

If, for explanatory purposes, a look is thrown at a simplified version of framing a problem space from 'everyday life', with one mother, one daughter and a need of a bicycle. The daughter in this case does not have a bicycle. If the need of having a bicycle is a problem who 'owns' that problem? Suppose that the daughter wants to have a bicycle - is this problem owned by the mother, the daughter or maybe a salesman ('IS analyst'). In this particular case it is suggested that the mother is the 'client' of our example (metaphorical) relationship and the daughter is the 'user'. Since in this initial phase of our example a salesman has not even been contacted (yet) so the need of bicycle is, in this example, not owned by that salesman. If the mother thinks that her daughter needs a bicycle the problem of the daughter needing a bicycle is owned by the mother. It is also quite possible that the daughter does not want a bicycle at all. If on the other hand the mother does not think that the daughter has to have access to a bicycle but the daughter wants one anyway. The problem of needing the bicycle would be owned by the daughter. Of course if the daughter wants a bicycle the mother might still assume ownership of the problem (act as if the problem was owned by her) since the daughter might become unruly. However the point with the story is that the problem is not the same anymore. Now we have two problems, a) the need of bicycle and b) the possible unruly daughter. In our example problem a) is owned by the daughter but problem b) is owned by the mother.

An imaginary triangle can be used to visualize a relation as exemplified above between a) the IS analysts, b) the client and c) the user. Such a triangle can be useful when

efforts are made to frame a problem space from different perspectives. Framing activities can as such be assisted through discussions surrounding mental constructs (as they are described by Jayaratna, 1994). A problem changes character when its ownership is juggled between different parties (a, b, c). In other words, what is recognized as relevant problem / problem space changes dependent on who is seen as the client, analyst and user as purpose and boundaries of any phenomena seen as system changes. All of these parties can be represented as being members of different 'communities' or systems. Focus is, with the use of an imaginary triangle, put on different classes of mental constructs. Each of which significantly influences not only an understanding of a problem space, but also an understanding of a problem character and changing boundaries. An 'analyst', 'client' and 'user' can be different individuals or groups of individuals, but they do not have to be different individuals since they could for example all three be the same person.

However, use of different classes of mental constructs might still be supportive in a search for properties of individual emergence (at a composite level).

In an Information Systems project environment, it is reasonable to target both individuals and specific groups of agents. The three exemplified above can more formally be described as follows:

- a client, e.g. 'manager' or 'executive' - someone who has the mandate to take budget decisions (mandate to 'run' a project). This is to be seen as control and responsibility over a distribution of financial resources.
- a user, 'business-specialist' or 'expert user' e.g. someone who has the advanced contextual knowledge related to activities which are supposed to influence and be supported by a successful use of Information and Communication Technology.
- an IS-analyst, e.g. 'consultant' (often a representative of a supplier). Someone who is a specialist related to organizational analysis, design and implementation of ICT.

Sometimes this set-up could be seen as unsatisfactory. One reason could be related to a 'missing role phenomena'. If the three 'roles' presented would be related to a 'law' system the roles presented could be transformed to the following:

- a) a 'client' for upholding a law system is a 'judge'
- b) a 'user' could be related as to the one targeted with the efforts of the system, an 'accused'
- c) an 'analyst' is in this case equalled with a 'persecutor' ('problem specification')

In this example, one problem is that two not represented missing groups can be described. One as a specialist supporting and working on behalf of the interest of a 'user'. Second as a specialist supporting and working on behalf of the interest of a 'client'. A closer look at this problem reveals that even if a 'client' is possibly well aware of their business contexts, it does not by default mean that that 'client' would have a clear view of possible impacts of technological implementations on their business activities or their business model. This situation does give an impression that the only one with a (supposed) expertise and competence in (IS) analysis and design is the 'specialist' representing a supplier and that supplier's interest. This description is not intended to imply that an analysts would understand a specific business better than a

'client'. In the law system metaphor it would be equalled with the fact that the only one who would have expertise and competence of the law system would be a persecutor (note that there is a difference between expertise of a law system and understanding a specific crime). It could be argued that such a miss-representation of expertise would affect mental constructs of participants in ways that might be inappropriate or questionable. At least from both a 'client' and 'user' perspective. So the question - who are IS designed for? is very valid indeed. Are information systems by default unknowingly, designed to mainly support supplier's financial interests?

## **Contextual Analysis**

Analysis can be viewed as an exploration into the nature of open systems thinking and how systemic identities are maintained and generated within a specific context. Analysis can also be explained as involving a professional analyst's activities and specific use of methodologies, rhetoric's and strategies to construct local arguments and findings. By the end of an initial analysis, an analyst might be familiar with some of the major strategies currently available for further inquiries into contextual dependencies within a targeted organization.

Individual emergence in contextual analysis is furthermore possible to equal with inquiries into systems organized around processes individuals are likely to go through in devising, carrying out efforts to maintain a professional personality. Such an analysis might include representing a recreation of identities within an organizational context. Individuals viewed, as open systems are not framed atomic entities, even if they pragmatically might be temporarily presented as a collection of closed systems. Rather, contextual analysis is to be seen as an 'as if' ad hoc creation of closed systems where boundaries are related to chosen contextual dependencies, which might be temporal. Such contextual dependencies are here represented as assumptions of networks of interactions relating an individual with her or his biological, socio-cultural and technological environment.

Information Systems has become one of the most debated concepts in Computer Science in relation to information and communication technology, managerial efficiency, sociology and social anthropology. One reason for an ongoing refocusing of a debate around information systems might be found in a sense of loss in a contemporary life-world (see for example Berger, Berger & Kellner 1981). A loss of assumptions of old certainties of modernity. We (IS and IT professionals in the western world) can see ourselves as living in a global village. Gone are ideas of seemingly fixed and clearly defined identities, academic fields and scientific truths (for a similar discussion see Lyotard, 1984). Accompanying us in this notion of socio-cultural breakdown is a sense of fragmentation (an example of a more in-depth discussion on fragmentation can be found in Gibbons et al, 1994). It seems as if we no longer are single, unified groups of professionals (assuming we ever were) but instead we seem to excel in living out multiple identities and subjectivities. We may even experience ourselves to be alienated from our immediate organizational surroundings but at the same time still linked with communities of practice living all around the global village. Our world can thus be described as a multicultural one where world-citizens and isolationists intermingle, where science and culture is constantly reinvented, hybridised and mixed, where 'new' scientific movements assert the salience of changing professional and academic identities.

Aims to provide an overview of a logic of information systems analysis within computer science in terms of interpretative and positivist modes of enquiry might have been drawing upon notions of hypothesis-testing, experimentation, sampling, measurement and sense-making. Research in IS methodologies does include discussions of these issues by for example outlining sets of key methods for a conduct of technological and organizational research, including surveys, questionnaires, prototypes, observations or unobtrusive measures and ethnographies. On this basis it is also possible to go on to outline a series of controversies in Information Systems research, drawing upon key debates in philosophy, psychology and sociology.

An analyst's efforts to explore an undefined problem space includes deciding a broad topic of interest; locating and reviewing relevant background material; focusing on more specific topics of analysis; producing an analysis strategy; negotiating access to a research setting or subjects; producing, analysing and interpreting data; writing up system documentation or research reports. There might even be a definite emphasis on ethnographic fieldwork. A theoretical and methodological content of information systems analysis includes an analyst relation to research as a practical activity: this might for example include use of diverse forms of documentation, awareness of different research paradigms (e.g. positivist, interpretive, quantitative and /or qualitative). Such an approach would consider issues raised in a design of an analysis: access, sampling, ethical issues, selecting appropriate methods, reliability and validity of data, coping with changes in direction of analysis. Focus on multiple contexts, work and practices might thus comprise both individual inputs and team work around particular tasks.

### **Ideal individual emergence**

The classical saying 'Too many cooks spoil the broth', describes a situation where the emphasis is put on phenomena where an observer comes to the conclusion that the emergent properties of one individual might be valued more than the emergent properties of a group of individuals. It is however not intended to imply that a cook works best in isolation. A cook might for example in many situations work in cooperation with a collective of kitchen staff. What it does imply is that the role of the cook is 'leadership'. In a way this relates to other sayings, which suggest that a ship only ought to have one captain. This of course has many dimensions. While it might be seen as if the role of the cook both includes a capability to coordinate work with staff ('non-cooks') but excludes the efficient ability to coordinate work with other cooks. This at the same time while the cook might be seen (by others as well as by him or herself) as a good cook because he or she belongs to a community of practice (of cooks).

The combination of roles (or alter egos) can be described as complementary phenomena. In this example the complementary phenomena would if used in a context of a restaurant, mean that the organization of the kitchen-team, inclusive the cook, is efficient due to a diversification of roles. The diversification is complementary and involves specialization. The specialization on the other hand is efficient because each specialist is a member of a community of practice. Each community of practice can be viewed as being organized around the phenomena of specialism, which allows a higher level of professional competence within a relevant area. In this very example it is also possible that the cook is a great fisherman. Thus this fisherman might belong to a community of fishermen and this might in turn influence the professionalism as a cook and specialization in cooking habits. This situation might result in that other fishermen

get inspiration to become better at cooking in general and start to experiment with new ideas and reinvent fish-dishes. Our cooks' participation in these adventures might eventually lead to that the cook becomes a master at seafood. In our restaurant example this complementary phenomena could also be expressed such, that the restaurant in turn becomes famous for its new and contemporary fish-dishes.

Each individual can thus have many alter egos, where each alter ego belongs to a different 'organization' or community. In other words the emergent properties of the individuals (the cook) in this (collection of) community (-ies) (i.e. the restaurant. the fishermen group, the community of cooks profession) permits the parts to become more than any (one) whole constituted of these parts. This effect is idealistically described to show an example of when individuals while being part of many communities at the same time can develop qualities which are complementary and positive for several of the involved communities. Of course the opposite (i.e. conflictual and detrimental development) is quite possible too. As stories goes the one above might have been very nice, but from an analyst perspective the interesting point is: if such complexities surrounds organizational problem spaces - what sense making approaches might be meaningful for an analyst working on behalf of a 'client' and 'user' interests?

## **Sense Making**

A concept of sense making as it has been defined by Dervin (1989a) is seen as both an internal (cognition) as an external (action) behaviour which allow an individual to construct and shape his or hers own movement through time and space. In other words it is a contextually dependent communicative behaviour where a search and use of information is a core factor. Dervin (1989b) also developed a theory of Sense-Making which is described as supposedly free from being tied down to a specific research paradigm. The theory of Sense-Making is also described as being outside the cages of traditional polarities such as positivism - hermeneutics, quantitative - qualitative methods (e.g. Dervin, 1983). Research based on Sense-Making uses concepts and methods, which are basically quantitative and analytical, but at the same time these methods are complemented, filled and coloured by enriching material from diverse in-depth qualitative studies.

The Sense Making theory has been built up in close relationship to other research within the area of cognition. Where, within the field of cognition, for example particularly Piaget did suggest meaning and knowledge as being individually created through interactions with the environment of an individual and unique contextual dependencies influencing these sense-making efforts (e.g. Flavell, 1968). This means that knowledge is neither to be viewed as given, nor derived from experiences. Sense making can also be seen in a relation to work by philosophers and researchers such as Habermas (1984), Kuhn (1970) and others who also point out some of the limitations within more 'traditional' academic approaches. Though, experienced limitations of 'traditional' research approaches are not new as for example already Mills (1959) did propose 'abstract empiricism' as a term to attack the (as he presented it) a-theoretical nature of quantitative social survey research. Of course it might be unfair to suggest that quantitative approaches, as those criticized by Mills, are being practiced without any theoretical assumptions. However, it would be appropriate to refer to an unfortunate habit of denial of theoretical inclusion of interpretative justification of the pre-assumptions that such an approach is build upon. Qualitative research in Computer Science was inspired by phenomenology and interpretative research in the social

sciences (Avison & Fitzgerald, 1988; Checkland & Holwell, 1998). Blumer (1968) was derisive of how attempts (in social science) to draw correlations between variables required that at least little attention paid as to how such variables were defined by those under study. It is however important to recognize that both quantitative and qualitative methods can be founded from within the 'same' meta-scientific school of 'thought'. As such, there is no 'natural' or automatic 'escape' from hinted problems with choice of methods only.

In the Computer Science field, researchers such as Nissen (1998; Nissen & Jayaratna, 1998) with a research focus on information systems research, have expressed that their experience of research concepts and methods of communication, developed out from a perspective of Logical Empiricism (LE), would suggest such concepts and approaches to methods as being not by default always satisfactory. Instead their work is often relying on individual instances and re-interpretations of open systems thinking, versions of critical theory and Hermeneutic-Dialectic (HD). It is not to be seen only as an academic exercise surrounding an existence of several research traditions. But also how these traditions might delimit questions, which can be asked within a tradition and that in turn narrows down possible answers that can be given (Nissen, 1998). Nissen points out that the dividing line between the two sets of schools of meta-science LE and HD does not go between the methods of inquiry, such as quantitative vs. qualitative developed within each of them. Instead the dividing line goes between those studies in which, as part of the used research framework, no objects of study are human beings and those in which also human beings are studied (Nissen, 1998). So far, we researchers/analysts are interested in raising a question within our framework of inquiry – for whom do we undertake research? If we do not want to separate theory and practice strictly, should we then choose to work within the HD school of meta-science (Nissen, 1998).

Ulrich (1997a, 1997b, 2000), while pursuing research in Critical Systems Thinking, also tries to apply contextual and constructive perspectives in his efforts to understand why individuals on occasions give the impression to behave irrationally and unprofessionally. Critical Systems Thinking as presented by Ulrich draws in many perspectives upon the work on Systems Science by Churchman (1979). Bateson (1972) can also be seen as having a strong relationship to System Science with the very recognizable feature of intertwining human beings into his research frameworks. Efforts in research on information systems analysis, development and communicative behaviour of IS analysts are further examples which points out that individuals re-create ideas to re-construct bridges over perceived 'gaps' in a continuously changing understanding of reality (e.g. Bednar, 1999; 2000). Arguably therefore such a discussion surrounding research on contextual analysis stresses the importance of a concept of contextual dependency, by which is meant a relationship with changing situation boundedness inclusive a re-evaluative perspective (Bednar, 2000).

The kernel of a revived version of contextual analysis with a pronounced focus on contextual dependencies is related to HD and boils down to the following. Much IS analysis and IS research exhibit a counterproductive bias towards a Cartesian mind-body split and an ensuing disembodiment of living people. In Western culture and academia this is shared with large parts of other disciplines - and as a whole this can be seen as in a way influencing popular beliefs - as commonly found in descriptions not only on mathematics and engineering but also in field like economics, psychology and

sociology. Why counterproductive? Because it builds on a belief in perfect separability of theory and practice. This belief researchers of LE traditions might use as a good reason not to bring in disturbing factors like power into their theories. However, attempts at practical applications of their theories (or those of others at that) occur in practical situations where power relations and lots of other complex complications abound. Theories that are founded on presupposition counter to experience can only offer partial explanation at best. Organizational change related to information systems development has influence on and is influenced by organizational contexts has among others been suggested by Walsham (1993). He also comments on the major importance to consider organizational culture and political behaviour (Walsham, 1993; Walsham & Sahay, 1999). Therefore a need to further develop and pursue a HD influenced version of contextual analysis might become more and more obvious to IS analysts and researchers.

## Conclusion

Contemporary research in IS related to Contextual Analysis is a truly interdisciplinary area which includes a wide range of thematic options which go far beyond Software Engineering combined with Sociology and Social Anthropology. The area embraces not only issues like interpretative approaches and (soft) systems thinking but also issues such as strategies for inquiries into contextual dependencies, individual and organizational identity and an evolved open systems thinking which includes several levels of learning and reflection. Influenced by the HD school of meta-science a developed version of Contextual Analysis could be used to complement (not to exclude) the widespread LE influenced approaches to analysis. Summarized these efforts aim to help the analyst (or researcher) to:

- a) avoid a (by default) delimiting separation of theory and practice (e.g. Nissen, 1998)
- b) remember that no analysis or evaluation is 'neutral', 'objective' or made without judgmental decision-making activities (Bednar, 2000)

For anyone interested in understanding the recently surfaced 21st century society, contextual analysis might provide new insights. The whole complex issue worthwhile further investigation could be presented as a relation between ontogenesis as distinguished from phylogenesis. Where ontogenesis represents a development (and 'origin') of an individual living professional being. Phylogenesis, on the other hand, represents a development (or 'evolution') of a specific 'organization' or 'community'. The question of origin (genesis), is all about creation, re-creation, generation and regeneration of systemic entities, at both micro- and macro-levels, in a social, cultural and technical world. For those wanting ultimately to pursue a new level of professionalism within Computer and Management Sciences as practitioners or researchers Contextual Analysis could provide an invaluable grounding.

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## **Paper 3: Contextual Analysis – a Multiperspective Inquiry into Emergence of Complex Socio-cultural Systems**

*This paper is a corrected post publication draft with minor changes to content, page numbering and to publication layout. An earlier version of the paper was initially presented, after peer review, in 2007 at the 4<sup>th</sup> AIRS conference in Castel Ivano, Italy and then published as a book chapter in 2009 (recommended reference below).*

Bednar, P. (2009). **Contextual Analysis – a Multiperspective Inquiry into Emergence of Complex Socio-cultural Systems**, in Processes of Emergence of Systems and Systemic Properties: Towards a General Theory of Emergence, G. Minati, M. Abram and E. Pessa (editors), London: World Scientific. p299 – 312.

*This paper explores the concept of organizations as complex human activity systems, through the perspectives of alternative systemic models. The impact of alternative models on perception of individual and organizational emergence is highlighted. Using information systems development as an example of management activity, individual and collective sense-making and learning processes are discussed. Their roles in relation to information systems concepts are examined. The main focus of the paper is on individual emergence in the context of organizational systems. A case is made for the importance of attending to individual uniqueness and contextual dependency when carrying out organizational analyses, e.g. information systems analysis. One particular method for contextual inquiry, the framework for Strategic Systemic Thinking, is then introduced. The framework supports stakeholders to own and control their own analyses. This approach provides a vehicle through which multiple levels of contextual dependencies can be explored and allows for individual emergence to develop.*

**Key Themes:** Emergence, Critical systemic thinking, Contextual inquiry, [*Individual emergence, Systemic thinking, Systemic practice, Communicative practice*],

**Character (Focus):** Ontology, Epistemology, Axiology, Praxiology

**Theoretical Influences:** Bateson (1972), Argyris (1974; 1990; 2006), Argyris & Schon (1978, 1996), Langefors (1966; 1995), Ciborra (2004), Churchman (1968), De Zeeuw (2007), Klein (2007), Radnitzky (1970), Ulrich (1983; 2001).



# Contextual Analysis – a Multiperspective Inquiry into Emergence of Complex Socio-cultural Systems

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## **Abstract**

*This paper explores the concept of organizations as complex human activity systems, through the perspectives of alternative systemic models. The impact of alternative models on perception of individual and organizational emergence is highlighted. Using information systems development as an example of management activity, individual and collective sense-making and learning processes are discussed. Their roles in relation to information systems concepts are examined. The main focus of the paper is on individual emergence in the context of organizational systems. A case is made for the importance of attending to individual uniqueness and contextual dependency when carrying out organizational analyses, e.g. information systems analysis. One particular method for contextual inquiry, the framework for Strategic Systemic Thinking, is then introduced. The framework supports stakeholders to own and control their own analyses. This approach provides a vehicle through which multiple levels of contextual dependencies can be explored and allows for individual emergence to develop.*

**Keywords:** Strategic Systemic Thinking, Contextual Analysis, Individual Emergence, Contextual Dependency.

## **Introduction**

The call for papers for the AIRS Congress 2007 (Minati, 2006) suggests that a study of processes of emergence implies a need to model and distinguish the establishment of structures, systems and systemic properties. It goes on to point out that, in a constructivist view, an observer identifies such properties by application of models. Different perceptions of structures and systems correspond to different, irreducible models. Perceived emergence of systemic properties, e.g. functionality in computer systems or collective learning abilities in social systems, then ensues from application of such models. The author of this paper wishes to compare and contrast two alternative models that may be applied in forming constructivist views of organizational systems. The paper shows how one particular model highlights the importance of individual, as well as organizational emergence. Its contribution is to argue for a move away from reductionist cybernetic models towards critical systemic thinking – from attempts to reduce uncertainties inherent in management of organizations towards approaches which embrace ‘complexification.’ Using information systems development as an example, the implications for individual and collective learning in organizations are explored and a case for contextual methods of inquiry to support organizational learning is made. A particular framework for contextual inquiry is then described in outline.

An organisation may be viewed as a complex social system, affected by goals and values of the individuals within it (Schein 1992). We are reminded by Senge (1990) that *“Today, systems thinking is needed more than ever because we are becoming overwhelmed by complexity. Perhaps for the first time in history, humankind has the capacity to create far more information than anyone can absorb, to foster far greater interdependency than anyone can manage, and to accelerate change far faster than anyone’s ability to keep pace....organizations break down, despite individual brilliance and innovative products, because they are unable to pull their diverse functions and talents into a productive whole.”* (Senge, 1990, p69)

The nature of these social systems, their sub-systemic structures and the relations which sustain them over time vary widely from one organization to another. An organization can also be viewed as a purposeful human activity system (Checkland 1999). However, objective agreement on the nature of such systems is elusive, since the defining properties of ‘the system’ will depend upon the viewpoint of the individual who considers it. For example, when a person enters a bank as a customer, he is likely to view this organization as a system for providing him with financial services. However, to a person who enters that bank as an employee, it may appear to be a system for providing her with a livelihood. (Checkland refers to these differing perspectives as ‘*Weltanschauungen*’ or ‘*worldviews*’). Schein (1992) suggested that organizational culture is formed over time through shared goals. Such sharing could only be achieved through a negotiation of differing perspectives held by individuals – what Checkland refers to as *Weltanschauungen*. For this reason, agreement on a single description of a ‘real’ human activity system will remain elusive and consensus on its goals difficult to achieve.

