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Making Sense of IS Research in a Complex World

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Abstract

Interpreting results of qualitative research has been regarded by many as difficult fraught with accommodating multiple points of view in complex problem domains. It is recognised (Denzin & Lincoln, 2000) that there is no clear or straightforward solution to interpret qualitative research results.

In this paper, sense-making conceptual models (SCMs) are explored as both a generic and an individual set of skills required by qualitative researchers in information systems. Interpretive sense-making is first put in context with the multiple meanings of sense-making. Sense-making is then situate within phase five of Denzin & Lincoln's (2000) 5-phase qualitative research framework. The important role of sense-making in coping with complexity and uncertainty in interpreting qualitative research results is discussed next. Sense-making is then situated both within the five-phase research process and six-stage reflective level model based on Bain, Packer, & Mills, (1999).

Characteristics of symbolic SCMs for qualitative research data interpretations are then described and situated within appropriate interpretive thinking frameworks for static, evolutionary and revolutionary times. Although SCMs are independent of any qualitative research method, an SCM needs to be aligned with the chosen research method, the individual researcher and the research area. SCMs inhabit a theoretically rich, multi-factored sense-making landscape, and provide the basis for interpreting qualitative data in information systems research. Finally, the characteristics of one revolutionary SCM are described.

Keywords Sense-making, conceptual models, qualitative research

Introduction

In this paper sense-making concepts are explored and sense-making conceptual models (SCM) are placed in context in the sense-making literature making a differentiation between rhetoric and symbolic sense-making (Lincoln). SCMs informed both by systems theory and complexity for interpreting qualitative research results in information systems are then described, both as a generic tool and for the individual researcher. Finally a case study drawn from research in the literature on interactive interface design considerations is used to demonstrate the importance of SCMs to assist in interpreting qualitative research results.

Although SCMs are independent of any qualitative research method, an SCM needs to be aligned with the chosen research method, the individual researcher and the research area. SCMs inhabiting a theoretically rich, multi-factored sense-making landscape provide the basis for interpreting qualitative data in information systems research.

Klein & Myers (1999) nominate 'a principle of multiple interpretations' with three basic foundations for interpretive research in information systems: establishing philosophical foundations; building interpretive social theories and advanced interpretive research methods; and establishing guidelines to evaluate interpretive research in information systems. It is however debatable if a rigid categorisation of interpretive devices is more appropriate to making sense of qualitative research than a rich landscape of clustered evolutionary, individual revolutionary or isolated static SCMs that are able to accommodate complex and multiple meanings. Multiple interpretations imply multiple world-views and theories, as well as ambiguity and conflict.

Paper Orientation

In this paper the following underlying theories and philosophies have informed the discussion on sense-making:

- General systems theory, particularly soft systems methodology (Checkland, 1984);
- Evolutionary model formation (Fielden & London, 2001);
- The nature of qualitative evidence (Lincoln, 2002);
- Bain, R., Packer, & Mills (1999) five-level model for levels of reflection in student learning
- Sense-making in information systems development (Glynn); and
- Multiple points of view incorporated in systems theory (Hutchinson & Warren, 2001), complexity theory (Stacey, 1996), (McKenna, 1999)and emergence (Plsek, Lindberg, & Zimmerman, 1997).

Sense-Making

Glynn (1997) defines sense-making as an approach to deal with ambiguity. In her research on the systems development process she discovered that sense-making was a conceptual strategy at both the individual and group levels. Sense-making has been described as interpretation coupled with action (Thomas, Clark, & Gioia, 1993; Weick, 1995) that is required to interrelate the construction of meaning into outcomes. Glynn (1997) has distilled out seven sense-making properties: being grounded in identity construction, retrospect, enactive of sensible environments, social, ongoing, focussed on extracting cues, and driven by plausibility rather than accuracy. Because sense-making encompasses a level of ambiguity, data gathering by a standard means such as a questionnaire does not provide a sufficient tool upon which to make sense of the rich and ambiguous data inherent in qualitative research.