Within any ‘*organization*’, an interacting collection of living individuals can be found, each with a unique life history and worldview. Every individual produce her/his own unique understanding of context, constructed through interaction with organizational

systems and environment by means of a variety of sense-making strategies (Weick, 1995; Bateson, 1972; Berger and Luckman, 1966). Those taking on responsibility for management as an activity need to be aware of the challenges posed by these differing perspectives. One possible definition of 'management' is '*a set of practices and discourses embedded within broader asymmetrical power relations, which systematically privilege the interests and viewpoints of some groups, whilst silencing and marginalizing others.*' (Levy et al (1998), from Alvesson and Willmott (1996)).

Längefors (1995) discusses the role of organizational information systems. He considered that, in order to manage an organization, it would be necessary to know something about the current state and behaviour of its different parts and also the environment within which it was interacting. These parts would need to be co-ordinated and inter-related, i.e. to form a system. Thus, means to obtain information from the different parts of a business would be essential and these means (information units) would also need to be inter-related. Since the effectiveness of the organization would depend upon the effectiveness of the information units, an organization could be seen as crucially 'tied-together' by information. For Längefors, therefore, the organization and its information system could be viewed as one and the same.

The next section of the paper sets out some of the theoretical background within which contemporary systemic models have been framed. This is followed by a discussion of learning and knowing in an organizational context. Contrasting models of organizational systems are then set out, showing how different perspectives on emergence result from their application. A role for contextual inquiry in enabling individual, as well as organizational emergence to be explored is then set out. One possible method of contextual inquiry is explained. The final section of the paper attempts to summarise the arguments.

## **Background**

Many attempts have been made in the past to understand and manipulate social phenomena by application of laws derived from the natural world. Ackoff (1999) quotes examples set out by sociologist Sorokin (1928) where researchers had attempted to establish laws of '*social physics*'. He also notes that philosopher Herbert Spencer referred to a general characteristics of 'life' (accepted in relation to biological phenomena) as no less applicable to society, i.e. characteristics of *growth*, increasing differentiation of *structure* and increasing definition of *function*. A great deal of research is available on systems perspectives in social science (see for example West Churchman, 1968; Simon, 1979). However, as Emery (1969) points out, these contributions have been fragmented and diverse, often using similar terms to denote quite different concepts. Attempts have been made to liken the operation of social '*systems*' to mechanistic models derived from engineering (see, for example, applications of the Shannon-Weaver model from telecommunications to human interaction and communication) or to organic models from biology (e.g. applications of Maturana and Varela's theory of autopoiesis). Ulrich (1983) provides a discussion of the way that root metaphors in systems thinking influence the way in which a person conceives of '*a system*'. Without these metaphors, the concept of a system might have remained '*empty*'.

The scope for systemic research to inform management thinking has therefore been diverse and confused. Perhaps one of the most influential works has been the General

Systems Theory of Von Bertalanffy (1968). He did not favour direct application of mechanistic models to human problems, suggesting instead: ‘... *systems science, centered in computer technology, cybernetics, automation and systems engineering, appears to make the systems idea into another – and indeed the ultimate – technique to shape man and society ever more into the “mega machine ...”*’ (1968, p viii). In his chapter on ‘The Meaning of General Systems Theory’ he points out that models which are essentially quantitative in nature have limited application to phenomena where qualitative interpretations ‘may lead to interesting consequences’ (p.47). Nevertheless, cybernetic models derived from GST have had great appeal in management literature. In particular, a concept of sub-optimality has been the focus of attention. Boulding (1953), for instance, attempts to establish laws of organization. His law of instability suggests that organizations fail to reach a stable equilibrium in relation to their goals due to cyclic fluctuations resulting from the interaction of sub-systems. Ways to remove sub-optimality, a result of conflict between systemic and sub-systemic goals, have therefore been identified as a key function of management as it attempts Fayol’s classic tasks of planning, directing and controlling (Fayol, 1949). The reflection is that learning must surely be a prerequisite to purposeful activities of the kind Fayol describes. Bateson (2003) reminds us that a critical element of learning is reflexivity – awareness of one’s own responses to context. Such reflexivity should inform any systemic view of human activities.

From an interpretive perspective, an individual’s sense-making is co-dependent with the organizational culture within which it takes place, and requires continual construction/re-construction through reflection over time (Schein 1992). A perception of organizational life focused on goal-seeking is therefore problematic. Vickers (1970) argues that life consists in experiencing relations rather than seeking ‘*ends*’. He challenges a cybernetic paradigm which a goal-seeking model implies, suggesting instead a cyclical process in which experience generates individual norms and values. These in turn create a readiness in people to notice aspects of their situation, measure them against norms and discriminate between them. Our ‘*appreciative settings*’ condition our perceptions of new experiences, but are also modified by them. Development of an individual’s appreciative system is thus ongoing over time as a backdrop to social life. If individual sense-making is co-dependent with organizational culture there must be some interaction between them, built on communication.

Information can be defined as data which is rendered meaningful in a particular context. The meaning attributed to an item may well vary when understood from the point of view of different individuals. Each individual produces her/his own understanding of contexts within which information is formed, constructed through interaction with organizational systems and their environment by means of a variety of sense-making strategies (Weick 1995). During the 1960’s, Borje Langefors developed the ‘Infological Equation’ (see Langefors, 1966). This work identifies the significance of interpretations made by unique individuals within specific organizational contexts (e.g. Langefors, 1995). The Infological Equation “ $I=i(D,S,t)$ ” shows how meaningful information (I) may be constructed from the data (D) in the light of participants’ pre-knowledge (S) by an interpretive process (i) during the time interval (t). The necessary pre-knowledge (s) is generated through the entire previous life experience of the individual. Individuals perform different systemic roles within organizations, and have unique perspectives derived from the sum of previous life

experiences. Meanings are constructed by different individuals reflecting their unique world views. While it is possible to construct a '*conduit*' through which data may flow around an organization, information is constructed by individuals in their interactions within the organizational context. Logically, therefore, it is possible to develop a data system to support management tasks, but this could only become an information system through direct and interpretive participation from those individuals using it. The logic demonstrated by the Infological Equation suggests that individual learning and organizational development are inextricably bound together. Information systems must therefore provide support for contextually relevant individual learning, and organizational analysis drawing on this learning, as a systemic process over time (Bednar, 2000).

### ***Learning and Knowing***

Those theories that an individual creates through sense-making will be influenced by multiple contextual dependencies arising from her/his experience and environment (Bednar, 2000). Such dependencies have been derived through the particular experiences of individuals involved, in the context of their own working situations. The distinctiveness of each work situation lies in construction of meanings that individuals attach to it. In relation to systems design in particular, therefore, there is no reason to assume consensus among the different actors as to the desirable properties of a proposed system. Indeed, as the Infological Equation demonstrates (see Langefors, 1966), it is not possible for any individual to know in advance precisely what requirements she/he might have. Instead, actors need support to engage in a collaborative endeavour of requirement shaping. Here individuals partake in a learning spiral through reflection on sense-making in a work context in order to create understanding of those emergent '*systems*' in their minds.

Individual learning may be described as taking place through sense-making processes as a response to messy and uncertain contexts in which resolutions are sought. Different orders of learning may be identified, based on a cycle of experience and reflection on experience (Argyris and Schon, 1978; Bateson, 1972). Higher orders of learning involve reflection on sense-making processes themselves, i.e. a learning cycle transforms into a spiral. Reflection on sense-making becomes an exercise in practical philosophy. Certain points follow from this. If individual learning is a creative process based in sense-making, then context is clearly important. Any unique individual's view is based in reflection on experience (Bateson, 1972), and experience is context specific. Therefore, an examination of contextual dependencies, as part of analysis, will be important.

Knowing, as a creative process, is inextricably linked to learning. Bateson (1972) suggests that information may be defined as '*a difference that makes a difference*', existing only in relation to a mental process. This process is what leads to an individual 'knowing'. Bateson describes a hierarchy of different orders of learning. At level zero, learning represents no change, since the same criteria will be used and reused without reflection. This is the case in rote learning of dates, code words, etc. which is contextually independent and in which repeated instances of the same stimuli produce the same resulting '*product*'. All other learning, according to Bateson's hierarchy, involves some element of trial and error and reflection. Orders of learning can be classified according to types of errors and the processes by which correction is



achieved. Level I involves some revision using a set of alternatives within a repeatable context, level II represents revision based on revision of context, and so on. Bateson's hierarchy finds an echo in the work of Argyris and Schon (single and double-loop learning). Double loop learning comes about through reflection on learning processes in which individuals may attempt to challenge prejudices and assumptions arising from their experiences. (Argyris, 1990; Argyris and Schon, 1996). When individuals need to solve an immediate problem, i.e. close a perceived gap between expected and actual experience, they may harness their sense-making processes within contexts of existing goals, values, plans and rules (Vickers's *appreciative settings*), without questioning their appropriateness. However, if individuals challenge received wisdom and critically appraise assumptions previously applied, double-loop learning occurs. The resulting process creates a productive learning spiral, which is at the heart of any successful organizational innovation.

As mentioned previously, the Infological Equation (Langefors, 1966) suggests that individuals develop unique understandings (meaningful information) by examining data in the light of (their own) pre-knowledge gained from reflecting on experience during a previous time interval. Information, and '*knowledge*' derived from it, cannot therefore be seen as commodities, to be transmitted from one individual to another (or stored) as containers of objective meaning. Furthermore, it is through these processes of constructing new understandings/meaning, by examining data in light of experience, that organizations, their goals and cultures are constituted. If individual learning is a creative process, organizational learning is so also.

### **Complexification and Emergence**

Attempts by students of management to reduce organizational problems to consideration of 'sub-optimality', drawing on mechanistic models from systems science can be seen as reductionism. Exploration of multiple levels of contextual dependency may help analysts to avoid entrapment in various types of reductionism, including undue reliance on sociological, psychological or technological concepts. It may also help to eliminate tendencies towards generalization, or substitution of an external analyst's own views for those of the participating stakeholders. A need to promote deep understandings of problem spaces requires us to go beyond grounding of research in phenomenological paradigms. In order to avoid various types of reductionism and achieve deepened understanding, analysts must attempt to incorporate philosophy as an integral part of their research practice (e.g. Bateson, 1972; Klein, 2007; Nissen, 2007; Ulrich, 1983).

As pointed out by Werner Ulrich in his discussion of boundary critique perception of a system varies with the stance of the observer (Ulrich, 2001), i.e. this differentiates between an observer's and an actor's picture of reality, which means that anyone wishing to inquire into IS use must continually align themselves with actor perspectives. For example, meaning shaping in particular situations can be described through comparisons of different actors' perspectives within given structural criteria, or '*circling of realities*'. This refers to a necessity to acquire a number of different perspectives (in time-space) in order to be able to get a better and more stable appreciation of an actor reality (Bednar and Welch, 2007). The whole person includes dimensions of both '*heart*' and '*mind*' (Ciborra, 2004). Personal perspectives which transcend received, organizational 'common sense thinking' may be encouraged to

emerge through methods which emphasize individual uniqueness and contextual dependency.

Those engaged in management tasks such as IS design should not forget that they set up personal boundaries for a situation by defining it from their own experiences and preferences. As human beings we all have pre-understandings of phenomena, which are influenced by our own values, '*wishful thinking*', and how each of us has been socialized into a particular society. These pre-understandings are being reviewed gradually, with the support of our experience. In a continual exchange/interchange between an individual's pre-understanding and experience, a process of inquiry may progress. It follows from the preceding discussion that, from the point of view of each individual's perception, an organization is an emergent property of inter-individual sense-making processes and activities. The organization is continually constructed/re-constructed for each individual as a result of emergence from individual sense-making perspectives. A critically informed approach to research involves recognition / understanding of this emergence. Without recognition of the uniqueness of each particular individual's experience of organizational life this critical approach may be undermined. Within a traditional scientific paradigm, the focus of a researcher's attention rests on increasing the precision and clarity with which a problem situation may be expressed. This can lead to an artificial separation of theory from praxis, of observation from observer and observed. '*Knowing*' about organizational context, formed by on-going construction of meanings through synthesis of new data with past experience, may be deeply embedded and inaccessible to individuals concerned. The perspective promoted in this paper emphasizes self-awareness of human individuals. In research undertaken from this perspective, a focus towards emancipation and transparency, rather than clarity and precision, is adopted. A researcher taking such a perspective will recognize that there are uncertainties and ambiguities inherent in socially constructed everyday world views (a similar discussion can be found in Radnitzky, 1970).

In some approaches, a human activity system is regarded as a mental construct derived from an interrelated set of elements, in which the whole has properties greater than the combination of component elements. When such a model is adopted, individual uniqueness is subsumed in perceived emergent properties of a conceptualized system. Even when considered as a duality seen as a system to be served and a serving system (e.g. Checkland and Holwell, 1998), individuals remain invisible. In order to take into account unique individual sense-making processes within an organizational problem arena, there is a need for analysts to explore multiple levels of contextual dependencies. Every observation is made from the point of view of a particular observer (Radnitzky, 1970). Since it is not possible to explore problem spaces from someone else's point of view, it follows that external analysts can only play supportive roles in enabling individuals within given contexts to explore their own sense-making. In an alternative model (de Zeeuw, 2007; Bednar, 2007), an organizational system may be seen as an emergent property of unique, individual sense-making processes and interactions within a particular problem arena. When considered in this way, it is possible to perceive some individuals themselves to have emergent properties of their own which can be larger than (i.e. outside of) those of one particular organizational system seen as a whole. Consider, for instance, a football club seeking to recruit skillful players for its team. The manager may perceive a need for a creative, attacking midfielder to play a role as one component part of the

team's efforts to win. The Los Angeles Galaxy Club recently experienced such a need but chose to recruit former England captain, David Beckham. Beckham can play the role of an attacking mid-fielder for the team. However, he brings with him qualities which transcend this in terms of his personal notoriety, publicity potential and marketing value for sales of Club products such as replica shirts, etc. Beckham has emergent properties beyond those of any other mid-field footballer in relation to the human activity system which is that Club. This model is not, of course, the same as a non-systemic, fragmented view which focuses on individuals but fails to perceive an emergent system arising through their interactions, and hence ignores the impact of norms, values, expectations, communicational acts, etc. on individual sense-making processes (Hay, 2007).

### **Contextual Inquiry**

The importance of context for systemic analysis has been widely recognized (see, e.g. Checkland, 1981 or Ulrich, 1983). Contextual inquiry, as described here, is viewed as a special case of contextual analysis. This paper describes an application of a framework for contextual inquiry, the Strategic Systemic Thinking (SST) framework (Bednar, 2000). This forms an exploration into the nature of open systems thinking and how systemic identities are maintained and generated within a specific human activity context. SST maintains a particular focus on ways in which human analysts can deal with complexification and uncertainty although this poses apparently insuperable epistemological problems. Particular emphasis is placed on a multiplicity of individual sense-making processes and ways these are played out within organizations. SST can support groups of organizational actors to take contextual dependencies into consideration, and is intended as a means to enable them to cope with escalations in complexity. A cardinal principle of the framework is that actors should own and control their own inquiry, supported but not dominated by a facilitating professional analyst.

When an attempt is made to evaluate effectiveness in managing or '*designing*' organizational systems, concepts of analysis become important. Good practice requires an understanding that addresses intrinsic and contextually-dependent characteristics of organizational activities. An understanding can only come about through relevant evaluative and analytical strategies. Evaluation is a result of both inquiring and reflecting thought processes, i.e. mental activity intrinsically dependent upon a demonstrated, contextually-dependent desire to explore a certain problem space. Analysis is an inquiry into the assumed-to-be unknown and/or a questioning of the assumed-to-be known. Evaluation, is a consolidating process, where judgments are made, and assumed '*truths*' and '*knowledge*' are incorporated into some kind of hierarchy. Together, an analysis (i.e. creation of '*new*' knowledge) and evaluation (i.e. categorization of '*existing*' knowledge) represent closing of a learning circle. Any conscious reflection over requirements for a higher quality learning circle could become a daunting exercise as it involves raising the quality of '*knowing*'. This is why a framework such as SST has an important role to play.

SST involves three aspects intra-analysis, inter-analysis and value-analysis. These should not be regarded as sequential, as it is possible to begin at any point in the framework. SST is intended to be iterative, and therefore it is possible to move from one analysis to another repeatedly and in any direction, at any time. A range of methods are available to the actors, and their facilitating external analyst, in seeking

to articulate their worldviews. These methods include: rich pictures, brain-storming, mind-maps, diversity networks, drama transfers, role-playing – all of which are supporting creation, visualization, and communication of mental models and narratives. Each of the three aspects of the framework helps to guide inquiries with a number of themes. The purpose of intra-analysis is to enable creation of an individual process for structuring a problem. This analysis aims to create and capture a range of narratives from participating stakeholders by providing an enrichment and visualization process for them. Inter-analysis is the aspect of the inquiry which represents collective reflections of decision-making alternatives. The aim is to have a dialogue and to reflect upon ranges of narratives derived through intra-analysis. The purpose is not to achieve consensus or to establish common ground, but to produce a richer base upon which further inquiry and decision-making could proceed. Grouping of narratives takes place through consideration and discussion of individually produced narratives. Results of these inquiries might be considered to form a knowledge base relating to problem spaces under investigation. A critical and reflective approach in considering these results is needed to ensure a basis for ‘good’ decision-making and to avoid unintended, negative consequences for actors and organizations concerned. Evaluation could be said to be an examination of the ‘*known*’ – what has been learned from analyses in a socio-cultural context. Here actors may carry out examinations of values influencing and constraining the analyses, and consider prioritization from political and cultural perspective.

SST can be explained as involving groups of professional members of organizations to act as analysts of their own problem spaces under guidance of expert analysts as external facilitators. This includes examination of their activities and specific use of methodologies, rhetoric and strategies to construct local arguments and findings. By the end of an initial analysis, analysts (i.e. organizational actors) might for example be familiar with some of the strategies available within their organization for further inquiries into contextual dependencies. SST is complementary, rather than alternative, to traditional approaches to analysis. However, there may be conflicts relating to un-problematized assumptions of ontological beliefs and logical empiricism (i.e. unquestioned beliefs of ‘*objectivities and truths*’). Other assumptions may also arise which are incompatible with the underlying philosophy of SST, e.g. the traditional communicational theories, focusing on a ‘*sender-receiver*’ perspective. To give a simplified example, in a traditional approach, inquiry might ask what a *company* wants to achieve with its information and communication system. On the other hand, a contextual inquiry would ask what the *people* who will use the system want to achieve, and what roles and specific purposes their activities might have in organizational contexts. What makes their unique situation recognizable *for them*?

What specific role do they give to information and the organizational business? This inquiry is to be seen as investigation by users themselves into their own assumptions and needs within the space of an open information system (an ‘*organization*’, human activity system or socio-cultural system). This is a bottom up perspective on organization, information and (technical) communication systems. Systems are envisaged, which are shaped with the intention to serve specific organizational actors and their needs – from their own points of view.

## **Summary**

Contextual inquiry is intended to support analysts to recognize individual emergence, ‘*multiperspectivity*’ and open systems thinking in combination. Two different

categories of emergence are highlighted. In the first, each individual's identity is an emergent property of a number of emergent systems of which the individual is a member. In the second category, each organization is an emergent property of the multiple perspectives of all the interacting individuals for whom its existence is relevant. There are multiple views of what comprises the organization, formed from the multiple perspectives of many individuals. From a systems analyst's point of view, many possible descriptions will emerge in any organizational inquiry, through the differing experiences of context among many individuals. The boundaries of an organizational system will be dependent upon multiple perspectives and descriptions from individuals. This requires consideration to be given to sense-making, emotion and learning processes that those individuals engage in. It is helpful to highlight different levels of abstraction involved in discussions about systems as emergent properties of socio-cultural phenomena.

The Strategic Systemic Thinking framework is discussed as a contemporary version of contextual analysis. Its aim is to support application and use of specifically adapted methods by groups of individual stakeholders in their efforts to construct understanding and meaning. Its focus is on ways in which information needs and information use are created by individuals. A concept of contextual dependency is of interest because it supports a focus of inquiry by unique individuals, on their own individual beliefs, thoughts and actions in specific situations and contexts. Through this kind of inquiry support is provided for a contextually-dependent creation of necessary knowledge. This has potential to provide a foundation for more successful communication, systemic analysis and eventually information systems development to be achieved. The purpose is to create a form of organizational transformation that allows individual emergence to surface.

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## Paper 4: Bias, Misinformation and the Paradox of Neutrality

Bednar P. M. and Welch C. (2008a). **Bias, Misinformation and the Paradox of Neutrality**. *Informing Science: the International Journal of an Emerging Transdiscipline*. Volume 11, 2008. p85 - 106. Accessible at <http://www.informingscience.org/Publications/441>

*What is normally described as bias? A possible definition comprises attempts to distort or mislead to achieve a certain perspective, i.e. subjective descriptions intended to mislead. If designers were able to exclude bias from informing systems, then this would maximize their effectiveness. This implicit conjecture appears to underpin much of the research in our field. However, in our efforts to support the evolution and design of informing systems, the way we think, communicate and conceptualize our efforts clearly influences our comprehension and consequently our agenda for design. Objectivity (an attempt to be neutral or transparent) is usually regarded as non-biased. However, claims for objectivity do not, by definition, include efforts to inquire into and reflect over subjective values. Attempts to externalize the mindset of the subject do not arise as part of the description. When claims to objectivity are made, this rarely includes any effort to make subjective bias transparent. Instead, objectivity claims may be regarded as a denial of bias. We suggest that bias can be introduced into overt attempts to admit subjectivity. For example, where people are asked to give subjective opinion according to an artificially enforced scale of truth-falsity (bi-valued logic), they may find themselves coerced into statements of opinion which do not truly reflect the views they might have wished to express. People do not naturally respond to their environment with opinions limited to restricted scales; rather, they tend to use multivalued logic. This paper examines the impact of bias within attempts to establish communicative practice in human activity systems (informing systems).*

**Key Themes:** Communicative practice, [Emergence, Individual emergence, Systemic thinking, Critical systemic thinking, Systemic practice, Contextual inquiry]

**Character (Focus):** Ontology, Epistemology, Axiology, [Praxiology]

**Theoretical Influences:** Bateson (1972), Argyris (1990), Langefors (1966; 1995), Ciborra (1992; 2002), Klein (2007), Mumford (2003), Nissen (1989; 2002; 2007), Radnitzky (1973), Ulrich (1994, 2001), Weick (1995).

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# Bias, Misinformation and the Paradox of Neutrality

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## Abstract

What is normally described as bias? A possible definition comprises attempts to distort or mislead to achieve a certain perspective, i.e. subjective descriptions intended to mislead. If designers were able to exclude bias from informing systems, then this would maximize their effectiveness. This implicit conjecture appears to underpin much of the research in our field. However, in our efforts to support the evolution and design of informing systems, the way we think, communicate and conceptualize our efforts clearly influences our comprehension and consequently our agenda for design. Objectivity (an attempt to be neutral or transparent) is usually regarded as non-biased. However, claims for objectivity do not, by definition, include efforts to inquire into and reflect over subjective values. Attempts to externalize the mindset of the subject do not arise as part of the description. When claims to objectivity are made, this rarely includes any effort to make subjective bias transparent. Instead, objectivity claims may be regarded as a denial of bias. We suggest that bias can be introduced into overt attempts to admit subjectivity. For example, where people are asked to give subjective opinion according to an artificially enforced scale of truth-falsity (bi-valued logic), they may find themselves coerced into statements of opinion which do not truly reflect the views they might have wished to express. People do not naturally respond to their environment with opinions limited to restricted scales; rather, they tend to use multivalued logic. This paper examines the impact of bias within attempts to establish communicative practice in human activity systems (informing systems).

**Keywords:** bias, misinformation, phenomenology, multivalued logic, informing systems, analysis.

## Introduction

For those concerned with the development and use of informing systems, it is important to consider human processes of communicating and sense-making which underpin any attempt a person may make to inform herself or to help others to inform themselves. At the heart of an informing system is an assumption that it is possible to generate messages that can become meaningful to

others. This is reflected in the words of Eli Cohen, who suggests that:

*‘the term Informing Science applies to disparate fields that share the common goal of providing a client with information in a form, format and schedule that maximizes its effectiveness’* (1999, p.217).

Knox (2007) has drawn attention to differing perspectives affecting use of the

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term ‘information’. This term is sometimes used to denote a business resource, i.e. a commodity which can be stored and exchanged. Here it is viewed as no more than structured data. However, other perspectives reflect the intimate involvement of human individuals in creating, interpreting and attempting to communicate meaning. Here, a focus may be placed upon processes of informing, rather than the notional products of these processes. In the Oxford English Dictionary (OED) (1989) information has been defined as:

*‘Knowledge communicated concerning some particular fact, subject, or event; that of which one is apprised or told; intelligence, news esp. contrasted with data.’*

Such a definition is not particularly helpful, since it requires the reader to make reference to other, associated or contrasted terms. For the purposes of this paper, we prefer to concentrate on the verbs that it includes: *communicated; apprised; told*. All of these are essential aspects of ‘informing’. For many people, becoming informed about a subject carries with it an imputation that messages can be received (from some external source) for which veracity can be assured. This leads us to consider the extent to which we can assess ‘truth’ of any particular message. In this context, the OED gives us some further definitions:

*‘Misinformation – erroneous or incorrect information’; ‘Propaganda – systematic propagation of information or ideas by an interested, esp. in a tendentious way in order to encourage or instil a particular attitude or response’; ‘Disinformation – the dissemination of deliberately false information ... with the intention of influencing the policies or opinions of those who receive it’.*

Each of these terms implies presence of bias. This has been defined as personal inclination or preference to favour a particular viewpoint with failure to fully inform a direct consequence (Cohen, 2005). We do not wish, in this paper, to focus on introduction of bias, or falsehood, which is deliberately undertaken for particular purposes. We confine our attention to situations in which those who undertake inquiry, or generate messages, may intend their efforts to be genuine or neutral and yet nevertheless find themselves entrapped in processes of misinforming. Maqsood, Finegan, and Walker (2004) point to the limitations of the human mind in dealing with tacit knowledge. Heuristic judgements undertaken in the process of formulating messages, and imperfections in memory over time, can lead to unconscious bias. It is important to note that a phenomenon of bias is not associated only with the senders of messages; misinformation can equally be a result of bias in the interpretation of a message by its receiver, or indeed by both parties.

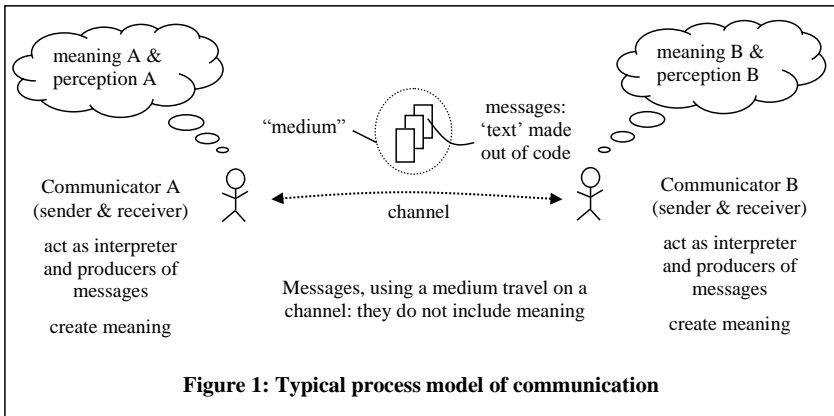
## Bias

In this section, we look at the phenomenon of bias in relation to some of the concepts through which its origins can be examined. We look at alternative models of ‘communication’ as a process of transmitting messages, noting a difference in focus. Form, and content are emphasized in one model, whereas the impact of the message on a recipient is emphasized in another. Issues of human sense-making and interpretation of messages are then discussed, particularly highlighting use of language. Here, denotative (naming) functions are distinguished from connotative (associating) functions of language.

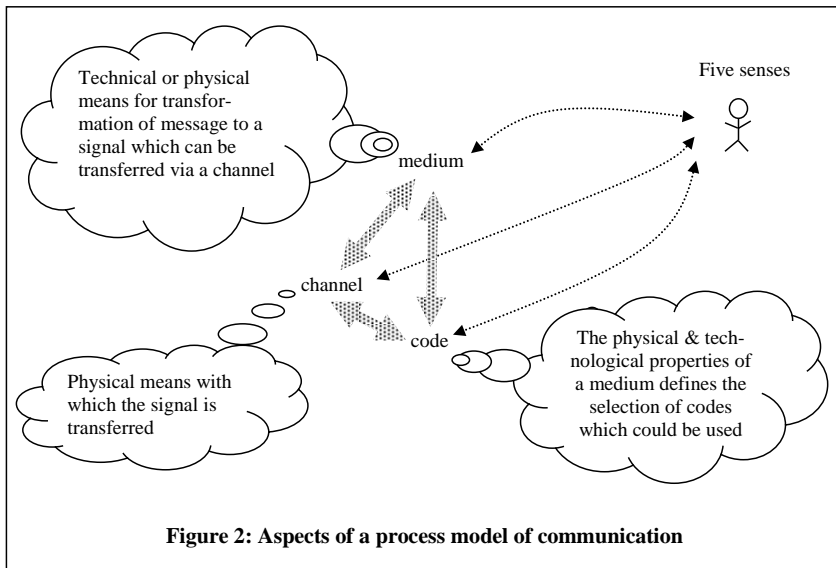
In common use, the term bias often has negative connotations – i.e. bias is equated with prejudice, and prejudice is seen as an evil to be avoided in favour of ‘objectivity’. However, like the parallel concepts of sense and nonsense, distinctions between bias and objectivity relate to subjective ‘judgement’ - bias from whose point of view?

In a process model of communication, (see e.g. Shannon & Weaver, 1949) there are interpreters/producers of messages who utilize a particular medium – a technical or physical means for transformation of a message to a signal, which can be transferred via a channel (see Figure 1.).

This channel is the physical means with which the signal is transferred. Messages are encoded and decoded.

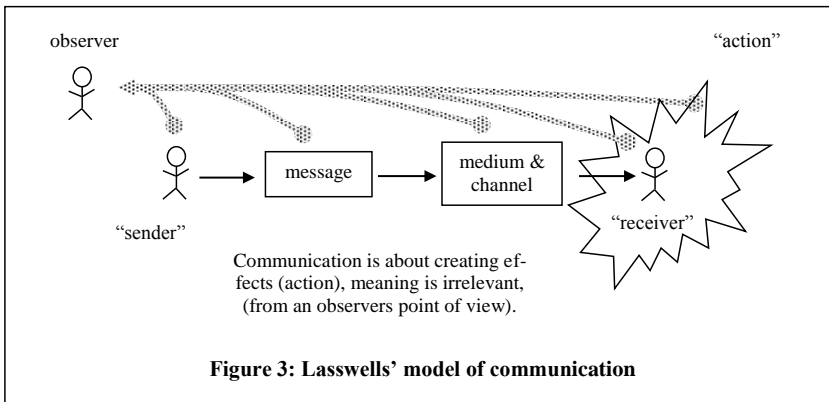


The physical and technological properties of a medium define the selection of codes which can be used ('sent' or 'received'). Choice of medium and code is dependent on the use, ability, and availability of the five human senses (see Figure 2).



Both producers (sender and receiver) constantly check their interpretation of the message against references – e.g. previous experiences of the way in which such messages could be interpreted. In a semiotic model of communication, socio cultural and other influences on such references are highlighted (e.g. Fiske, 1982; Saussure, 1974). Typically, in a process model, we might focus on bias on the part of the sender, e.g. when she wishes to convince the receiver of her opinion about something, bias might be introduced into the form and content of the message. However, it is not only the sender who is a producer. When decoding a message, a receiver interprets and creates meaning by relating to reference(s). Bias is present therefore through the actions of both parties. However, it is unlikely to be the same bias.

In some process models, (e.g. Lasswell, 1948) meaning is regarded as irrelevant for communication practice and theory (see Figure 3). *Effect* is seen as a more relevant focus for attention – i.e. communication is about creating effects (actions) not understandings. Who says what, through which channel, to whom, with what effect? Communication is about interest and control, not about meaning.



Richards (1968, p.157) calls the process-oriented model a '*vulgar packaging theory of communication*'. In his view, the Shannon and Weaver model is suggesting that there can be a core message which exists independently of human interpretation. This message is then encoded (packaged) for further transfer. The recipient de-codes (unpacks) the message and exposes the core content and form. According to Richards, the misconception here lies in a belief that a message can exist before it has been articulated (or coded). Articulation is essentially a creative process. At first, there is only a wish to articulate, not a pre-existing content which needs only to be coded. In other words, there is no content before the message is given form, and efforts to find differences between form and content would become highly questionable, to the point of being futile. Form and content are always one 'package' – one cannot subsist independently of the other. Content is not simply *presented* by form. There is a relationship between content and form that is dynamic and 'co-acting'. Each combination of content and form is unique, in the sense that any change of form will also change the content. Recognition of a change of form by a human reader of the message must by definition conjure different associations from that person's past history – thus changing her interpretation of the message. Each element, and the relationship between them, are essential characteristics of the message, which influence and change it. We can reflect that Gregory Bateson's view of information as 'a difference that makes a difference' suggests similar reasoning (Bateson, 1972).

In the field of semiotics, researchers (e.g. Fiske, 1982) tend to prefer the term ‘reader’ to that of ‘receiver’ (and tend not to focus specific attention on ‘senders’). In semiotics, sense-making and interpreting (i.e. ‘reading’) are the focus of interest. This forms a link between semiotics and linguistics. Consider the relationship which subsists between a territory (world) and a ‘map’ that supposedly represents it. A map may appear initially to be a simple metaphor for the territory, but at the same time this relationship is complex. We recognize that the territory is not the map and vice versa. However, there are quite a few different categories of ‘maps’. Examples include street plans; geological maps; those depicting water levels and flows; navigation charts; maps showing sources of raw materials; bio-diversity or climate zones; plans showing phone land lines etc – all these specialist purposes can be covered by specialist ‘maps’, each of which may take a different form, with different signs and signifiers.

Successful communication (from the perspective of the recipient) cannot necessarily be equated with an outcome of a convinced audience or an effective intended result or action. Consider the following statements (see Table 1) as responses from a reader of a message; each might be regarded as a ‘success’ in communication. However, only one of them can be seen to be successful in terms of resultant effect (including non-action as an effect). A person might say “I think I understand you”, indicating that she is uncertain. However, she might equally say “I understand you” believing that she is certain, unaware that she has misunderstood. Likewise, a person might be convinced that she does not understand when in fact she does, e.g. “Surely, it cannot be that simple.” Success in communication could instead be discussed in relation to both intended and unintended consequences; to both recognized / observed consequences and those which are unrecognized / unobserved.

**Table 1: Variations of successful communication**

<ul style="list-style-type: none"> <li>• <b>I understand what you mean – but I do not agree with you;</b></li> <li>• <b>I agree that you are right – but I do not care, and will not therefore take the action you suggest;</b></li> <li>• <b>I agree that you are right – but I cannot take the action you suggest (... because I lack the necessary courage; I lack the physical capability; I lack the necessary will power; I lack the economic means, etc) to act on my agreement with you;</b></li> <li>• <b>I understand and agree – I will take it the action you suggest when I have the time (... privately I am prevaricating because I am in denial of my real disagreement with the suggested action, or because my agreement is weak and I see it as a low priority);</b></li> <li>• <b>Yes I agree – and will immediately act accordingly. (Claim)</b></li> <li>• <b>Yes I agree – and will immediately act accordingly. (Observed effect)</b></li> </ul>
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Maturana (in Maturana & Varela, 1980) considers this in his discussion of the role of language in human interaction. He suggests that linguistic behavior is orienting behavior. Consensual orienting interactions are only possible where the (cognitive) domains of interaction of each organism are to some degree comparable, so that they are able to develop some system of communicative descriptions.

*“So long as language is considered to be denotative it will be necessary to look at it as a means for the transmission of information, as if something were transmitted from organism to organism, in a manner such that the domain of uncertainties of the ‘receiver’ should be reduced according to the specifications of the ‘sender’. However, when it is recognized that language is connotative and not denotative, and that its function is to orient the orientee within his cognitive domain*

*without regard for the cognitive domain of the orienter, it becomes apparent that there is no transmission of information through language. It behooves the orientee, as a result of an independent internal operation upon his own state, to choose where to orient his cognitive domain; the choice is caused by the 'message', but the orientation thus produced is independent of what the 'message' represents for the orienter.*" (Maturana, in Maturana and Varela, 1980, p.32).

Nissen (2002) also points to the distinction between connotative and denotative usage of language. He suggests that human communication, as described by Maturana (Maturana and Varela 1980), does not presuppose a conduit metaphor (as in a simplistic understanding of the Shannon and Weaver model), but is consistent with perception of people as creative beings. The denotative function of information, in the context of information systems development and use, is generally taken for granted. Nissen uses the phrase 'Information System' to refer to information processing and management processes comprising both social and technical elements. He underlines the fact that the denotative function of language presupposes much prior interaction and mutual learning among orienters/orientees. This often seems '*grossly underestimated when software systems are incorporated into information systems*' (Maturana, in Maturana and Varela, 1980 p.81).

Thus, while many are very aware of the denotative features of language, the connotative features are often ignored. It may be beneficial that denotative features should dominate in some specialist contexts, e.g. particular technological contexts such as that contemplated by Shannon and Weaver when they developed their model of communication in a specifically engineering environment. Here, a specific 'jargon' can be useful within the immediate context among those attempting to orient one another in very specific ways. However, in informing systems generally, the denotative meanings should not be taken as self-evident. Neither denotative nor connotative features of language should be focused upon in isolation from one another. This point is taken up by Apel (1980) in the context of theories and methods of inquiry; by Bateson (1972) in a context of different types of systems thinking; by Radnitzky (1973), drawing upon work by Habermas, in a context of communicative action; and by Nissen (2002), in a context of traditions of inquiry in software development.

In this section, we have focussed on communicating, use of language and the processes by which human individuals interpret messages in their efforts to communicate. These were highlighted in order to elucidate some possible origins of 'bias'. We now move on to consider some philosophical concepts that influence our perspectives on human communication and interpretation of meaning.

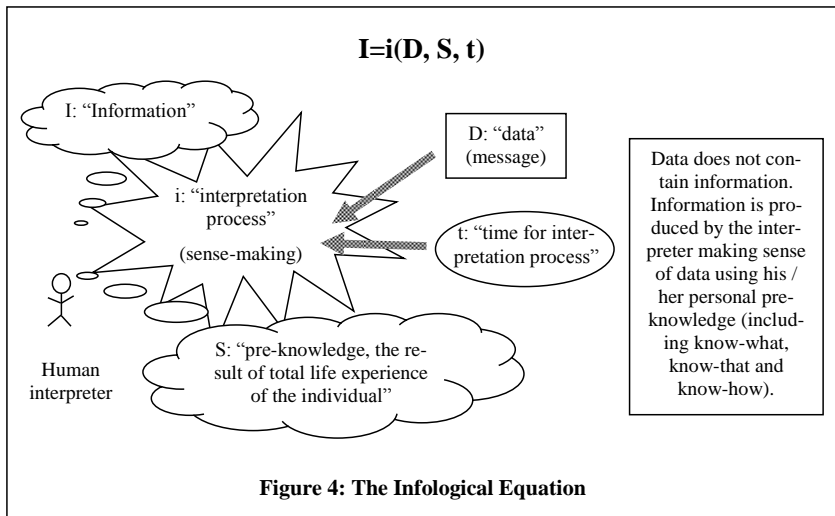
## Philosophical Foundations

In this section, we consider how different philosophical perspectives treat the issue of communication among human beings. In particular, we contrast the Logical Empiricist school of thought with that of Hermeneutic Dialectics. These are discussed in order to highlight the problematic nature of communication and a need to avoid oversimplification by treating processes of sense-making and interpretation as if they were merely issues of transmission of the right signals.

The term 'information' is used in a number of ways by different researchers, reflecting different perspectives (see Callaos & Callaos, 2002). For example, Langefors (1966), in his Infological equation (see Figure 4), specifically allies the term information with meaning, brought about through interpretation. Shannon and Weaver, however, in their 1949 model of communication, specifically state that '*information must not be confused with meaning*' (p.99). However, these authors specifically draw their readers' attention to this as a variant on common usage, by pointing out that

*'The semantic aspects of communication are irrelevant to the engineering problem'* (p.3).

Richards (1968) points to a dangerous confusion that can lie in wait for a naïve researcher who attempts to apply Shannon and Weaver's model, or Laswell's (1948) formula, uncritically in a context of human communication. The term information, when used by the authors of this paper, refers to meaning, drawing upon data interpreted (created) by human sense-making processes, including application of bias by its producer.



A simple transmission or conduit model of communication is therefore rejected, since relation between form and content, and interpretation through human sense-making (application of bias) cannot be reduced to technological applications only (see also Nissen, Bednar, & Welch, 2007). Thus, ideal 'informing' efforts are more than just attempts at information provision, because two-way communication processes are essentially involved (two-way informing). This requires us to consider an expanded model, and move from information exchange to communication and relation-inclusive interpretation. This argument is strengthened by reference to works of e.g. Bateson (1972), and Hay (2007). In this way, our intention is to incorporate a recognition of the double hermeneutic involved when sentient human beings interact. It could be helpful also to consider process of communi-forming, inter-forming, conforming ... etc. In particular, we wish to contrast perspectives based in logical empiricism (LE) with those based in hermeneutic dialectics (HD). These perspectives may be seen as complementary (rather than antagonistic), but inquiries conducted within each are likely to have different objectives and result in differing types of discourse.

Drawing on Nissen (2002) and Radnitzky (1973), the authors have compiled Table 2 which summarises the distinctive features of each of these paradigms as they relate to a phenomenon of bias.