Davidson (1996) identified five sense-making devices categories in her research on the influence and role of sense-making devices for negotiation and communication and the implications for systems development processes. These are: narrative histories; organizational stories; personal stories; scenarios-of-use and vignettes; and metaphors. Lissack (1997) suggests that all meaning making is via languaging and word usage. Davidson (1996) on the other hand describes four types of artefacts used in the systems development process – analytical models, information technology (for instance existing systems and purchased software packages), project work plans and systems development and project documents. It is in the realm of technical artefacts that the SCMs described in this paper are situated. Such technical artefacts are only sense-making devices when communication is between like-minded and equivalently skilled communicators, as is the case in of bringing sense to qualitative research results in information systems. Lincoln (2002) suggests that qualitative researchers are both 'literary (i.e. rhetorical reasoners) and symbolic reasoners (i.e. interpretive thinkers)'. It is in this second role of the interpretive thinker that SCMs are sense-making devices. Wolcott (1994) states that there are three major activities in qualitative research – description, analysis and interpretation: all qualitative research has these three elements and the hardest task to accomplish successfully is interpretation.

Sense-Making in Information Systems Research

Denzin & Lincoln (2000) states that qualitative research is a five-phase activity (Table 1). Sense-making is informed by others' interpretations (consulting the literature in research); local interpretation schemes within the application domain and the academic environment of the information systems researcher; and the researcher's own predisposition and purpose, past experience and current skill level. It is however only at phase 5 that interpretations made and reported are addressed in this paper.

Klein & Myers (1999) nominate 'a principle of multiple interpretations' in their guidelines for evaluating interpretive research in information systems. Multiple interpretations imply multiple world-views and theories, as well as ambiguity and conflict. This implies the need for sense-making conceptual devices to interpret qualitative research results.

It is debatable if a rigid categorisation of interpretive devices is more appropriate to the rich landscape of clustered evolutionary, individual revolutionary or isolated static SCMs accommodating complex and multiple meanings.

Table 1. The Research Process (Denzin & Lincoln, 2000, p. 20)

Phase 1: The Researcher as a Multicultural Subject History and research traditions; conceptions of self and others; ethics and politics of research
Phase 2: Theoretical Paradigms and Perspectives Positivism, postpositivism; interpretivism, constructivism, hermeneutics; feminism(s); radicilised discourses; critical theory and Marxist models; cultural studies models; queer theory
Phase 3: Research Strategies Study design; case study; ethnography, participant observation, performance ethnography; phenomenology, ethnomethodology; grounded theory; life history; historical method; action and applied research; clinical research
Phase 4: Methods of Collection and Analysis Interviewing; observing; artefacts, documents and records; visual methods; autoethnography; data management methods; computer-assisted analysis; textual analysis; focus groups; applied ethnography
Phase 5: The Art, Practices and Politics of Interpretation and Presentation Criteria for judging adequacy; practices and politics of interpretation; writing as interpretation; policy analysis; evaluation traditions; applied research

Sense-Making, Complexity and Uncertainty in Information Systems Research

Wynn (2001) suggests qualitative research in information systems is so complex that there is a demand for research to incorporate many different kinds of descriptors, measures and insights. Qualitative researchers who utilise thinking devices that can be categorised as SCMs are more likely to capture more of the richness offered (Pervan, 1998; Urquhart, 2000)

Sawyer (2001) had difficulties integrating multiple data sets gathered from within different research paradigms; he maintained that this integration requires great intellectual flexibility. Awareness of these difficulties in making sense of qualitative research results in the complex world of information systems research underpins this paper.