**Table 2: Logical Empiricist and Hermeneutic Dialectic Views of Bias**

Feature	Logical Empiricism	Hermeneutic Dialectics
View of 'reality'	<p>One observer independent reality;</p> <p>Reality is 'out there' to be discovered;</p> <p>Bias can and should be avoided as far as possible in order to get closest to this reality.</p>	<p>Many coexistent 'realities' dependent on observers;</p> <p>Understandings of 'realities' created through sense-making;</p> <p>Bias is a necessary part of individual sense-making processes – what enables people to make sense of their world.</p>
Theory of truth	<p>Correspondence theories predominate;</p> <p>Information can exist independently of human beings.</p>	<p>Coherence theories predominate;</p> <p>Information is created by individual human beings and cannot exist without them.</p>
Historical context of data collected	<p>Irrelevant because information is independent of any context. The object of research is assumed to lead to a given set of variables;</p> <p>Boundary of context is taken as given.</p>	<p>Relevant because selection of variables is dependent upon the choices made by individuals who collect the data;</p> <p>Boundary setting is a political process and questions to be asked are a matter of individual choice.</p>
Causal connections	<p>Linear chains or trees;</p> <p>Efforts are made to define the parameters of a problem requiring rigorous inquiry;</p> <p>The domain of the problem space is taken as given;</p> <p>Focus is on rigor in inquiry.</p>	<p>Mutual, interlocked influences;</p> <p>Efforts are made to consider what the relevant problem space is, and how this is chosen.</p> <p>The domain of the problem space is selected by a human actor;</p> <p>Focus is on relevance in inquiry.</p>
Values guiding research	<p>Only those which are science-immanent;</p> <p>Objectivity, absoluteness and particularity.</p>	<p>Both science-immanent and external values;</p> <p>Subjectivity, plurality and relativity.</p>
Separability of theory from practice	<p>Strictly separable;</p> <p>Objectivity follows from this premise.</p> <p>Subjective elements are excluded from the process of inquiry.</p>	<p>Theory and practice dialectically related;</p> <p>Subjectivity and relativity follow from this premise;</p> <p>They are inseparable and subjectivity is inherent in the process of inquiry.</p>
Research interest	<p>Technical research interests, potentially emancipatory;</p> <p>Desire to create a solution based on observation of objective 'facts'.</p>	<p>Mainly hermeneutic and emancipatory interests, can provide social techniques;</p> <p>Desire to create a resolution based on interpretation of interaction.</p>
Main language features	<p>Extensional and denotational;</p> <p>Messages, containing meaning (and knowledge) can be transmitted from a sender to a receiver.</p>	<p>Intentional and connotational;</p> <p>Messages are exchanged between an orienter and an orientee; meaning (and knowledge) is not contained in messages but is created by participants in an orientation process.</p>

We do not discuss scientific proofs or analysis of empirical evidence about communication but rather seek to highlight some of the issues and problems experienced in individuals' efforts to make sense of the world and to communicate one with another – what Heidegger (1962) might have termed '*Befindlichkeit*'. Our perspective is also informed by an appreciation of phenomenology as an underpinning philosophy of inquiry. Alfred Schutz reminds us that:

*“all empirical sciences refer to the world as pre-given, but they and their instruments are themselves elements of this world. Only a philosophical doubt cast upon the implicit pre-suppositions of all our habitual thinking... can guarantee the 'exactitude' not only of such a philosophical attempt itself but of all the sciences dealing directly or indirectly with our experiences of the world...”* (Schutz as cited in Wagner, 1970, p 54).

Schutz goes on to comment on attempts to attach to phenomenology labels, such as idealism, realism or empiricism. These, he regards as inadequate in application since by its nature phenomenology puts them all in question. Phenomenologists seek to include in their inquiry a sense-making space which comes before the point where many other philosophers begin.

Communication is a key concept here. Habermas (1985) describes difficulty among human beings in achieving communication; there is a need for strategies, such as 'linguaging' to enable people to explore one another's sense-making processes (see Wittgenstein, 1963). When elaborating upon 'meaningfulness' some authorities (e.g. Schutz) question how it is possible for any mutual understanding or communication between people to take place, and how a person can act purposively in order to achieve actions which are meaningful.

This section has highlighted the problematic nature of human communication, by comparing perspectives from two contrasting schools of thought. We now go on to look at the phenomenon of misinformation, using the particular context of the IS discipline to provide illustrations.

## Misinformation in Informing Systems

In this section, we explore some examples of ways in which 'misinforming' can arise. We note, particularly, that an intention to mislead on the part of the originator of messages is not necessarily required. Even if we choose to accept that all parties act in good faith, the impact of misinforming can be the same.

In the Information Systems and IT area, there is a long history of developing methods and techniques to support informing practices in complex problem-solving and development projects (e.g. Nissen, 1989; Checkland, 1999; Mumford, 2003). When information technologies began to be developed for organizational purposes, it was soon discovered that there was a gap in communication between technologically-oriented and business-oriented staff. This is recognized not only in the academic world but also in industry and is discussed in an IBM white paper on IT service management (Salvage & Dhanda, 2007). Furthermore, although systems development can be conceived as an integrated process, in practice attempts to standardize the steps and techniques involved have led to less, rather than more comprehension among the various communities of practice seeking to establish the meanings of these aspects. For example, within an overall context of 'Application Lifecycle Management' different providers have generated a range of different interpretations of what is supposed to be a standardized process (Baer, 2007a). It could be argued therefore that the informing science transdiscipline, applied to information systems, is an emerging result of developers and researchers recognizing misinforming communication breakdowns (e.g. Nissen, 2002). In the discipline of information systems, this can be observed in the many efforts to create standardized languages, methods and techniques intended to support complex communication and interaction between different stakeholders in a systems development project. However, because these efforts have not proved to be entirely successful in achieving

their aims, they continue to be of major interest for this community of practice. As Baer (2007b) comments:

*‘the nice thing about standards is that there are so many of them to choose from ... the more standards, the less standardisation.’*

The phenomenon of misinformation can be recognized in many aspect of the IS/IT field. The following examples provide anecdotal evidence to illustrate the impact of this.

A Canadian man who had a \$10 wireless contract which included “unlimited mobile browser plan” was charged with \$85,000 “because the company was charging him on a per-kilobyte basis” (Haines, 2007). The man who had used his mobile phone as a modem for his PC had not realized that his “unlimited browser plan” did not include unlimited download in the subscription. It could be argued that the man should have known this, especially since when installing necessary software on his computer a warning message was displayed stating that ‘additional data charges may be incurred’. On the other hand, the source of potential misunderstanding is clear - that those particular customers having a contract described as including “unlimited mobile browser plan” are not necessarily to be taken as the intended audience for the warning message. This confusion is exacerbated when considering that there are many different wireless contracts available for each customer to choose among. We reflect that it is irrelevant whether this was deliberate attempt to mislead on the part of the service provider – the scope for downloading data to a mobile phone tends to be self-limiting in comparison to other technologies such as a PC. The possibility exists that the company never considered a context of use of a mobile phone as a modem when drawing up the agreement, but the impact on the user is the same.

Recently, Microsoft proudly presented in a press release that they had ‘delivered a holiday surprise’ unveiling a public beta of a piece of software technology (Vance, 2007). The release was worded as if this release was ahead of schedule. The description went on to include a reference to the company’s expectation of being ready in the first quarter of 2008. This was intrinsically flattering in a world where delays are commonplace. While the release date presented was accurate, it was not the original release date. Microsoft had initially presented a plan to ship the software in the first half of 2007. The release was then delayed to the second half of 2007 and then again to the first half of 2008. This latest deadline was the one they eventually managed to beat, ahead of schedule. A cynical observer may conclude that the Press Release was intentionally made in order to mislead the audience into thinking this achievement more attractive than it was. However, because it is possible that this selective ‘half-truth’ was put forward in good faith, it is irrelevant in our discussion of bias whether this selectivity was purposeful or not.

Do modeling languages improve communication? In a discussion about modelling and designing software solutions, it is recognized that modelling languages (techniques etc) can be used for different purposes and this then influences the result of their use. Although the use is within a particular community of practice, and the modelling languages are standardised, this does not guarantee success in efforts for communication between different stakeholders. This is mainly because it is recognised that the purpose for using the modelling language also influences the results of its usage (see for example Rosenberg and Stephens, 2007). The problem described focuses on the difference between using modelling languages to design a solution from scratch and then use the design to develop and implement code, or to analyse code and reverse engineer a model out of the code. The intention in using the modelling language is to try to make a clear picture of the software design. Stephens comments on the result of the second option as follows:

*‘... muddy water poured into a crystal flute is still muddy water. Now you’ve got the same dysfunctional mudball in two places – the code and the UML model’* (Stephens, 2007a).

The conclusion is made that the modelling language cannot in itself create the expected clarity and meaning. This is encapsulated by Stephens (2007b), when he comments as follows.

*‘Imagine if everyone on your team was talking a different language. Let’s say you’re speaking German, your team mate is speaking French, and someone else is speaking Swahili.*

*Every time someone speaks, people glean whatever slivers of meaning they can, and then nod as if they’ve understood perfectly. They then walk away with a completely wrong interpretation of what the speaker was really trying to say.*

*In virtually all IT projects, the problem of miscommunication is rampant, but it’s rarely noticed because everybody thinks they’re speaking the same language. They’re not. One person says ‘book review’ and some people interpret this as meaning ‘editorial review’ (a review written by an editorial team), whereas others might interpret it as meaning ‘customer review’ (a review written by a customer and posted to the site).*

*The results can be – and often are – catastrophic, as the system gets developed with everyone interpreting the requirements and the design differently.’*

These examples show concerns within the community of practice about the proliferation of perceived communication breakdowns. This is further compounded in academic discourse on methods/approaches, with statements such as ‘closing the gap’ (Sommerville, 2007), in a context of software engineering); ‘bridging the gap’ (Avison & Fitzgerald, 2002), in a context of method) and ‘navigating the gap’ (Stowell & West, 1994), in a context of client-led design).

In this section, we have shown how misinforming can take place using examples from the IS field. We have seen that intention to mislead is not a necessary condition for misinforming to take place and that, even within communities of practice with common interests, misinformation may be rife. We now turn our attention to two particular cases where human activity, intended to inform, can actually result in misinforming. The first of these arises through misguided attempts to achieve ‘objectivity’. We explore, through discussion of Hermeneutic Dialectics (introduced in the previous section) how such efforts cannot meet with success. The second case arises when those seeking to inform are constrained by artificially imposed criteria based in bi-valued logic (e.g. yes/no; true/false) which tend to filter out richness and complexity of ‘meaning’.

## **Paradox of ‘Objectivity’**

This section describes how attempts to achieve objectivity can lead to misinformation. If, in metaphysics, it were possible to identify a number of different and (in some cases) incompatible versions of ‘interpretivism’, it would be highly questionable to proceed as if there were only one. See, for example, the discussion by Radnitzky (1973) in which he discusses a number of different schools of thought, including different variants of interpretivism. The authors would prefer to avoid making an assumption that there is only one particular variant. For example, we may look at the difference in assumptions between logical empiricism and hermeneutic dialectics. Inquiries based in an LE tradition are likely to give great attention to precision and clarity in expressing a problem situation. Radnitzky (1973) points to a danger within such inquiries that an artificial separation may arise between observations made and the unique perspectives of observer and observed. Adopting such a focus of attention could consequently lead to a loss of critical awareness and entrapment in a confusion between specific and general sable descriptions of experiences. Researchers whose inquiries are based in philosophical practice from an Hermeneutic Dialectics tradition, on the other hand, are likely to make explicit efforts to recognize uncertainty/ambiguity as features of socially constructed perspectives on human activity. Their focus is intended to be on transparency, rather than clarity, emphasizing individual self-awareness. Both traditions could be described as leading to a very different strand of ‘interpretivism’, one focusing on clarity and

the other on transparency. The authors also wish to avoid suggestions that any approach, with its underlying philosophy, is directly linked with predetermined sets of methods for investigation. Such a view is also highly questionable. If we consider the work of leading researchers within any paradigm, they may (in principle at least) choose to use any method for investigation. Application of method does not necessarily explain the philosophy underpinning any particular research. However, the justification of method use, the choice of variables, the choice of boundary settings, the arguments related to validity, etc. are dependent upon the particular philosophical interpretation and stand adopted by the particular method user. This is illustrated in work by Werner Ulrich (1994). In efforts to provide help for citizens attempting to communicate with experts, Ulrich develops a method for critical systemic thinking and emphasizes a need for 'boundary critique', i.e. awareness of the impact of drawing boundaries around spheres of interest within problem situations. In a context of information systems, Ciborra (2002) draws on work of Edmund Husserl in order to urge a need for a phenomenological understandings. In doing so, he draws attention to a common '*...forgetting of issues such as the subjective origin of science, the foundational role of everyday life in the creation and development of any methodology, and, ultimately, the obliterating of authentic human existence in the management of organizations and technologies*' (Ciborra, 2002, p. 15).

For example, where interpretive research refers extensively to work by Heidegger, Gadamer, possibly Husserl and Habermas, it might be alleged to be grounded in idealistic, metaphysical thinking (for an example of this discussion, see Radnitzky, 1973). Perhaps, therefore, efforts should also be made to refer to authors such as Bateson, Apel and Schutz in attempting to apply philosophy in practice (Apel, 1980; Bateson, 1972; Schutz, 1967). Researchers struggle to bring scholarly illumination in touch with everyday experience, as suggested by Randall Whitaker:

*"...this literature can be characterized as scholarly, i.e. abstract or theoretical in content. Fine points of philosophy have been examined in relative isolation from consideration of how they might pertain to the workaday world. Regardless of its illumination of 'meaning' or 'reflection' such theoretical work rarely addresses either the 'meaningful use' or 'reflection upon use' at the center of my professional ...work."* (Whitaker, 2007).

An idea that meaningful communication has taken place can be based in an 'illusion' that there is some objective reality to which both parties are referring. When elaborating upon '*meaningfulness*' Schutz (1967) questions how it is possible for any mutual understanding or communication between people to take place, and how a person can act purposively in order to achieve actions which are meaningful. He reflects that such possibilities can only be approached via '*sedimentation*' of pre-interpreted experiences built up through conscious life. Any justifiable methods for interpreting social interrelationship must then be based on careful description of underlying assumptions and their implications. He goes on to suggest that the methods of the social sciences cannot be regarded as adequate to this task.

*"These questions cannot be answered by the methods of the social sciences. They require a philosophical analysis. And phenomenology ... has not only opened up an avenue of approach for such an analysis but has in addition started the analysis itself"* (Schutz, as cited in Wagner, 1970, p. 56).

This concept of '*sedimentation*' of pre-interpreted, lived experience comes about, for Alfred Schutz, through reflection. While conscious life may be described as a continuous flow of experience which moves only forward and is irreversible, the act of paying attention to living experience removes the subject from the flow and marks out one '*experience*' from another for description or reflection. In reflection, the individual is essentially stepping out and turning against the '*flow*'. Thus, meaningfulness can only be attributed in retrospect. To illuminate this, we can paraphrase Dylan Thomas' well-known poem and consider the idea of reflection on '*an experience*

ago'. As Bohm (1992) points out, 'thought' as a concept always implies a passage of time. We are always in the process of thinking but any 'thought' can only be considered in retrospect, when it no longer exists as experience. It should be noted that Schutz' view has been subject to criticism by some authorities, e.g. Habermas, who suggests that a transcendental view of the 'lifeworld' fails to take into account a possible role for objective challenges to pre-interpretation (Habermas, 1985, p.401). For the purposes of the discussion in the current paper, however, the authors do not see Habermas' position as contradictory. The reason for this is that the 'objective challenge' would be based upon collections of subjective assumptions referring to a 'common' (which is itself a socio-cultural temporality).

In considering Schutz's view, the authors are reminded of the work of Börje Langefors, in the mid-Sixties, with the Infological Equation. Reflecting on the nature of information systems, Langefors (1966; 1995) suggests that those people who are to interpret data in order to inform themselves must be viewed as part of the system. He demonstrates this using the infological equation (Langefors, 1995, p.144):  $I=i(D,S,t)$  where "I" is the information (knowledge) produced by a person from data "D" in conjunction with pre-knowledge "S", by an interpretation process "i", during time interval "t". Meaning (information or knowledge) is thus created by each individual. Pre-knowledge "S", here, is considered to be created through the entire lived experience of the individual concerned (cf Schutz's concept of 'sedimentation').

Like Schutz, Langefors reflects on the apparent impossibility of communicating 'meaning' between people. Simply transmitting data will not lead to communication of a shared understanding, since, by their nature, "i" and "S" cannot be assumed to be common. He observes that communication may be seen to approach success most closely where individuals interpreting the same data belong to a group, definable for example by locality or common professional interest, e.g. standardized accounting data among accountants. He concludes that every act of interpretation does not necessarily invoke the entire "S" attributable to every individual and that some aspects of shared experience may be sufficient to lead to similarities in "i" among group members. In seeking to reconcile this counter-intuitive phenomenon with the logic of the equation, Langefors makes a philosophical distinction in the nature of interpretive processes. Any simple piece of data might be interpreted by different individuals to have a similar 'factual' meaning. However, inferences drawn from such facts would be likely to differ more widely – the 'meaning' of the data for an individual in terms of its associations, and/or possible consequences depending upon her/his unique "S". Communication and intention is context-dependent. Interpretation of context continually changes over time and this influences sense-making and communication efforts (see Wittgenstein (1963), e.g. his later work and his discussion of language games). Constant change of interpretation, and consequently of perceived meaning, (e.g. information) was highlighted by Langefors in the infological equation in 1966 (see Langefors, 1966). This view is supported by Klein (2004) when he refers to 'meanings' as:

*"... acquired by being born into and embedded in the social lifeworld, which include day to day interactions with the people around us".*

Klein makes reference to work of Tsoukas (1996) and of Berger and Luckman (1967) in emphasizing subjectivity and reflexivity as key aspects of social scientific investigation. Tsoukas refers to subjectivity as consisting of a system of mental patterns acquired by individuals through past socialization and drawn upon in particular situations (i.e. sense-making). The so-called double hermeneutic of social research is immediately highlighted here. Only by explicit recognition of bias and reflexivity inherent in inquiries into this 'social lifeworld' can any general relevance of social research be established (Klein, 2004). In reflecting on meaning shaping we can remind ourselves that the 'truth is the whole system' including both subject and object in relation to information:

*'A systemic notion of information would place it not just in the subject, or in the object, but in both of them and in what relates them.'* (Callaos & Callaos, 2002, p. 6)

The authors of this paper can see parallels here to the work of Habermas. Sometimes reflection on experienced reality is not a matter of choice. At times the world appears to kick back and force an individual to reflect. As Habermas points out, if an individual is experiencing an earthquake, she has no choice but to reconsider an assumption that the ground beneath her feet is solid (see for example discussion on p. 400 in Habermas, 1985).

Wittgenstein (1963) introduces what he calls "language games" as a metaphor for language use in the everyday course of practical life. He avoids giving a precise definition, but 'linguaging' is nevertheless a rigorous aspect of his proposition. He expresses the problem as a need to reconcile a predictable structure that determines how words in language can be assembled, with a simultaneous need for use to be flexible. Any language structure must be dynamic to be able to account for regularities extending over time. Language games, in Wittgenstein's terms, provide a vehicle for structure and flexibility to be achieved (for further discussion, see Nissen, 2007).

Human beings can be viewed as adaptive learning systems, and as such their behavior is not deterministic. Each human individual observes phenomena and interprets them from her own unique perspective (Bateson, 1972; Vickers, 1984). Human beings have free will to adapt their behavior to their perceptions in any feasible way. The greater the experienced complexity of the problem situation, the greater is likely to be the uncertainty experienced by the individuals. In the context of a complex problem space therefore it is likely that behavior patterns of different individuals will vary widely. The authors wish to emphasize their belief that a key aspect of discourse regarding critically informed contextual inquiry is an explicit recognition of individual uniqueness. When individual behavior is considered in the context of informing systems, as part of research discourse, it can be suggested that reductionist analysis ignores the possible extent of emergent properties. While researchers drawing upon a systemic ontology recognize emergent properties of a system, they may not always relate these to roles and perspectives of individual actors. An individual, acting in the context of an informing system, may generate emergent properties greater than those of the system as a whole (Bednar, 2001). This may arise when considering the influence of other systems of which she is a component. As has been pointed out elsewhere, any observation can only be made from the point of view of a particular observer (Maturana & Varela, 1980) and consequently perception of a system varies with the stance of the observer (see e.g. Ulrich, 2001). Informing systems incorporate people engaged with meaning creation as part of their knowing. (NB Here, we refer to 'knowing' as experience, as opposed to 'knowledge').

Processes through which people create and recreate their knowing are at once deeply personal, contextual and social. Therefore knowing is susceptible to personal, contextual, and social biases. Gregory Bateson has suggested that knowing comes about through perception of change, i.e. of a 'difference that makes a difference' (Bateson, 1972). According to Weick (1995), knowledge creation takes place more readily through individual and collective sense-making activities within the cultural context of an organization. Such activities have been described as a negotiation of differing perspectives held by individuals – what Checkland calls 'Weltanschauungen' (Checkland, 1999). We (the authors of this paper) recognize that individuals can always select from a range of alternative viewpoints which may be contradictory, complementary or simply different, and which may overlap at any point.