Sense-Making and Reflexivity in Information Systems Research

Bleakley (1999) discusses holistic reflexivity as going beyond a purely mental event to reflection grounded in practice. He hones this notion of reflection-in-action where the locus for reflection is not on the individual (de-contextualised), but the total event involved in embedding the act in a context. He maintains that this holistic reflexivity has within it a degree of sensitivity to the whole of the action in context. Such reflexivity is a necessary skill for the IS researcher to interpret qualitative results. Without reflexivity, the researcher is unaware of the model-forming process and does not gain access to the flexibility and adaptability of evolutionary SCMs (Fielden & London, 2001) or the insightful, emergent revolutionary SCMs (Fielden, 2002). An information systems researcher who has not honed reflexive skills is confined to rigid mental models that do not serve well the interpretation of qualitative research results in a complex world.

The researcher's ability to deal with uncertainty and emergence is another factor to consider. To become a competent reflective researcher — a level of familiarity and awareness, if not comfort, is required to develop the self-awareness necessary to reflect on data gathered and analysed (Schultze, 2001). In (Bain, R., Packer, & Mills, 1999), levels of reflection in student learning have been adapted to establish researcher reflection across three qualitative research methods: action research (Carr & Kemmis, 1991), case study (Stake, 2000) and grounded theory (Glasser, 1992; Glasser & Strauss, 1967) (Table 3).

Difficulties experienced by researchers in making sense of qualitative research results can be seen in the conceptual jumps required in levels of reflection, particularly in case studies, where the researcher is situated at the second reflective level **[R2],** responding; interpretation is required at the fifth reflective level **[R5]**, reconstructing. A major dilemma with grounded theory is that the researcher is required to reach reflective level 4 **[R4**], reasoning; but the imbedded theory is situated at level 2 **[R2]**, responding. Action research requires a higher order reflection from the researcher at all times.

Level 6 **[R6]** is usually displayed in research outputs when the researcher is considering future directions for research, for practical solutions in the research domain, or in the construction of new theories, models or SCMs. It is not necessarily an output of a particular emergent research method.

Table 2. Levels of Reflection adapted from (Bain et al., 1999)

Level 1 (reporting) [R1]	• The researcher describes, reports or re-tells with minimal transformation, no added observations or insights.
Level 2 (responding) [R2]	• The researcher uses the source data in some way, but with little transformation or conceptualisation. • The researcher makes an observation or judgement without making any further inferences or detailing the reasons for the judgement. • The researcher asks a 'rhetorical' question without attempting to answer it or consider alternatives.
Level 3 (relating) [R3]	• The researcher identifies aspects of the data which have personal meaning or which connect with their prior or current experience. • The researcher seeks a superficial understanding of relationships. • The researcher gives a superficial explanation of the reason why something has happened or identifies something they need or plan to do or change.
Level 4 (reasoning) [R4]	• The researcher integrates the data into an appropriate relationship, e.g. with theoretical concepts, personal experience, involving a high level of transformation and conceptualisation. • The researcher seeks a deep understanding of why something has happened, looks for causal and/or emergent relationships. • The researcher explores or analyses a concept, event or experience, asks questions and looks for answers, considers alternatives, speculates or hypothesises about why something is happening. • The researcher attempts to explain their own or others' behaviour or feelings using their own insight, inferences, experiences or previous learning, with some depth of understanding. • The researcher explores the relationship between theory and practice in some depth.
Level 5 (reconstructing) [R5]	• The researcher displays a high level of abstract thinking to generalize and/or apply learning. • The researcher draws an original conclusion from their reflections, generalizes from experience, extracts general principles, formulates a personal theory or takes a position on an issue.
Level 6 (construction) [R6]	• The researcher creates/extends new knowledge or extends knowledge about epistemology and ontology.

Solutions and Recommendations: Sense-Making with Conceptual Models

In this section, sense-making conceptual model landscapes are discussed as a possible solution to the difficult task of interpreting qualitative research results in information systems. Analysis of action research (Carr & Kemmis, 1991), case study (Stake, 2000) and grounded theory (Glasser & Strauss, 1967) with an adaptation of (Bain et al., 1999) reflection model suggests that qualitative researchers are not equipped with appropriate reflection skills.

One way of addressing this dilemma is familiarization with conceptual model landscapes as a reflective device. These conceptual model landscapes are both generic and individual, and may be static, evolutionary or revolutionary in nature (Figure 1).

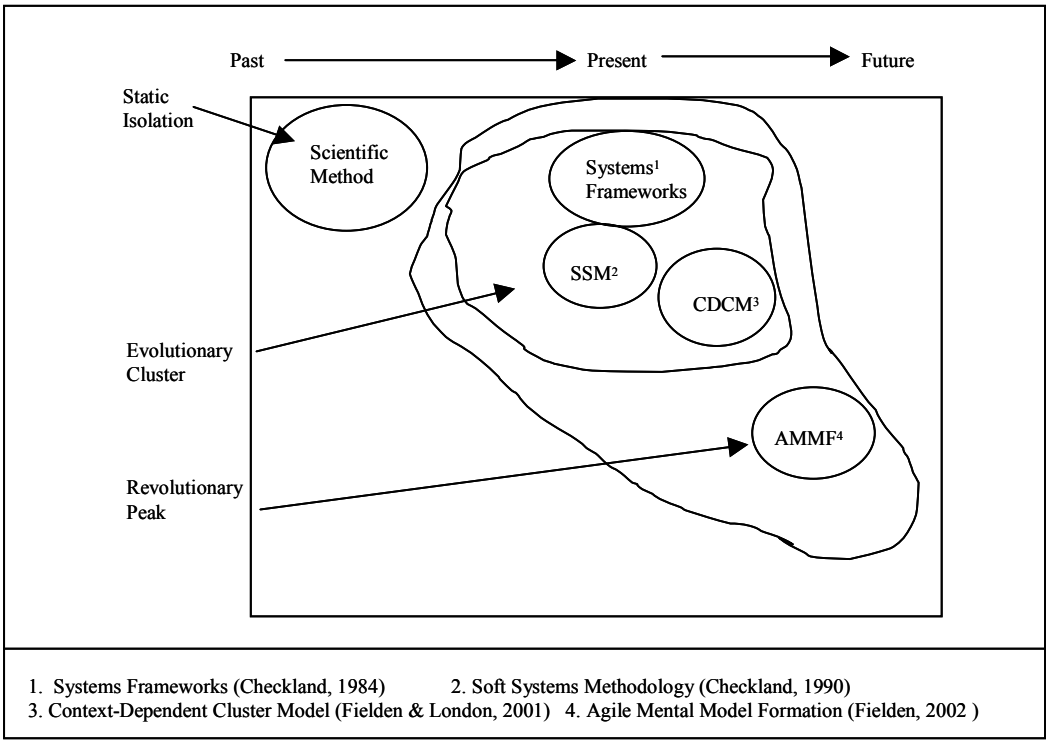

Figure 1. The SCM Landscape

Characteristics of Symbolic SCMs for Qualitative Research Data Interpretations

Symbolic (rather than rhetoric sense-making conceptual models) (Lincoln, 2002) formed generically and individually, are influenced environmentally, culturally and socially - both by academia and the particular application domain.

Symbolic SCMs are formed when existing mental models do not help in the sense-making process of an individual researcher. SCMs may evolve collaboratively when researchers work within a research community. SCMs are also bounded by the dominant research academic paradigm. This is usually achieved by grounding the research area being explored in existing literature. An interesting corollary to this is that the dominant research academic paradigm necessarily gives rise to the formation of evolutionary SCMs.

Symolic SCMs are independent of qualitative research methods. These symbolic SCM landscapes are multi-factored and have within them —clusters of evolutionary SCMs, peaks of revolutionary SCMs and isolationist static SCMs.