Organizations have no embodiment beyond that of individuals, interacting within social communicational networks. 'Knowing' within an organizational context is formed by on-going construction of meanings by individuals, as they encounter new experiences and synthesize new data with existing 'knowledge' from past experiences (Langefors, 1966). In order to express their knowing

in a process of creative development, individuals need space to explore their own understandings, since knowing may be deeply embedded and inaccessible to them. Nonaka and Konno (1998) described this space using the label '*originating Ba*' – that space where individuals share feelings, emotions, experiences and mental models.

Knowledge sharing is a form of communicative action which goes beyond a transmission of messages. Like 'knowing', it is subject to human sense-making and is susceptible to personal, contextual, and social biases. 'Knowing' may be constructed through teamwork in which individuals make a collaborative exploration of a problem-space. In his later work on organizational information systems, Claudio Ciborra discussed such exploration. Realizing that the openness and the dynamics of problem spaces create a multi-dimensional complexity, he turned to Heidegger for inspiration (Depaoli, 2006). Ciborra highlights a phenomenon that human beings cannot 'design' their own future. Ciborra suggests that, when confronted with a problem space they experience as complex, people turn first to existing knowledge, seeking for a solution within familiar competences and gradually 'tinkering' and moving outwards from this base (Ciborra, 1992). Only if such a strategy proves insufficient to deal with the problem might a person then turn to wider sources of unfamiliar knowledge. Ciborra highlights two types of evidence we encounter when approaching organizational phenomena: formal ideas or models derived from organization theories; and evidence belonging to a space in which informal expression can surface, which 'host the unexpected aspects of organizational life' (Ciborra, 2002, pp. 175-177). Such a space, he suggests, no model or theory could address. If researchers focus only on the first category of evidence, to the exclusion of the second, they miss the opportunity to encourage underlying phenomena to become 'unveiled' (Ciborra, 2002, p.178).

In practice, there may be constraints on the conditions within which effective team communication takes place, e.g. perceptions of differences in competence, culture, power or status among a group, which distort communicative processes. Habermas (1985) attempted to specify an 'ideal' situation for effective dialogue where conditions of equality of status, information and skill in discourse subsist between participants. Such conditions appear in the authors' experience to be a rare in everyday life. We consider it vital, therefore, that for the purpose to develop informing systems, vehicles are found to support individual and group sense-making activities.

In this section, we have discussed one instance of human activity where an intention is to inform but the result is misinforming, i.e. a paradox of 'objectivity'. Next we examine a case in which bi-valued logic operates as a constraint upon informing processes.

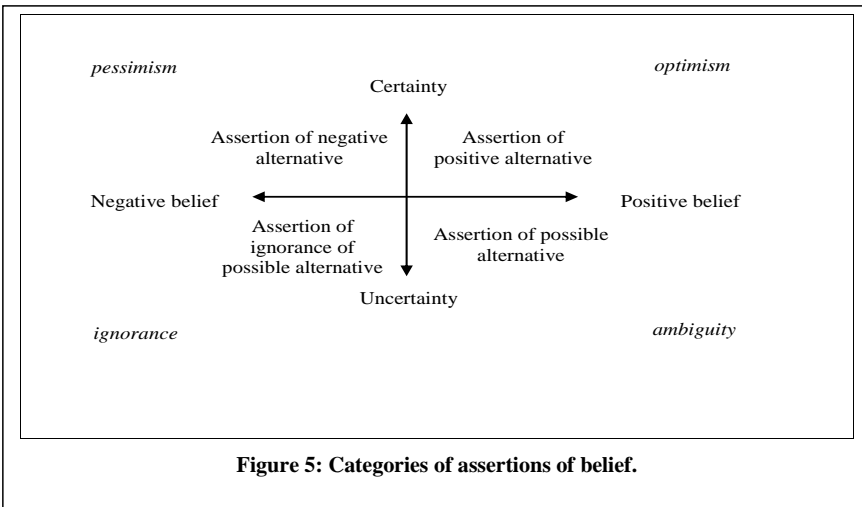
## The Tyranny of 'Truth'

In this section, we elaborate upon a second instance where the intention to inform fails due to misguided use of bi-valued logic where para-consistent and multi-valued logic would have been more suitable (see Recher, 1969 for an extended description of multi-valued logic). This issue relates to the recognition of uncertainty, and contextual dependency, inherent in life as it is experienced. We, as human beings, do not always know the answer 'yes' or 'no' but are often constrained to act as if we did – i.e. to misinform.

The authors of this paper suggest that it is our common experience in everyday life that, when posing a question to someone, we might receive the answer 'it depends'. Here, an individual gives an answer conditional on obtaining further data about the context of the question. We infer from this that people might be comfortable with multi-valued logic when dealing with everyday problems (i.e. things are not necessarily assessed on a scale of 'truth' or 'falsity'). Clearly, when Ulrich (2001) discusses the need for boundary critique in systemic inquiry, he is giving recognition to this phenomenon of 'it depends'. Observation, for Ulrich, is critically dependent upon the stance of the observer. This links directly to the argument put forward by Maturana and Varela



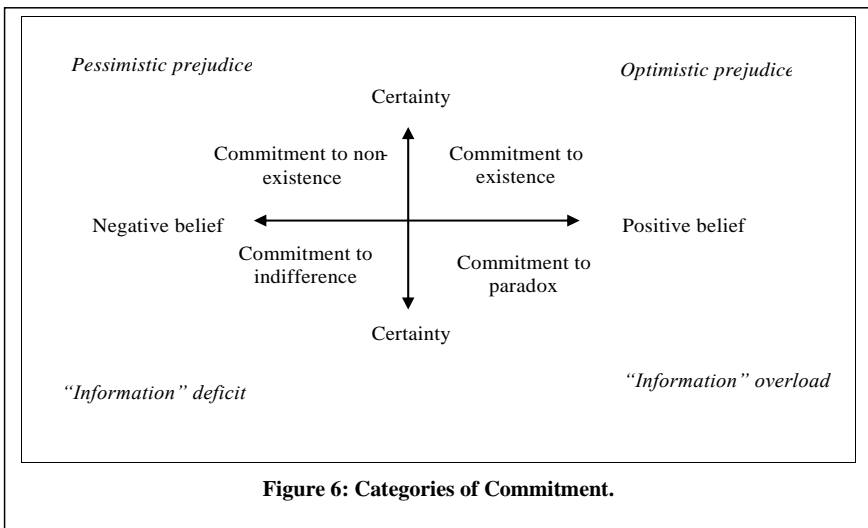
(1980), pointing out that no observations are independent of particular people who observe. Vickers (1984) adds to this focus in highlighting human interpretive processes as incorporating ‘appreciative settings’ reflecting an individual’s previous life experiences. Similar views are expressed by Langefors (1966) in setting out his Infological Equation. We can also refer to work by Bateson (1972), in which he points out the contextually dependent nature of human learning, and hence understanding of any phenomenon. If human learning is by nature contextually dependent, then there is no reason to approach more complex problems with an assumption that it is necessary to break them down systematically or to apply bi-valued logic. Whilst there may be occasions when it is beneficial to break problems down and simplify them, this need not be done as a matter of cause. In our view an approach involving routine and systematic attempts to simplify inquiry is reductionist. Attempting to identify every aspect of a problem situation separately, in isolation from its context, in order to establish the ‘truth’ or ‘falsity’ of certain key parameters ignores emergence. Instead, we would advocate ‘complexification’ of inquiry, creating a multi-valued assessment and categorization through elaboration upon individual expression of ‘it depends’. The authors see emphasis on use of bi-valued logic as restrictive of individual choice. In everyday life, human beings are confronted with the need to make choices. It is important to examine the element of choice and judgment available to individuals. Often, the variety of choice open to individual people is much wider than is commonly expected (Gilovich, 1991). The categorization, as presented in Figure 5, outlines a phenomenon, i.e. that decision makers are able to keep in mind that they are asserting beliefs of truths rather than truths - exercising judgment.



All four alternatives can be seen to be variants of the answer ‘it depends’, the main different lies in character and degree of the espoused certainty (see example in Table 3). The logic also implies that choices need to be made for each individual alternative. Any assertions made, even if assumed to be generally valid, are not obviously valid under all conditions and out of context. Each assertion requires a decision. Each decision is chosen as a result of an assessment of risk of being ‘wrong’ where the fit between assumptions of context and generalization is taken into consideration.

This phenomenon is a result of a strategy for dealing with uncertainty in context. It happens as an aspect of negotiation, when people (analysts) try to make sense of their own, and each other's, narratives regarding their understandings and definitions of a problem space.

It should be noted that a further dimension, commitment (e.g. strength of conviction), is not reflected in the model in Figure 5. Figure 6 reflects four different values within the world of certainty. The four quadrants illustrate that participants may be committed to different types of belief. It is possible for instance to be certain that you have not enough information to make a decision, or certain that there is a paradoxical situation in which apparent alternatives are both true or both untrue. This (relation to level of commitment as described in Figure 6) is not the same as experiencing uncertainty in relation to a question where the values of particular conditions cannot be ascertained (see Figure 5).



In everyday life, we are skilled in ignoring limitations in bi-valued logic because our familiarity with the context of a problem space enables us to compensate selectively. However, this habitual approach could easily become skilled incompetence (Argyris, 1990) when a problem space is complex and difficult to comprehend. This habitual oversimplification can be a problem since it can lead to ignorance of the range of possible alternatives (Gilovich, 1991), through complacency. Although this may hold true most of the time, bi-valued logic has received considerably more credit than its real value merits, and has entered realms 'incompatible' with its nature.

The authors believe that a focus on bi-valued logic would constrain normal exercise of human judgment, since people are capable of using multi-valued logic in a process of creating assertions. In recognizing that human reasoning supports contradictions in forming judgments, we perceive a need for any supportive system we create to extend beyond bi-valued logic.

A desire to avoid information overload, and to navigate through rich and diverse sources of potential meaning can lead individuals to prefer methodologies which purport to simplify a problem space. Such a reductionism, while useful in many cases, tends not to handle complexity in contextual problems very well. We suggest that it is preferable to confront the complexities and 'mud-

dle’ presented by organizational life by undertaking structured, but systemic inquiry into contextual dependencies (see also Bednar, 2000 for an example of a framework which support such an undertaking). In particular, we believe it is vital to maintain a focus on unique, individual beliefs and perspectives within the context of collective exploration of problem spaces. In cybernetics, it is recognized that every distinct dimension of a complex system needs to be controlled in a way which is appropriate to its characteristics. This is known as Ashby’s law of requisite variety (Ashby, 1964). Similarly, we believe, when conducting inquiry, the multitude of dimensions of a complex problem space requires appropriate analytical approaches.

**Table 3: Example of multi-valued reasoning**

<p><b>Let us assume that you and I are in Portsmouth, on the south coast of England.</b></p> <p><b>Assertion of positive alternative:</b></p> <p><i>If you asked me ‘Is it possible to get to Southampton this afternoon?’ I would answer ‘Yes, I believe so. It is twenty miles by road or rail, and there are plenty of services.’</i></p> <p><b>Assertion of negative alternative:</b></p> <p><i>If you asked me ‘Is it possible to get to Buenos Aires this afternoon?’ I would answer ‘No, I doubt it. Even if there was a flight from the local airport today, the distance is so great that you would not arrive until tomorrow.’</i></p> <p><b>Assertion of possible alternative:</b></p> <p><i>If you asked me ‘Can I get to Paris this afternoon?’ I would answer ‘I expect so. It could be possible if there is an afternoon flight from the local airport. Assuming seats are available and you can afford the fare, then perhaps you can’.</i></p> <p><b>Assertion of ignorance of possible alternative:</b></p> <p><i>If you asked me ‘Can I get to Timbuktu this afternoon?’ I would say ‘I have no idea. I am not sure where it is or even which continent it is in. I do not know whether there are services from Portsmouth or even direct flights from the UK’.</i></p>
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In this section, we have discussed how human reasoning is based in multi-valued, rather than bi-valued logic. We discuss how this relates to the uncertainties and contextual dependencies inherent in human experience of life as it is lived and the consequences for informing processes when people fail to recognize this. We emphasize that where people resort to reductionism, this should be selective rather than habitual and requires critical reflection. It should also be accompanied by selective ‘complexification’.

## Conclusions

In this paper, we have attempted to discuss two specific examples of situations in which those taking part in inquiry, or making efforts to communicate, may intend to take a neutral or objective stance, and yet nevertheless find themselves entrapped in processes of misinforming. These examples relate to human reasoning (imposing a scale of bi-valued logic on multi-valued reasoning); and human perspective (making attempts to create a position of objectivity) in denial of bias that participants bring to any informing process.

In informing science, the focus is on efforts made by people to provide their clients with information in a form, format and schedule that maximizes its effectiveness. Depending upon ones relationship to the concept of bias what is meant by ‘providing information’ and ‘effectiveness’ will be significantly different. From Logical Empiricist perspective, mainly denotational features of language become influential, while from a Hermeneutic Dialectic perspective, mainly connota-

tional features are more significant. This includes strategies adopted in efforts to inform. For instance, from a Logical Empiricist perspective, messages by which data are transmitted may also contain meaning which needs only to be decoded by a receiver in order for that person to become informed. This creates a focus upon technical issues concerned with coding, decoding and transmission of a message. However, from a perspective of Hermeneutic Dialectics, meaning is created by those individuals who are seeking to orient or be oriented within a particular context to which a message may be relevant. Here, therefore, a technical focus would be inadequate to inquire into processes of informing. The focus must also incorporate individual human sense-making. As indicated by Nissen (2002), drawing on Apel (1980) and Radnitzky (1973), these two research traditions should be regarded as supplementary. In the context of inquiry into human spheres of action, neither alone can be sufficient.

We do not suggest that there is no value in researchers setting out with a desire to achieve objectivity in their inquiries. However, we do believe that objectivity is in practice elusive and that it is necessary to recognize this in any endeavour. When use of language is recognized to be connotative, then communication is about efforts to orient someone within her cognitive domain. It is the orientee who creates meaning by delving into her cognitive domain in order to reduce uncertainty. Hence, she draws upon prior consensual linguistic experiences. The denotative function of language presupposes much prior mutual interaction and learning between members of informing systems. We have attempted to highlight examples of concerns within both professional and academic communities of practice, relating to experienced breakdowns in communication, i.e. misinforming. We have attempted to put these issues into a context of critical systemic thinking. We have also made efforts to describe approaches intended to support people in their efforts to cope with these experiences.

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## **Paper 5: Inquiry into Informing Systems: critical systemic thinking in practice**

Bednar, P.M. and Welch, C. (2009a). **Inquiry into Informing Systems: critical systemic thinking in practice**. Chapter 14 in G. Gill, editor, *Foundations of Informing Science: 1999-2008*. Santa Rosa, California: Informing Science Press. p459 - 501.

*The theme of this chapter is a dialectic we perceive to subsist between meaningful use and reflection upon use in informing systems (using a metaphor of double helix). We explore the nature of the symbiosis between experiences people have in using systems to inform themselves (or others) and the evolution of these informing systems. We use the term 'history' to denote on-going and continuous change of experience, and development of experience (i.e. a process of 'experiencing'), by both individuals and collective groups. Human behavior unfolds in a continuous pattern of response to reflection upon experience. As conscious beings, we have no choice but to reflect and thus our consciousness changes from one moment to the next. Our interpretations of perceptions are related to assumptions arising from previous reflections upon our lived experiences.*

**Key Themes:** Critical systemic thinking, [*Emergence, Individual emergence, Systemic thinking, Systemic practice, Communicative practice, Contextual inquiry*]

**Character (Focus):** Epistemology, Axiology, [*Ontology, Praxiology*]

**Theoretical Influences:** Bateson (1972), Argyris (1990), Langefors (1966; 1995), Ciborra (1992; 2002), Klein (2007), Mumford (1983; 1995; 2003; 2006), Nissen (1989; 2002; 2007), Radnitzky (1970; 1973), Ulrich (2001, 2006).

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# Inquiry into Informing Systems: critical systemic thinking in practice

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## Abstract

Any perceived human activity system is, by definition, also an informing system. Human activity systems must continually adapt to their dynamic environments in order to survive. There is therefore critical role for deuterio-learning through human sense-making and multiple levels of reflection in bringing this about. In this chapter, the authors suggest a need for an approach based in philosophy as practice, when considering the complexities of informing systems. Our discussion draws upon a variety of reference disciplines that have contributed to developing an epistemology of informing systems discourse. These include systems science, systems thinking and cybernetics (which we explore through the work of Gregory Bateson and C. West Churchman); philosophy (explored through the work of Gerard Radnitzky and Hans-Erik Nissen, as well as Bateson); and organizational behavior (explored through the work of Borje Langefors, Chris Argyris, and Karl Weick). We conclude by presenting two examples of hermeneutically-informed, phenomenological approaches.

**Keywords:** Human activity system, Use, Usefulness, Double Bind, Informing Systems, Information Systems, Phenomenology, Hermeneutics.

## Introduction

The theme of this chapter is a dialectic we perceive to subsist between meaningful use and reflection upon use in informing systems (using a metaphor of double helix, see Figure 1). We are by

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no means the first to reflect upon such relationships in a wider context. Vickers (1965), for example, commented upon it in the following way:

*“...human history is a two stranded rope; the history of events and the history of ideas develop in intimate relation with each other yet each according to its own logic and its own time scale; and each conditions both its own future*

*and the future of the other.*" (Vickers, 1965, p.15)

We explore the nature of the symbiosis between experiences people have in using systems to inform themselves (or others) and the evolution of these informing systems. If we follow a metaphor of a two stranded rope, we can see that the coil of one strand influences the coil of the other in an ongoing helix – neither can remain straight without challenging the integrity of the rope. Vickers refers to ‘history’. In this paper, we use this term to denote on-going and continuous change of experience, and development of experience (i.e. a process of ‘experiencing’), by both individuals and collective groups. The rope metaphor reflects our thinking that human behavior unfolds in a continuous pattern of response to reflection upon experience. As conscious beings, we have no choice but to reflect and thus our consciousness changes from one moment to the next. Börje Langefors highlights the on-going nature of human sense-making processes in his Infological Equation (Langefors, 1966). Our interpretations of perceptions are related to assumptions arising from previous reflections upon our lived experiences. As Langefors expressed it:

*"It is natural to say that an "information system" is a system in which essential components are information entities or information processes. Now that we are aware of the distinction between data and information, we know that a set of data cannot be an information entity except when it is combined with requisite pre-knowledge and an interpretation process. Thus to have an information entity, we will have to have, for instance, a person plus some data. The data are not information; they may at best represent information" (Langefors, 1995, p56).*

Furthermore,

*"The important question of how data or text may inform has been extensively studied under the name "infology". One of the central insights from infology has been that data or texts do not "contain" information (knowledge) but will only, at best, represent the information to those who have the requisite "pre-knowledge" (Langefors, 1995, p28).*

The nature of that “pre-knowledge” is not, of course, unproblematic. It is possible for individuals to become entrapped in taken-for-granted assumptions. We will discuss these issues further in a later section of the paper.

Langefors may be regarded as a founding father of the discipline of “information systems”. He proposed it as a new subject area to be covered at the third International Conference on Information Processing and Computer Science in New York 1965 (organized by IFIPS). His proposal was successful, and this was the starting point of the IS academic subject area, followed in 1967 by establishment of the first professorial chairs in this new area. Since then the term “Information System” has become widely used. Unfortunately the concept that Langefors had in mind appears to have been widely misunderstood (Langefors, 1995). He specifically pointed out (1995, p.26) that:

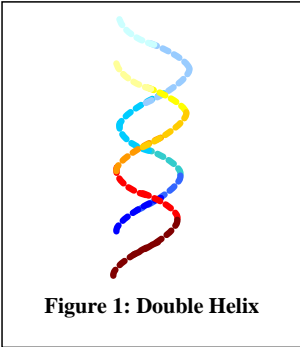
*"Information" ought to be something that had to do with informing and this was the real task behind all processing of data" (Langefors, 1995, p52)*

For us, the term information system (as described by Langefors) and the term ‘informing system’ that we might prefer today, are interpreted as having the same meaning – people are an essential feature of such systems. However, this emphasis on “informing” as an interactive process was somewhat lost in the Information Systems community during the two decades that followed Langefors original work. Much work undertaken during this period, influenced by ideas from the field of computer science, tended to describe information as a commodity, created by processing data, which could be transmitted from one individual to another if only the right channels could be designed to support effective transmission. Later work by Cohen and others (e.g., see Cohen, 1999) has since returned our attention to Langefors earlier conception, by setting an agenda for an emerging transdiscipline of “Informing Science”. This relationship between traditions in under-

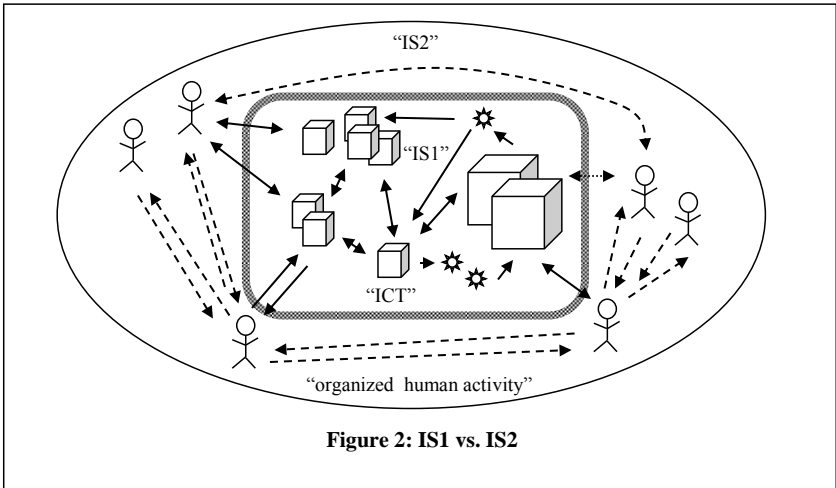
standings of information systems and, more recently, informing systems, is discussed by Nissen elsewhere in this current work.

A further dimension to the misunderstandings that have characterized work in the field of “Information Systems” has been a confusion over the scope that this term implies. In their eagerness to discuss particular phenomena under investigation, writers on IS often neglect to give their readers a precise definition of the sense in which they understand it. In his 1995 editorial reflections on Langefors earlier work, Bo Dahlbom comments on his thoughts when he first became acquainted with the subject:

*“... I did not understand why people in this discipline found it so important to stress, again and again, the distinction between data and information, between data processing system and information system. As a philosopher, I thought that distinction was rather obvious. But while the very idea of an information system as a human organization ... may be simple enough in theory, it is extremely difficult to hold on to when you are engaged in software development or discussing what information technology can do. This idea demands a whole new attitude to technology use, and is of course the basis for the new conception of computer systems design introduced by Langefors” (Dahlbom, editor, in Langefors, 1995, p.22).*



**Figure 1: Double Helix**



**Figure 2: IS1 vs. IS2**

An example of confused thinking is illustrated when looking through the proceedings of the European Conferences on Information Systems from recent years which appear to reveal very few attempts by authors, or even Track Chairs, to define their terms. We can support two very distinct interpretations of the term “Information System” as it is used in the literature (see Figure 2). We have labeled these ‘IS1’ and ‘IS2’ (see Bednar, 1999; Bednar and Welch, 2005). ‘IS1’ refers to individual people, and their use of hardware and software. However, an expanded definition emerges (‘IS2’) once we include their range of inter-individual communicative activities. An organization is comprised of individual people, in interacting, social, communicative networks. Where development work is carried out within assumptions conforming only to ‘IS1’, actors

could find their efforts lack synergy. The results may then disappoint the expectations of those who need to use them. Langefors (1995) points out that interaction and exchange of data is so fundamental to the operation of all the functions of a business organization that it becomes difficult to separate the organization from its Information System conceptually – they are effectively one and the same. Checkland and Holwell (1998, p.111) refer to the concept of an Information System as an instance of a Human Activity System. However, they go on to distinguish the role of serving systems in relation to systems ‘to be served’. Information Systems are sometimes included in the category of serving systems, suggesting that these authors make a distinction similar to our own between ‘IS1’ and ‘IS2’. Due to a close connection between organizational and informational/communicative issues inherent in ‘IS2’, any initiatives grounded in ‘IS1’ within the same organizational context are likely to ‘succeed’ only if perspectives grounded in ‘IS2’ are given prior consideration. This is because, when viewed in the context of ‘IS2’, systems analysis and design activity must be seen as a special case of purposeful change, involving individual and collective organizational learning as a processes over time. Support for contextually-relevant individual and collective learning is needed in order to avoid the artificial separation of theory, e.g. standard methodologies, from practice - organizational life as it is lived.

Few people would dispute that a dialectic subsists between users’ experiences of ICT artifacts and the processes of design and redesign. For example, we may consider the launch of the iPhone by the Apple Corporation. Undoubtedly, this has been preceded by discussions between designers, and users of cell phones and MP3 music players, to discover which features of these devices might be popular if incorporated into a new artifact. Further testing of devices by prospective users will also have taken place in order to refine design and enhance product development. A great deal of academic debate has taken place in the past around this dialectic relationship. See, for example, discussions by Bijker et al, 1987 and McKay, 1994 in which they debate evidence for technological determinism of social use, as against social shaping of technologies. Langefors reflected on this phenomenon as follows:

*“To create new needs seems to imply manipulating people. And, of course, it does... But many needs that have been created by inventors and entrepreneurs in combination are clearly of kinds that people do not want to see disappear... We have, of course, a complex ethical problem here” (Langefors, 1995, p26).*

We believe that processes involved in development of ‘information systems’ must be distinct from those concerned with artifact design. Information (informing) systems may be considered to have a twofold purpose: to support people in informing themselves, and/or to support people in helping others to inform themselves. Research into processes for developing informing systems may be seen as a quest for approaches which combine rigor with appropriate recognition of complexity, and which address meaningfulness of systems from the perspectives of individual participants. We consider that a key to achieving this balance of rigor with relevance lies in creation of an effective learning spiral in which stakeholders (i.e. actors who participate in using informing systems) can engage in reflection within the context of their use. How could this be done? Langefors appears to ask just this question, whilst hinting at a similar metaphor to our own double helix:

*“The perspective used here raises questions of how to identify the potential wants of people, their values, on the one hand, and how to discover the new possibilities that are inherent in the developing technology. How does one go about finding answers to questions like “What is desirable?” and “What is possible?”?” (Langefors, 1995, p 26)*

Later in this chapter, the authors point to two approaches which support application of hermeneutically-informed, phenomenological inquiry into human activity systems in practice.

The next section of the paper explores the philosophical background and ideas underpinning the discussion. Following this, the authors consider concepts of use, usability and usefulness in relation to the double helix metaphor. A further section then gives two examples of practical application, before we attempt to draw some conclusions. Some readers of our earlier work on this topic (see Bednar and Welch, 2007) have focused on the discussion of usefulness and usability in order to draw a comparison with the Technology Acceptance Model (Davis, et al, 1989). Whilst we are aware of TAM, the philosophical basis of our work is wholly different, and the apparent similarity is both superficial and co-incidental. It is not our purpose to enter into a detailed discussion of this issue, but we have included a small section below.

## Systems and Systems for Use

A key aspect of meaningful research in this area, for the authors, is consideration of individual and collective sense-making processes (Dervin, 1983; Weick, 1995). The authors reject a realist approach, which assumes that there is one world 'out there' awaiting individual discovery. Alfred Schutz, writing of the work of Edmund Husserl, puts forward an argument for phenomenological approaches as follows:

*'All empirical sciences refer to the world as pre-given; but they and their instruments are themselves elements of this world. Only a philosophical doubt cast upon the implicit presuppositions of all our habitual thinking – scientific or not – can guarantee the "exactitude" not only of such a philosophical attempt itself but of all the sciences dealing directly or indirectly with our experiences of the world ...'* (Wagner, 1970, p.54).

It is this 'philosophical doubt' that we pursue when we adopt a hermeneutic approach. We recognize that individuals create their own perspectives of 'realities', through sense-making (see Berger and Luckmann, 1967; Radnitzky, 1970). For us, a kind of critical idealism may be preferred over realism, and thus sharing of 'realities' is problematic. The way forward is a communicative effort, applying critically-informed systemic thinking, drawing on Gregory Bateson's holistic, hermeneutic approach (Bateson, 1972). The focus is on self-emancipation through systemic meta-reflection from unique individual perspectives of autonomous and self-reflecting systems. Bateson proposes a perspective of human self-awareness and understanding.

When embarking on a design process embedded entirely in an 'IS1' paradigm, professionals are attempting to create a system on behalf of 'users'. They may attempt to consult those 'users' about their needs, but it is likely that the clients concerned will be disappointed in the extent to which the results are meaningful to *them*. Without inquiry into wider, individual and organizational sense-making processes (i.e. an IS2 perspective), only a partial view of needs can be formed. Thus, ownership and participation of clients in the inquiry process is vital – they are part of the system to be 'designed'. In particular, a focus on design of artifacts, in isolation from the individual and organizational contexts within which use will occur, and their associated contextual dependencies, is likely to result in disappointment. At this point, it is worthwhile to reflect also on what we mean when we invoke the term 'user'. Nissen (2002) points to a difficulty arising through developers' choice of language to use when addressing their clientele. The concept of 'user', and reference to the needs of 'users' or 'end-users' tends to exclude actors within an organization from full participation in, and/or ownership of, the process of design or its outcomes. Clients (i.e. people who perceive a need for a new or modified system to support their work) are unlikely to regard themselves primarily as users of IT. They work as managers, surveyors, accountants, chemists, etc. and in their wider life experience, they perceive themselves as parents, family members, friends, sportswomen, etc. Furthermore, as previously mentioned, they are not simply 'consumers' of information or technologies, but co-creators of informing systems, since their collaboration is required to create systems which are usable and useful in the first place. This perspective is reflected in work by many well-respected researchers in our field in addition

to Nissen. Enid Mumford focused throughout her long career (see, for instance, Mumford, 1983; 1995; 2003; 2006) on socio-technical design, embracing the whole work system and not just artifacts. Participation by individual people and organizational groups in designing systems to work *for them* was crucial to successful design for Mumford. This idea is reinforced in work by Stowell on client-led design (Stowell and West, 1995), and by Ehn (1993) in relation to participatory design. We can also point to Checkland, whose work on the Soft Systems Methodology and its application to design of information systems placed emphasis on individual Weltanschauungen (worldviews or perspectives) as a key factor (Checkland and Holwell, 1998). Friis, 1991, placed emphasis on a need for those who would use a system to take ownership and control over the development process. A system that will be perceived as meaningful to particular people requires their input as co-creators in design, and consequently cannot be developed *for them* by anyone else, however expert.

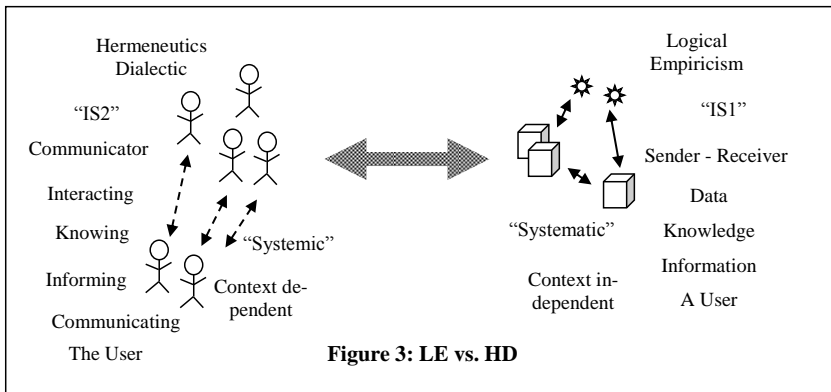
As mentioned above, Langefors gave consideration to the phenomenon of needs creation in relation to design of systems (Langefors, 1995 p 26). It is interesting to reflect upon the phenomenon of desire in this context. Designers of systems frequently focus upon gathering data about the 'what' of informing systems – what do these 'users' need to be informed about? They also commonly engage with the 'how' – e.g. what performance criteria must this system satisfy? However, the third category of data that designers need in order to create systems perceived as meaningful is often overlooked – 'why'. Why might someone wish to engage with this informing system? What motivation is there for engagement? This third category of data must also be created and explored if IS developers are to take a holistic approach in building systems that can contribute to empowerment for use (Bednar and Welch, 2006). However, it is recognized that professionals are often constrained to work within assumptions based in 'IS1'. Furthermore the emphasis in their work is often placed on efficiency and productivity rather than meaningfulness for particular clients. Developers need scope to explore contextual dependencies with the clients themselves, to embark on a process of co-creation. We suggest that only clients themselves are able to explore their desires, based on contextually-dependent factors in the system for use. Some models that attempt to explain 'user' behaviour do so in terms of *acceptance* (e.g. the Technology Acceptance Model of Davis, et al 1989). Such models emphasise a passive role for people, who are perceived to be recipients of IT artefacts. Davis' model considers two main factors: perception of usefulness, and perception of ease of use of particular systems. This model has been criticised extensively by one of the co-authors of the 1989 paper (see Bagozzi, 2007) as failing to take into account a number of dimensions, psychological, philosophical and socio-cultural. Bagozzi does not argue that the model has no useful role to play in examination of systems for use. We agree with him, however, that it is insufficient on its own as a guide to successful introduction of informing systems. In our view, *desire* for systems that support people to inform themselves (or help others to do so) is contextually dependent and can only be satisfied through a process of co-creation, owned and controlled by those people themselves. Langefors discussion of people as information entities, who, together with data, are essential to formation of 'information systems' lends support to this view.

The concept of a system of use is in itself an important one. Peppard (2007) reminds us of a widespread fallacy that ownership of the 'right' IT systems will automatically lead to delivery of value for a business. He points out that information technology can only generate value if attention is paid to the design of the system for use at the same time that technological systems are developed. It is only at the level of the business that effective action can be taken to influence organizational values and behavior to enable effective use of available technologies. There is a paradox therefore in that, while elaborate and rigorous plans may be developed for implementation of the technology itself, it is relatively unusual to find similar plans in place for the *realization of benefits* from that technology. Ward and Peppard (2002) argue for an iterative process of benefits management. The view that IT 'resources' are a separate artifact that can be dealt with by 'ex-

perts’ outside the main stream of business management leads to inherent difficulties. Evidence for these points can be seen in current popularity of the concept of IT Service Management. IBM, for instance, in their recent White Paper on ITSM, make a plea for organizations to recognize that IT management cannot be separated from management of the business itself (Salvage and Dhanda, 2007). Consequently, IT professionals need to understand business imperatives and be able to communicate effectively with other business managers *as an integral part of the same team*.

### Philosophical Perspectives

The authors believe that theory and practice are indivisible, neither can progress without the other and they stand in a dialectic relationship. What Radnitzky (1970) calls Continental or hermeneutic-dialectic (HD) schools of metascience share this position, whereas, according to Radnitzky (1970), Anglo-Saxon or logical-empirical (LE) schools strictly separate theory from practice (see overview Figure 3 and Table 1). Moreover, HD schools of metascience acknowledge the importance of history, which LE schools tend to ignore. In this context, we are not referring to history as a recorded sequence of past events, but as an on-going, continuous process of change in predefined variables (Langefors, 1966). The authors acknowledge that approaches based in Hermeneutic Dialectics recognize, not only individual uniqueness, but a need to avoid a Cartesian split in analysis. Any observation must be made by a particular observer, under particular circumstances, in a particular context (Maturana and Varela, 1987). It is not possible to separate observers from what is observed, in order to objectify/simplify analysis. Inquiries based in an LE tradition are likely to give great attention to precision and clarity in expressing a problem situation. Radnitzky (1970) points to a danger within such inquiries that an artificial separation may arise between observations made and the unique perspectives of observer and observed. Adopting such a focus of attention could consequently lead to a loss of critical awareness and entrapment in con-



fusion between specific and generalizable descriptions of experiences. Researchers whose inquiries are based in philosophical practice from an HD tradition, on the other hand, are likely to make explicit recognition of uncertainty/ambiguity as features of socially-constructed perspectives on human activity. Their focus is likely to be on transparency, rather than clarity, emphasizing individual self-awareness. Applying metascience in informing science, and the relationship of these matters to Cohen’s (1999) ideas, is discussed in greater depth by Nissen elsewhere in this work.



**Table 1: Logical Empiricist and Hermeneutic Dialectic views (Bednar and Welch, 2008)**

Feature	Logical Empiricism	Hermeneutic Dialectics
View of 'reality'	<p>One observer independent reality;</p> <p>Reality is 'out there' to be discovered;</p> <p>Bias can and should be avoided as far as possible in order to get closest to the this reality.</p>	<p>Many coexistent 'realities' dependent on observers;</p> <p>Understandings of 'realities' created through sense-making;</p> <p>Bias is a necessary part of individual sense-making processes – what enables people to make sense of their world.</p>
Theory of truth	<p>Correspondence theories predominate;</p> <p>Information can exist independently of human beings.</p>	<p>Coherence theories predominate;</p> <p>Information is created by individual human beings and cannot exist without them.</p>
Historical context of data collected	<p>Irrelevant because information is independent of any context. The object of research is assumed to lead to a given set of variables;</p> <p>Boundary of context is taken as given.</p>	<p>Relevant because selection of variables is dependent upon the choices made by individuals who collect the data;</p> <p>Boundary setting is a political process and questions to be asked are a matter of individual choice.</p>
Causal connections	<p>Linear chains or trees;</p> <p>Efforts are made to define the parameters of a problem requiring rigorous inquiry;</p> <p>The domain of the problem space is taken as given;</p> <p>Focus is on rigor in inquiry.</p>	<p>Mutual, interlocked influences;</p> <p>Efforts are made to consider what the relevant problem space is, and how this is chosen.</p> <p>The domain of the problem space is selected by a human actor;</p> <p>Focus is on relevance in inquiry.</p>
Values guiding research	<p>Only those which are science-immanent;</p> <p>Objectivity, absoluteness and particularity.</p>	<p>Both science-immanent and external values;</p> <p>Subjectivity, plurality and relativity.</p>
Separability of theory from practice	<p>Strictly separable;</p> <p>Objectivity follows from this premise.</p> <p>Subjective elements are excluded from the process of inquiry.</p>	<p>Theory and practice dialectically related;</p> <p>Subjectivity and relativity follow from this premise;</p> <p>They are inseparable and subjectivity is inherent in the process of inquiry.</p>
Research interest	<p>Technical research interests, potentially emancipatory;</p> <p>Desire to create a solution based on observation of objective 'facts'.</p>	<p>Mainly hermeneutic and emancipatory interests, can provide social techniques;</p> <p>Desire to create a resolution based on interpretation of interaction.</p>
Main language features	<p>Extensional and denotational;</p> <p>Messages, containing meaning (and knowledge) can be transmitted from a sender to a receiver.</p>	<p>Intentional and connotational;</p> <p>Messages are exchanged between an orienter and an orientee; meaning (and knowledge) is not contained in messages but is created by participants in an orientation process.</p>

Individual learning may be described as taking place through sense-making processes as a response to messy and uncertain contexts in which resolutions are sought. Different orders of learning may be identified, based on a cycle of experience and reflection on experience (Argyris and Schon, 1974; Bateson, 1972). Higher orders of learning may involve reflection on sense-making processes themselves, i.e. a learning cycle may become transformed into a spiral. It is possible to describe reflection on sense-making as an exercise in practical philosophy, or investigation of the kind of ‘philosophical doubt’ described by Schutz (Wagner, 1970). The authors believe that certain points follow from this. First, if individual learning is a creative process based in sense-making, then context is clearly important. Any unique individual’s view is based in reflection on experience (Bateson, 1972), and experience is context specific. It is suggested in this work, therefore, that an examination of contextual dependencies, as part of analysis, will be important. The Infological equation (Langefors, 1966) suggests that individuals develop unique understandings (meanings) by examining data in the light of pre-knowledge gained from reflecting on experiencing during a previous time interval. Furthermore, processes of reconstructing new understandings (meaning-shaping), by examining data in light of experience, may be what *constitute* organizations, their goals and cultures. For this reason, we consider it is inappropriate to speak of ‘requirements capture’ or ‘requirements specification’ in relation to the design process, as if there were some ‘requirements’ that are pre-existing. This was expressed by Bednar and Welch (2009, p 228) as follows:

*“Ways in which a problem is defined and redefined when perspectives shift will influence conceptualization and ultimately any proposed solutions. In our view, contextual inquiry forms and agenda for analysis in which individual perspectives can emerge and play a role in a creative process of requirements shaping (see Table 2)*

Table 2: Nature of Inquiry (Bednar and Welch, 2009)	
Decontextualized	Contextualized
External analyst supports users in carrying out their problem definition.	External analyst supports actors in becoming analysts themselves.
Danger that solutions will be sought to problems described (pre-defined), not necessarily problems experienced by users.	Possibility for actors take ownership of the analysis. Solutions sought based on problems as experienced by actors.

Many researchers interested in informing systems ‘design’ have attempted to explore philosophical frameworks based in phenomenology (e.g. Mumford, 1983; Klein, 2006). These researchers recognized the existence of a double hermeneutic, in that they were dealing with autonomous human beings, who also attempted to make sense of their worlds. However, in order to take into account unique individual sense-making processes within an organizational problem arena, we suggest a need for analysts to explore *multiple levels* of contextual dependencies. Since it is not possible to explore a problem space directly from someone else’s point of view, it follows that an external analyst/designer can only play a supportive role in enabling individuals within a given context to explore their own sense-making.

In the authors’ view, exploration of multiple levels of contextual dependency may help to avoid entrapment in various types of reductionism: sociological, psychological or technological. It may also help to eliminate tendencies towards generalization, or substitution of an external analyst’s own views for those of the participating stakeholders. Furthermore, we advocate attempts to go beyond grounding of research in phenomenological paradigms, recognizing a need for critically-

informed understandings of problem-spaces. The authors suggest that, in order to avoid various types of reductionism and introduce ‘philosophical doubt’, analysts might attempt to incorporate philosophy as an integral part of their research practice (Bateson, 1972; Hirschheim et al, 1995).

A reductionist approach, emphasizing artifact design, ignores the possibility of emergent properties, which appear when individual behavior is considered in the context of systems. It is important to note that recognition of emergent properties of a system as a whole is insufficient. An individual actor acting within the context of a human activity system (of which an informing system may be viewed as one special case) may represent emergence of a different order. It is possible that the emergent properties associated with that individual may amount to more than those of the system as a whole, when considering the influence of other systems of which s/he is a component. For example, consider a fashion house as a human activity system. We might view a couturier as one contributing component, if we choose to draw a boundary around a ‘system for supplying ladies clothing’. However, considered as a ‘system for making profits by attracting customers to buy designer fashion wear’, the emergent properties change, as the identity and reputation of the designer becomes an attracting influence (Bednar, 2007). As pointed out by Werner Ulrich in his discussion of boundary critique, perception of a system varies with the stance of the observer (Ulrich, 2001).

In some theories of sense-making, attempts are made to differentiate between an observer’s and another actor’s pictures of ‘reality’. See, for example, work by Dervin (1983). These views are not assumed to be complete or static. Instead, they are characterized by discontinuities. Individuals make efforts to bridge these gaps in a continual process of meaning-shaping. ‘Information’ might here be described as a sense-making/meaning-shaping continuity (re)constructed by a particular individual at a particular moment in time and space, through continual adjustments of perspective. Any observer must attempt to shape meaning in a particular situation by comparing different actors’ apparent perspectives within given criteria, i.e. by carrying out a ‘circling of realities’. Thus, anyone wishing to inquire into informing system use must continually align themselves with an actor’s perspective. For example, the meaning shaping in a particular situation can be described through a comparison of different actors’ perspectives within given structural criteria. When we speak of ‘circling of realities’, we refer to a necessity to acquire a number of different perspectives (in time-space) in order to be able to get a better and more stable picture of a particular actor’s view of ‘reality’. This actor’s view of ‘reality’ is influenced by reflecting on interactions with other actors (Bateson, 1972). It is most important that those considering systems design recognize that they are setting up personal boundaries for a situation by defining it from their own experiences and preferences. We all have pre-understanding of phenomena, formed through the influence of our own values, wishful thinking, and how we as individuals have been socialized into a particular society. See, for instance, Langefors (1966) who discusses how information is created taking into account continuously evolving life experience; or Vickers (1972) who discusses the formation of what he calls ‘appreciative settings’ through a similar process. Bateson (1972) considers the impact of perception of ‘difference’ through continuous reflection upon sense-making. Information, for Bateson, represents a ‘difference that makes a difference.’

Awareness of this process, and attempts to focus upon the understandings and perspectives of the actors/stakeholders, are needed in shaping the requirements for design. The claim to take an actor perspective might seem to be unreasonable, but with the help of what is known as the ‘hermeneutic circle’, the pre-understanding is being reviewed gradually, with the support of ones experience. In other words there is a continual exchange/interchange between an individual’s pre-understanding and experience, and it is within this process that inquiry may progress (Thuren, 1991). Furthermore, a dialectic emerges in such interactions, because each individual is concurrently interacting with others (Hermeneutic Dialectics). Hans-Erik Nissen draws attention to human perception of time (Nissen, 2007). He points out that on some occasions individuals see time

as a linear progression from past to future. In other circumstances, however, individuals perceive time as a cyclical flow. For example we might consider the lifecycle of a frog. Frogs spawn in the spring; tadpoles hatch and grow into new frogs during the summer. These frogs either perish or grow strong during the year. In the winter, they shelter at the bottom of a pond, waiting for a chance to mate next spring, producing spawn. But we know that this is not the same spawn as before; it is the beginning of a new generation. Thus, it is not a life cycle but a spiral. We perceive a helix to form as a metaphor which combines both views of time.

The term 'sense-making' is intended to suggest the idea that people constantly meet gaps in meaning which need to be overcome. People move through life moment-by-moment, step-by-step, by experiencing. A step can be a re-occurrence of previous behaviors but, philosophically speaking, it is always a new step since it takes place in a new moment in time and space. Sense-making relates to that moment when a step in movement is halted and hindered because of all the discontinuities that surround us. We can reflect, like Heraclitus, "*No man ever steps in the same river twice, for it is not the same river and he is not the same man.*" This aspect of human experiencing creates a need to construct new meanings and understandings. In the context of our double-helix metaphor, users and designers must unravel how an individual interprets and overcomes this moment. Why was a gap experienced? How did the individual move strategically or tactically to overcome the gap? How did the individual continue her/his journey after the bridge building (Dervin, 1989)?

In this context, it is important to reflect upon the difference between a conceptual phenomenon and any particular instance of that phenomenon as it is experienced. For example, it is possible for two people to converse about the River Nile, each conceptualizing a similar phenomenon of a river passing through Africa to the Mediterranean Sea. This is, however, different from any particular lived experience of that river in space and time. It is through such confusion between conceptual phenomena and interpretation of lived experience that individuals may become entrapped in assumptions that requirements can be 'captured' – failure to engage with 'philosophical doubt' in relation to meaning-shaping can lead us into false steps when engaging in systemic analysis.

In the next section of the paper, we go on to consider how individuals experience systems in use, distinguishing between the characteristics of usability and usefulness, and exploring the linked processes of use and reflection upon use.

## Thinking about use

Different researchers have conceptualized the term 'information system' in a variety of ways. Nissen (1984), for example, points out that 'information systems' have two distinct dimensions, i.e. they usually include information technology and they are associated with *people* capable of acting as self-steering systems. Checkland and Holwell (1998), make a similar point, suggesting that not one, but two systems are involved – a system to be served (i.e. *people* engaged in activities), and a serving system containing elements which generate data useful to those people. Sauer also points out that an information system is not just an artifact, but that: '*Economic task, organizational, human relations / labor process and technical perspectives are all involved*' (Sauer, 1993, p 10). Claudio Ciborra (2002), points to a tendency within the field of information systems research to adopt perspectives suggested to be associated with outdated perspectives of natural sciences, which researchers proclaim to be 'objective.' Thus, systems professionals may be observing social phenomena and yet insist upon recording their observations using abstractions such as entity-relationship diagrams in order to preserve 'objectivity'. As Ciborra puts it: "*Thus, one tends to forget ... the role of human choice behind the technical artefacts, and study the user side of IS by adopting the methods of natural sciences.*"

The authors of this paper wish to highlight the confusion inherent in treating technical and social domains as if they are either alike or susceptible to 'objective' investigation. Furthermore, we believe use of the term 'information system' itself to be problematic, since it suggests that there is a commodity 'information' which can be readily transmitted from one person to another. Since human beings are required to take part in such a system in order to interpret data and transform it into something meaningful to them, we consider it preferable to refer to a system by which a person seeks to inform herself / himself as a *self-informing system*. Similarly, a system through which a person seeks to support others in informing themselves might be called an *informing system*.

Drawing on work such as Mumford et al (1984) and Checkland and Holwell (1998), it appears to the authors that the question 'What is the purpose of an informing system?' is a relevant one to ask. Design of (i.e. human efforts to purposefully influence change or transformation of) an informing system, which is to be assessed as meaningful from someone's perspective, requires understanding (a process of meaning-shaping) as to what would make it meaningful for that person. However, if people are regarded as essential elements within an informing system, as the definitions above must imply, then a further dimension of complexity is added. *People* cannot be the subject of design by external professional developers. It may be possible only to contemplate design of *use* of an informing system (process), but not of the system itself. Borje Langefors (1966) pointed out in his Infological Equation that each individual creates meaningful information for himself. The equation " $I=i(D,S,t)$ " shows how meaningful information (I) may be constructed from the data (D) in the light of participants' pre-knowledge (S) by an interpretive process (i) during the time interval (t). The necessary pre-knowledge (s) is generated through the entire previous life experience of the individual. This can be viewed as a single helix of experiencing, interpreting and reflecting, because understanding is continually changing as time goes by. We might consider that this reflects Heidegger's words, that objectivity has meaning only for a subject who judges. It follows then that understanding of use is a matter of interpreting by the individual user concerned, through her sense-making processes. We would argue, therefore, that those individuals must own and control the process of development for themselves and cannot delegate such tasks entirely to an external professional 'designer'.

A key purpose for design of systems appears to be to change something for the better, as defined by some participant in, or observer of, that system. Such change may be seen as an emergent consequence from combined individual and organizational learning and sense-making processes (Bednar and Welch, 2005). In order for beneficial change to be brought about, both explicit and tacit organizational norms must be challenged. This requires users of ICT's and actors in organizational processes, both individually and collectively, to contemplate embracing the (as yet) unknown (Bednar and Mallalieu, 2001). Design efforts are contemplating a future problem space without any guarantee of success. Such challenges are often found to be uncomfortable by some participants in organizational life (see, e.g. Walsham, 1992; Argyris, 1990; Mumford, 2003) and thus a political dimension adds further complexity.

We do not intend, in this paper, to define human beings by their use of a technology or process. 'User' should not be perceived as referring to people as important mainly in their role in using ICT artifacts. We prefer to write about 'workers' or to use examples of names of people in their proper professions, when talking about people who use IT artifacts. This helps to break an unfortunate linguistic trend. On those occasions when we refer to 'users' we do not intend to imply assumptions of common characteristics between collections of individual people who are 'users' of particular technologies.

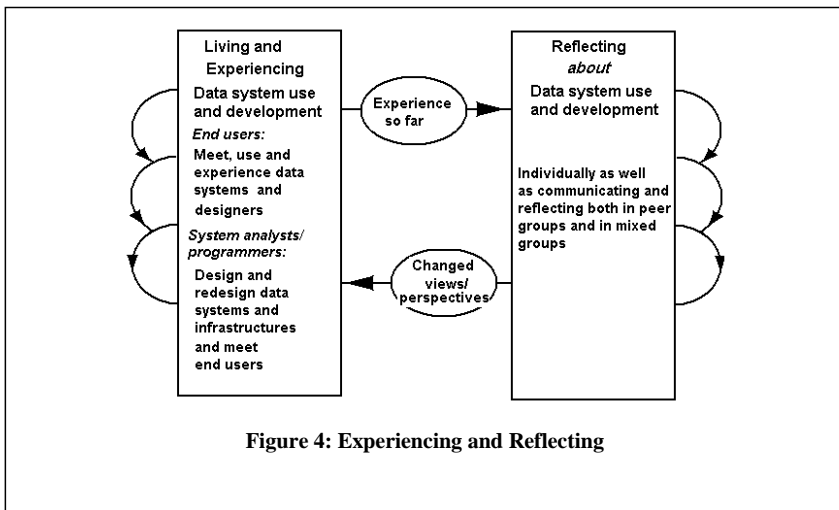
People, as users, interact with ingenious creations of designers in the course of daily life. Each user's experience of use is unique and contextual. Descriptions of people's experiences as users may be made either by themselves or by other observers of use, e.g. analysts (formally or infor-

mally). As use is experienced, so descriptions of use will be interpreted by users and other analysts. Such interpretations will, in turn, lead to change in the experiences themselves in an unfolding process over time, e.g. the experience of driving a car for the first time cannot be repeated. The second drive is a different experience, influenced by interpretation of experiencing the first. Thus, experiencing use can be seen as a spiral, driven on by the interaction of experiencing and interpreting of experience (see Figures 4 and 5).

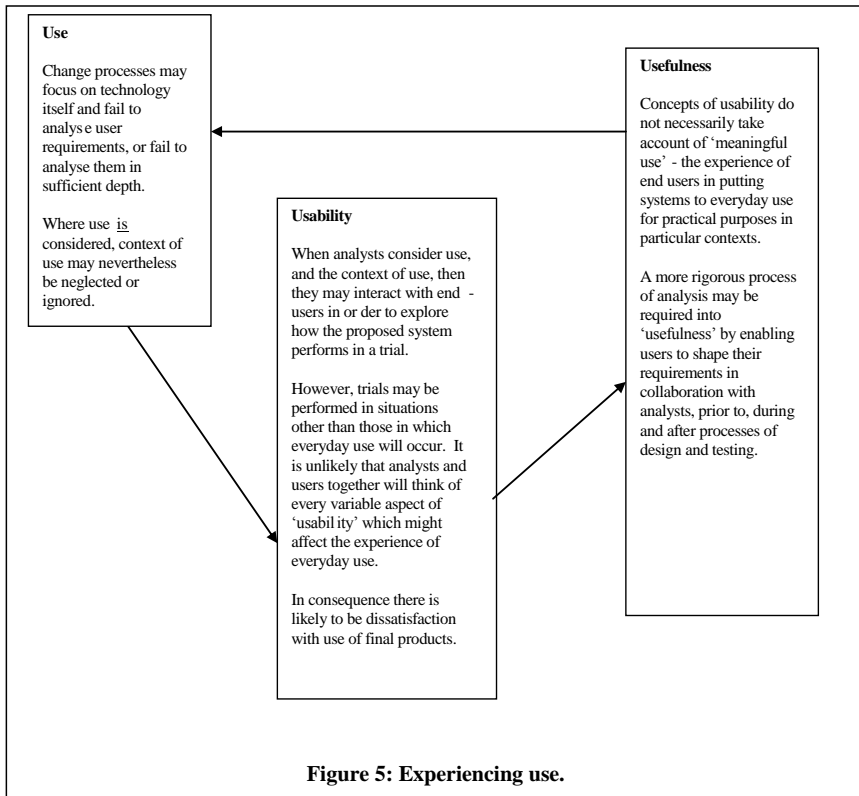
Living, experiencing and reflecting, individually and in various groups we perceive as on-going processes. This we have tried to indicate by the directed arcs suggesting a helix. The diagram shows two interacting helices, which may be described in the following way:

1. Helix one: *Living and experiencing*. This helix relates technological system use and design. End users meet, use and experience systems and their designers. Systems analysts / developers design and redesign systems and infrastructures and meet end users.
2. Helix two: *Reflecting about* system use and design individually, as well as communicating and reflecting both in peer groups and in mixed groups.

We perceive each helix to influence the other. Thinking about use triggers interpretation of the descriptions of experiences made by users and other observers. Such interpretations trigger changes in experience of use and may lead to novel approaches to use, triggering ideas for further ingenuity in design.



Ingenious designers create new technologies aiming to satisfy the requirements of particular use. Such creative thinking begins a spiral in which reflections on use (by users and analysts interacting with them) can lead to modifications in design by focusing on usability (can an artifact satisfy the requirements of use?). Further reflections on usefulness (could the requirements of users be better satisfied than they are?) drive the spiral on by triggering further ingenuity in design. See Figure 5 for an overview of the relation between use, usability and usefulness.



In the context of informing systems, 'Use' reflects a purpose for the system (*what* someone wanted to achieve with it). Designers and developers will have a view of this purpose when they begin an intentional process of creative development. Reflecting upon this purpose as development progresses may lead developers (and/or other participants in the creative process) to consider 'usability' (*how* can the users be supported to pursue that purpose effectively / easily / pleasantly?)

Here, we can consider Gregory Bateson's concept of multiple orders of learning (Bateson, 1972). At lower orders, an individual attempts to make sense of phenomena in order to bridge an epistemic gap. Higher orders of learning occur when the individual reflects upon his own sense-making processes in this context, and upon these reflections themselves. We might see a focus on purpose (*what*) as an instance of what Bateson refers to as zero order learning, whilst reflection upon usability (*how*) may suggest a move to first order, i.e. involving reflection upon the process by which the *what* is achieved.

However, this does not appear to go far enough. Bateson refers to 'informing' in the following way:

*"The explanatory world of substance can invoke no differences and no ideas but only forces and impacts. And, per contra, the world of form and communication invokes no things, forces, or im-*

*pacts but only differences and ideas. (A difference which makes a difference is an idea. It is a 'bit', a unit of information.)" (1972, p. 272/3).*

Our purpose in highlighting these terms (use, usability and usefulness) is to focus upon *cognition*. In order to cognize, we must be able to recognize a phenomenon, i.e. to perceive a difference. Each individual who seeks to make use of an informing system has reasons of her own for doing so, which are both unique and contextual. It is this that we refer to when we use the term 'usefulness' – not *what*, or *how*, but *why* does the individual engage as a participant in the informing system (Bednar and Welch, 2006). This is the difference that makes a difference for her

Unless designers reflect upon 'usefulness' (*why and from whose perspective?*), it is likely that their creative process may focus upon a different problem space than that which is of genuine concern to problem owners (intended 'users'). Consider, for example, a number of well-publicized cases of organizational ICT developments that have failed to deliver the benefits expected from them. In some cases, participants within organizations have reflected that problems arose through conception of the development process as occupying a technological or socio-technical problem space, ignoring cultural dimensions. A shift of perspective on the nature of the problem space has sometimes enabled 'success' to become achievable. We find evidence for this position, for instance, in an experience of Nestlé. In 1998 the company began a project to introduce an Enterprise Resource Planning system (Worthen 2002). Problems were experienced in implementing the new system and after approximately two years, during which it proved impossible to achieve the desired functionality, Nestlé managers realized that what they had initially seen as a purely technical venture was actually engaging with the culture of the company in a negative way. The project was then restarted, taking into account the social as well as technical dimensions of the desired changes. The results this time were found to be more successful. Another example comes from Marchand and Hykes (2006). Here, developers of a new system were congratulated upon a successful project, coming in on time and within budget with apparent functionality. However, it took the company's auditors to point out that the project had really failed – few people were actually using the new system! A further inhibitor of success in such projects may be attributed to an undue reliance on rational planning methods as a basis for decision-making, when actually such methods fail to surface the real, contextually-dependent desires of the actors concerned. Support for this proposition comes from Bateson (1972, above) and also from work by Lindblom (1959) in which he refers to 'muddling through' rather than rational planning as a more accurate descriptor of organizational decision-making. Ciborra (1992) also discusses this phenomenon when he refers to 'bricolage' (see below).

C. West Churchman's (1979) expressed a similar view, as follows:

*"We see again the tragicomedy of rationality pushed beyond the boundaries of its domain. Reflection is one of the strongest instruments of rationality and is also its enemy. When reflection is allowed full sway, then can we really say that the rational approach is the best way of using the human intellect to improve the human condition?" (Churchman, 1979, p. 152).*

When Churchman describes human efforts to negotiate this dilemma, he proposes:

*"... a beginning attempt to say something about an inquiring system that does not feel impelled to choose the best in a class of approaches to the problem of human destiny and yet does not at the same time fall into the trap of relativity" (1979, p.152).*

Experience of living can lead in many different, unexpected directions that cannot be planned or managed in advance (Heidegger, 1962). It follows that any process of design that focuses only on specific purposes (*what and how*) is unlikely to be experienced as satisfying by intended 'users' of the system. In work related to application of formal methods, Claudio Ciborra points out two alternative strategies which developers of an informing system could choose to adopt.



When faced with a novel problem space, a person might first try to make sense of it in a context of her previous experiences in seeking for resolutions. Beginning within familiar competences, and gradually ‘tinkering’ and moving outwards from this base, she might only turn to wider or more formal sources of unfamiliar ‘knowledge’ if her existing competences prove insufficient to the task (see Ciborra, 1992). This first type of strategy, Ciborra refers to as *bricolage*, or improvisation. Similar observations can be recognized in the work of Ehn (1993) related to efforts of going beyond Participatory Design. Ciborra relates the concept of improvisation to the complex world of open source, and how the phenomena of open source as a community has been able to deal with increasingly complex and dynamic software development, through ‘hacking’. This may be contrasted with commonly specified purposes behind more formal information systems methodologies, which assume orchestrated efforts in ‘information systems’ analysis and development. Such methodologies have an appeal to organizational managers in that they appear to offer a possibility of exercising control over resource expenditure, together with the possibility of applying concrete measures of performance with which to evaluate success. However, we suggest that they offer only the illusion of good stewardship, since many formal projects fail to deliver value to the business in practice (see e.g. Marchand and Hykes example mentioned above). Bartis and Mitev (2008) illustrate this how power relations within an organization can influence perceptions of ‘success’ or ‘failure’ in the governance of projects, regardless of the perceptions of the actual users. Referring to their work relating to a project in a large multinational company’s operations in a central-eastern European country, they say:

*...the dominant coalition claimed project success. While the key users did not use the system as intended and the project goals were not achieved, the project committee reported success to the top management board* (Bartis and Mitev, 2008, p 112).

We can reflect that hermeneutically-informed, phenomenological approaches to analysis are a necessary part of the double helix described earlier. In a method for contextual inquiry, such as the Strategic Systemic Thinking framework (Bednar, 2000), we can see a multitude of different roles for users (and other actors) as analysts. They may make descriptions of their own sense-making and experiencing, and reflect upon them. The external analyst (e.g. consultant), on the other hand, both observes her/his own experiencing and assists users (or other actors) in making their descriptions and interpretations. Figures 4 and 5 draw attention to the thinking / reflecting about use side and presents different dilemmas of system analysis/design as against system use.

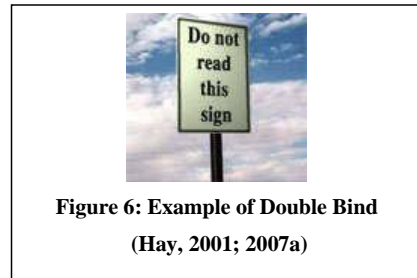
In the next section, we examine the formation of productive learning spirals in the light of Gregory Bateson’s concept of multiple orders of learning. We go on to explore possible methods for promoting learning through exploration of multiple levels of contextual dependencies.

## Double Helix

Informing systems can be discussed as systems of information. Efforts to develop the quality of such systems would incorporate reflection over processes of informing oneself, informing others or facilitating others to do so. This reflection forms part of a learning process. As we have seen, Gregory Bateson (1972) put forward a concept of multiple orders of learning. At lower orders, an individual attempts to make sense of phenomena in order to bridge an epistemic gap. Higher orders of learning occur when the individual reflects upon his own sense-making processes in this context, and upon these reflections themselves. We might again consider this to involve the creation of a double helix. Zero and first order of learning we relate to the ‘first’ helix. The second order of learning we see related to the second helix. When Bateson remarks on his description of order he suggests that ‘the talking and thinking about’ the second order, in its own right, would be outside of the taxonomy. In a sense it would be ‘parallel’ to it or possibly something which could be described as Order 2.5. Reflection as part of efforts to develop the quality of an informing system can be seen to incorporate a number of facets, such as informing environments (at different

levels), delivery systems involving particular technologies and problem specific contextual dependencies. These facets are similar to those explored by Cohen (1999) in his Informing Science framework.

When referring to the metaphor of double helix, we could imagine that when we, as observers, discuss this (as a metaphorical phenomenon) we might do it from a perspective within a 'third' external helix. We might reflect with Gregory Bateson that there is a double bind in our thinking which relates to the double helix theme. As conscious human beings, we have no choice but to reflect (see Figure 6). Bateson suggests that efforts to adopt a third party perspective (an imaginary outsider parallel) may help to break out of double bind, i.e. in our view an observer perspective brings out creation of a triple helix. (For a discussion of Bateson's double bind theory, see below).



**Figure 6: Example of Double Bind**  
(Hay, 2001; 2007a)

Werner Ulrich (2001; 2006) discusses research as a means to promote reflective societal practice. He points to three indispensable qualities for *reflective competence* (in relation to one's own claims and those of others). It must be:

1. *self-critical*: the effort of systematically examining one's own premises through self-reflection and dialogue, with a view to carefully qualifying the meaning and validity of one's claims;
2. *emancipatory*: working actively to help others in emancipating themselves from one's claims, as well as from theirs; and
3. *ethically alert*: making transparent to oneself and to others the value implications of one's claims, and limiting these claims accordingly (Ulrich, 2006, p16).

To us, Ulrich's three qualities described above reflect the same characteristics of critical systemic thinking that we recognize in the work of Gregory Bateson, i.e. a focus on self-emancipation through systemic meta-reflection from unique individual perspectives of autonomous and self-reflecting systems.

The question for us all to address is how we should conduct hermeneutically-informed, phenomenological inquiry into human activity systems in a practical setting. We discuss some examples of approaches which attempt to do this, below. The first of these relates to the specific context of professional practice in systems analysis. Here the focus is on inquiry into complex problem spaces in an organizational setting (e.g. ICT development as an instance of organizational change). The second example focuses on image as a therapeutic catalyst in the context of dysfunctional relationships within human activity systems.

The Strategic Systemic Framework (see Figure 7) is an example of an approach to contextual inquiry that may be helpful in empowering individuals to break out from prejudices and explore their own perspectives in order to escape from a double bind (e.g. Bednar, 2000). The process of the SST framework includes three, interrelated aspects (intra-analysis; inter-analysis and value analysis). All aspects incorporate tools and techniques that support actors, both in the process of elaboration and in the process of categorization of messages. The intra-analysis aspect is intended to support creation of a learning spiral, as actors are supported to reflect and think about a problem space with this collection of tools and techniques. In inter-analysis, actors are supported in creating a learning spiral that focuses on communication of their individually-created narratives,

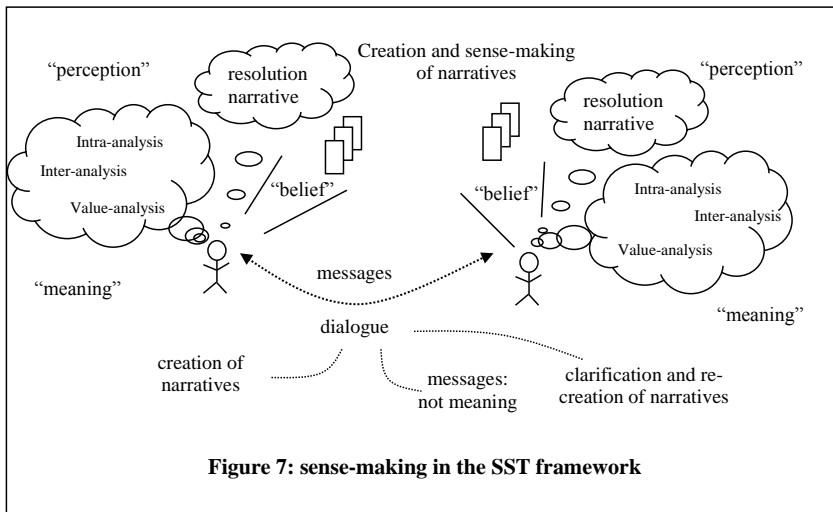
and sense-making of others' individually-created narratives. In value analysis, actors are supported, both individually and in group interaction, to create a learning spiral that focuses on reflecting and thinking about the scale of 'measurement'. What is worthwhile as a scale of comparison for evaluating narratives, and assessing how they will be evaluated?

Bednar and Welch (2009 page 229) comment on the issue with the following:

*"The concept of contextual dependency is of interest because it supports a focus of inquiry on unique individuals, and their beliefs, thoughts and actions, in specific situations and contexts. This kind of inquiry is intended to provide support to individuals in a contextually dependent creation of necessary knowledge. This in turn enables successful communication, analysis and, eventually, IS development to occur."*

All three aspects together are intended to support people in creating a frame of reference for reflection over their process of inquiry. Each aspect may be described using the metaphor of a helix; and together they 'form' an intertwined, double helix upon which participants may reflect.

Unfortunately, in organizational life as it is experienced, phenomena occur that can inhibit higher orders of learning (as described by Bateson, 1972) and prevent the formation of creative learning spirals such as that reflected in the double helix metaphor.



Argyris (1990) highlights a concept of 'defensive routines' in relation to organizational behavior. From time to time in organizational life, people are confronted by a need for uncomfortable choices, or have to give one another 'bad news. Often, they prefer to avoid unpleasantness and/or conflict in their workplace, and so they become quite skilled in adopting routines of avoidance. Argyris coined the term 'skilled incompetence' to describe such phenomena. These routines have an effect of ensuring that the status quo is maintained, and difficulties appear to be addressed when practically they are ignored. Argyris points to a discrepancy that often occurs between espoused theories (i.e. what people think they do) and theories in use (what it appears to other people that they do in practice). A variety of emotional responses called forth by experience of organizational life may conflict with each other, or may conflict with more reasoned assessments of

necessary action. The phenomenon of defensive routines represents an emotional, rather than a rational response. People exhibit neither perversity nor stupidity in adopting these routines but pursue them while scarcely aware that they are doing so. Argyris observes that, even where there is a positive organizational discourse about change, defensive strategies may operate to block progress with projects or plans designed to affect it. Further support for this view comes from Brunsson (2002), who points out how organizational discourse (talk) may be at odds with decisions and actions taken. He describes a phenomenon of ‘hypocrisy’ that is similar to Argyris’ idea of defensive routines – decisions are sometimes taken in order to avoid action, rather than to bring it about. However, Brunsson’s view is that conflict within organizations is healthy, and that it may be better for problems to remain unsolved, since this leads to more opportunity for reflection and discussion (what Argyris might term opportunities for double-loop learning to occur). In Brunsson’s words:

*“Insoluble problems are a splendid vehicle for the reflection of many ideas and values. They can be endlessly discussed from all sorts of angles and without ever reaching a conclusion. Solutions that can reflect an equal variety of ideas are rare indeed”* (2002, p.23).

Clearly, the potential for defensive routines to emerge will depend very much on individual and organizational sense-making processes and their expression in organizational culture. Weick (1995) comments as follows:

*“What is unique about organizational sensemaking is the ongoing pressure to develop generic subjectivity in the interest of premise control and inter-changeability of people. Generic subjectivity is developed through processes of arguing, expecting, committing, and manipulating. These four processes produce roles that create interchangeability, and they produce arguments, expectations, justifications, and objects that become common premises for action. These same four processes dominate the more intimate intersubjective interactions where innovations in arguments, expectations, justifications, and objects are formed”* (Weick, 1995, p.170).

We see similarities between the perspectives of Argyris and Weick and Gregory Bateson’s work on double bind theory (Bateson, 1972). It is interesting to compare the following discussion of this theory with the quotation from Weick, above:

*“Psychologists commonly speak as if the abstractions of relationship (‘dependency’, ‘hostility’, ‘love’, etc) were real things, which are to be described or ‘expressed’ by messages. This is epistemology backwards: in truth, the messages constitute the relationship, and words like ‘dependency’ are verbally coded descriptions of patterns immanent in the combination of exchanged messages ...*

*“But to act or be one end of a pattern of interaction is to propose the other end. A context is set for a certain class of response.*

*The weaving of contexts and of messages which propose context – by which, like all messages whatsoever, have ‘meaning’ only by virtue of context – is the subject of the so-called double-bind theory”* (Bateson, 1972, p.275).

The theory of double-bind deals with a phenomenon of transcontextuality, in which the weaving of messages which propose context leads to ‘tangles’ in the rules for making transforms and consequently individual sensemaking processes experience confusion. Bateson points out (1972, p.273) that all organic systems (of which people are an example) are capable of adaptive change. Thus, they are capable of deuteron-learning:

*“Whatever the system, adaptive change depends upon feedback loops, be it those provided by natural selection or those of individual reinforcement. In all cases, then, there must be a process of trial and error and a mechanism of comparison.*

*But trial and error must always involve error, and error is always biologically and/or psychically expensive. It follows therefore that adaptive change must always be hierarchic.*

*There is needed not only that first-order change which suits the immediate environmental (or psychological) demand but also second-order changes which will reduce the amount of trial and error needed to achieve the first-order change. And so on. By superposing and interconnecting many feedback loops, we (and all other biological systems) not only solve particular problems but also form habits which we apply to the solution of classes of problems.*

*We act as though a whole class of problems could be solved in terms of assumptions or premises, fewer in number than the members of the class of problems. In other words, we (organisms) learn to learn, or in the more technical phrase, we deuteron-learn” (Bateson, 1972, pp 273/4).*

Difficulties arise for us as human beings when the habits we form through deuteron-learning come about through the confusion of double-bind. Acting upon taken-for-granted assumptions about the class of problem a particular context represents, we may be led unawares to take those false steps described by Argyris as ‘skilled incompetence’ or ‘defensive routines’. In effect, we are learning how not to learn. Reflecting in the context of alcoholics’ efforts at recovery through the programmes of Alcoholics Anonymous, Bateson goes on to point out that escape from double bind requires establishment of a new personal epistemology in the subject. He discusses the impact of the Serenity Prayer with which each meeting of AA is commenced: *Grant me the serenity to accept those things that I cannot change, the courage to change those things that I can, and the wisdom to know the difference.* Bateson comments:

*“If double binds cause anguish and despair and destroy personal epistemological premises at some deep level, then it follows, conversely, that for the healing of those wounds and the growth of a new epistemology, some converse of the double bind will be appropriate. The double bind leads to the conclusion of despair, ‘There are no alternatives’. The Serenity Prayer explicitly frees the worshipper from those maddening bonds” (Bateson, 1972, pp 334/5).*

We reflect that, in order for individuals to escape from the double bind that leads them to adopt Argyris’ defensive routines, a converse influence is required to enable them to challenge taken-for-granted assumptions. Brunsson’s argument for the benefits of insoluble problems (Brunsson, 2002, p. 23 cited above) may be viewed as an example of such a converse influence. Another, we suggest, is provided through the concept of ‘diversity networks’ in relation to the Inter-analysis aspect of the SST framework (Bednar, et al, 2008). An essential principle underpinning Strategic Systemic Thinking is that individual people are not constrained by a need for bi-valued logic. In everyday life as it is lived, we do not always respond to a question with ‘Yes or No’ or ‘True or False’ but often we answer ‘It depends’ or even ‘Yes and No’. Human beings have no difficulty in holding in mind values or propositions that conflict (see Table 3). Thus, in any problem situation, a human being can contemplate a paradox within or between particular proposed resolutions. However, many vehicles for organizational decision-making, be they meetings to discuss a problem situation or systems designed to provide support to decision-takers, are based on a presumed need for consensus around non-paradoxical solutions. A key purpose of the SST framework is to support creation of a rich ‘knowing’-base about problem situations, which takes into account individual perceptions of contextual dependencies at multiple levels. A process for creating such a knowing-base, such as SST, includes support for postponement of any search for consensus while actors explore their own and one another’s understandings. The framework supports employment of several levels of four valued logic in order to create representations of ‘diversity networks’, i.e. overviews of the range of opinion among a group of interested actors, arising from their individual narratives created in their Intra-analyses.

Table 3: A model of four-valued logic (e.g. para-consistent logic)

<i>Assertion of Negative Belief</i> 'I do not believe that a resolution for this problem space can be achieved'	<i>Assertion of Possible Belief</i> 'I believe there it may be possible to resolve this problem space, but I don't currently know how'
<i>Assertion of Positive Belief</i> 'I believe that a resolution for this problem space can be achieved'	<i>Assertion of No Belief</i> 'I can offer no opinion whether or not a resolution for this problem space can be achieved'

The first level in creation of a diversity network is formed when individual actors explore their personal, contextual analyses of a problem scenario. Table 1 shows that a range of possible responses emerges. Each individual's articulated narrative can be classified during inter-analysis by means of these four values. It is then possible to progress to a second level, in which those narratives expressing positive or possible belief are fed back to the whole group of actors. Each then creates her own narrative about that particular possible resolution. These responses can again be classified according to the four values shown in the Table. The process is repeated for each positive assertion, building a diversity network. This becomes a depiction of the collective, individual 'knowing' within the group upon which they may reflect further in seeking for resolutions. This is, of course, an idealised view of a process because, once an inquiry is on-going, it becomes a dynamic, flexible and ever-changing phenomenon.

Another approach supporting individuals to break out from entrapment of mind can be found in the work of Hay (2001; 2007a; 2007b), relating to image as a therapeutic catalyst. Here, she uses visualization of an outside perspective to support individuals caught in a double bind in e.g. dysfunctional family relationships through games using computer animation. It reflects Gregory Bateson's idea of an "Infinite dance of changing coalitions" (Bateson, 1972; pp 240-242), which is itself a translation of Von Neumann and Morgenstern's game theory.

Human sense-making is the essence of the creative dialectic in the helices to which we refer. We reflect that the concept of senses can be used in different ways. We might understand our senses to involve the input of perceptions of lived experience to our human consciousness, i.e. the 'now'. However, it is also possible for us to conceive of senses as those of the imagination and human emotions (e.g. as conceived by in contexts of art, emotional intelligence, etc.). Here, the senses are released from 'now' and can 'experience' the past or the future as well. Why is it difficult to connect reflection with use (or reflection on analysis with design practice)? This may be due to cultural and social aspects of our environments.

Figure 8 is an illustrator's view on the double bind in society (Hay, 2001; 2007a). It shows marshmallows (representing individual people) caught in a double bind. Each 'soft' marshmallow experiences 'pain' in its encounters with 'spiked' fellows. As a response, it grows spikes of its own. When marshmallows with spikes get together they are more prone to get stuck, reflecting entrapment. We can draw a parallel with entrapment of mind which can occur when human individuals espouse a paradigm equating to Bateson's first order learning and are not able to move beyond to embrace second order learning (e.g. reflection on thinking).

*'Individual emergence could mean unraveling entrapment through the identification of double binds and 'mixed messages', in short the re-learning of leveling patterns of communication and there is an irony that this can be done through therapy using double-binds'* (Hay, 2001; 2007a).

Hence, efforts at reflection on ones own behavior from an observer's stance might break into this cycle of harmful responses and encourage a beneficial dialogue. This can be viewed as breaking away from a single helix of experience, interpretation and reflection.

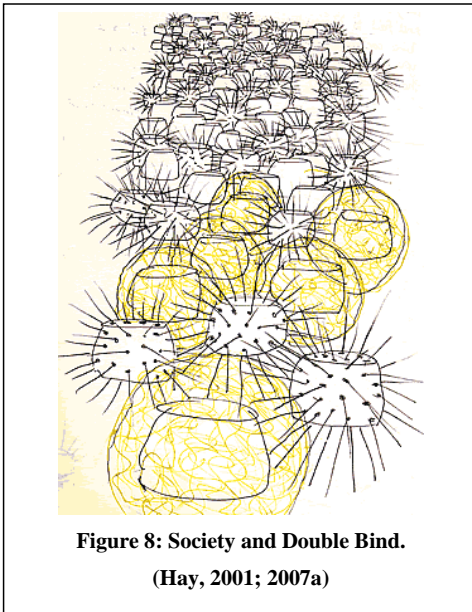
In both the examples discussed above, we can see how individual understandings, and reflection over these understandings, are continually changing in interaction with other people as time goes by. It is for this reason that we highlight a need to consider multiple levels of contextual dependencies. We might also consider, paraphrasing Heidegger's words, that inquiry into usability and usefulness has meaning only for the particular subject who judges (e.g. Heidegger, 1962).

## Conclusions

In this paper, we explore the proposition that separation of (and confusion between) reflecting over use and usability, on one hand, and usefulness on the other, are open to question. We see support for this view in discussions such as that referred to in the 6th annual National Colloquium for Computer Security Education 2002:

*'Most representatives and speakers talked of information assurance programs at the bits and bytes level, with research agendas heavy on technology, including loss leaders like public-key infrastructure. And while speakers touted forensics programs, intrusion-detection and prevention programs, security standards development and other technical programs, there was little talk about business value and critical thinking'* (Radcliff, 2002).

It appears that there were a few individual speakers, such as Professor Nimal Jayaratna, who deviated from the main stream and suggested that *'We need a fundamental re-think about security education issues'*. Some educators, like Alexander Korzyk *'questioned whether information security should remain in the computer science discipline at all or be moved to areas of study more reflective of business risk issues'* (Radcliff, 2002)



**Figure 8: Society and Double Bind.**  
(Hay, 2001; 2007a)

This is to us another example of the great importance we ascribe to reflecting on overall usefulness from end users' points of view. However, it is not obvious how reflecting would be encouraged in practice. We believe that the metaphor of the double helix described in this paper, may provide a vehicle for discussion - a step in the right direction.

In this paper, the authors have attempted to draw a distinction between the dialectic relationship of experiencing and designing of artifacts/processes, such as communication and information technology devices, and the more complex relationship which must be surmised to subsist between use and design in informing systems. We have done this by highlighting differences between the terms use, usability and usefulness in this context. The inherent complexity of such processes is a function of the nature of informing systems as a special case of

a human activity system, in which people form an essential part of the system itself. The double helix metaphor is considered by the authors to be helpful as a means to examine complexities in such a relationship. The contribution of this paper is to support systems analysts in their efforts to cognize, and to recognize, continuities of experience and reflections upon experience in their practical inquiries.

From a philosophical perspective, the authors have highlighted the importance of a hermeneutically-informed, phenomenological approach as a means to challenge presuppositions which might be taken for granted. Such an approach also helps us to avoid a fallacious emphasis on objectivity, which is inappropriate when examining individual reflections on experiences (use of the plural 'experiences' here is intended to emphasize the uniqueness of individual perspectives). Dangers involved in an artificial separation between observations made and the unique perspectives of observers, leading to a loss of critical awareness are also highlighted. Methods of inquiry based in multiple levels of contextual inquiry are suggested as a means to empower individuals to reflect upon their experiences of use. In developing informing systems, they need to consider not just *what* and *how* and *on whose behalf*, but also the *why*, and *from whose point of view* – as this reflects the difference that makes a difference.

We have introduced two examples of approaches to inquiry into human activity systems which draw upon hermeneutically-informed, phenomenological perspectives. These are the Strategic Systemic Thinking Framework (Bednar, 2000) and image as a therapeutic catalyst (Hay, 2001; 2007a; 2007b). Both of these exemplify efforts to put critical systemic thinking into practice, influenced by work by Gregory Bateson.

Individual and collective sense-making processes are discussed in relation to learning about experiencing use in relation to designing. The authors discuss a need to go beyond the concept of the 'hermeneutic circle'. We discuss how an individual gradually reviews her own pre-understandings, with the support of experience, in a continual exchange/interchange between those pre-understandings and experience. Additionally, it is necessary to include interactions between individuals as a part of the analytical process. A recognition that people are reflecting and experiencing in interaction with other people (who are also reflecting and experiencing) supports awareness of a double hermeneutic through which a dialectic emerges. It is only through this recognition that critically-informed, systemic inquiry is enabled to progress. We perceive the phenomenon of a continuing flow of human experiencing and reflecting, not as a circle, but as a multifaceted spiral of learning about, and experience of, use, usability and usefulness over time.

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## Complex methods of inquiry: structuring uncertainty

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This text is about a journey. This journey began when I worked as a professional engineer, and progressed over a period of 20 years during which I worked as a professional analyst, academic and teacher, and engaged in reflective study, reading and thinking. In the sections that follow I describe the thinking by which I came to focus upon certain concepts as crucial for effective Systems Analysis/Inquiry, and to develop my own perspectives on those concepts, which later formed the foundation for a body of work comprising more than 100 publications. The work is thus the result of reflection on success and failure, thinking and re-thinking, including a consequential struggle for conceptualization and understanding.

The first section is an introduction, summarising the essence of the thesis that is elaborated in these documents. This section effectively explains the substance of the thesis and sets out my original contribution to the Information Systems field. The next section is a reflective commentary on words, assumptions and ideas influencing contextual inquiry, after which is a section on Primary Contribution, including a short summary of, and introduction to, Contextual Inquiry. An overview of the selected papers is set out, including a structured analysis of the papers that shows where the key themes are taken up and developed within the body of work. The selected full papers accompany this document.