Effective symbolic SCMs are aligned with the qualitative research method being employed and its underlying philosophy and culture; are formed in a political climate both academically and in the information systems research application domain; are most likely to be evolutionary; but may also emerge insightfully within a qualitative research domain. Such SCMs are like neighbouring peaks that stand apart from an evolving cluster of SCMs (Figure 1).

Static SCMs are not likely to be an effective interpretive tool for an information systems qualitative researcher.

Sense-Making and Mental Model Formation in Static Times

In static times, traditional mental models may exist within a culture - organisational, social or technological; the way the world is interpreted need not change. Such model formation constitutes a closed system.

Boulding (1956) suggests that such model formation is a source of vulnerability in systems. Even with small disturbances within a system, there is no flexibility to cope with a changed situation. Mechanistic interpretations of information systems research results are more likely to be vulnerable than the dynamic, flexible interpretations formed with either evolutionary or revolutionary SCMs.

Sense-Making and Mental Model Formation in Evolutionary Times

In evolutionary times, mental model formation is contained by and oscillates around existing fixed mental model frameworks. Both evolutionary mental model formation and static mental model formation are bounded closed systems (Figure 1). Dominant paradigm mental model formation (both fixed and evolutionary) is contained within a context of environment, culture, education and/or discipline area. Evolutionary model formation maybe informed across boundaries (Love, 2001).

Evolutionary models push out boundaries gently. The comfort and security found in existing and long-standing mental models is described as habituation. Such mental models provide a sense of security in static times. Evolutionary mental models are the dominant paradigm in academia. Most research is based on the work of others and therefore can be described as evolutionary mental model formation. Evolutionary mental model formation supports Agile Mental Model Formation AMMF (Fielden, 2002). As a new theory, however, agile mental model formation allows alternate theory formation to enter from inter and multidisciplinary levels of thought formation. It is not clear how often construction [R6] (Table 2) occurs in the three qualitative research methodologies considered.

Table 3. Research Phases and Levels of Reflection

Phase	Action Research	Case Study	Grounded Theory
1 Researcher	(Carr & Kemmis, 1991) (Forster, 1972) Reflexive Practitioner **[R4]**	(Stake, 2000) **[R2]**	(Glasser, 1992) Researcher understands events, processes, relationships **[R3]**
2 Theory	Applied research postive change in organisations Ethical **[R3]**	Particular research situation **[R2]**	
3 Research Strategy	Cyclic process Participant-researcher reflection built in to process **[R4]**	Immersion in-depth in research situation **[R3]**	Classification and Categories – theory emerges **[R3]**
4 Data collection & Analysis	Multiple methods Complex data Any data collection and analysis method possible **[R4]**	Multiple methods Complex data An data collection and analysis method possible **[R4]**	Multiple methods Complex data Data collection and analysis method possible. Observe, converse, interview. . Note down **[R2]**
5 Sense-making & Presentation	At odds with positivist dominant paradigm Positive change Dilemmas – own org - (Holian, 1999) Evaluation traditions Applied research **[R5]**	Much description Weak in interpretation Applied research **[R5]**	Discover theory as it emerges from data **[R4]**

Sense-Making and Mental Model Formation in Revolutionary Times

As suggested by Whelan-Berry & Gordon (2000), collective individual mindset change processes are core to mental model processes in times of change. Both the group and the organisation mind are dependent on the collective individual mindset. Seeley (2002) also suggests that a dynamic approach to change that inevitably happens in relation to others is required. Mental modelling qualities required to cope with rapid, discontinuous and/or revolutionary change include:

Sense-Making and Flexibility

Boulding (1989) in developing his vulnerability theory states that the more flexible or adaptable a system, the more sustainable that system becomes. Flexibility implies that mental model formation uses open systems to inform this process.

Closed systems are akin to the 'freeze-frame' of Lewin's (1958) unfreeze, move or change, freeze model of the individual's ability to deal with change. Open systems are absolutely necessary for any change to mental model formation in times of rapid change. Boulding (1989) also suggests that the ability to adapt quickly is necessary to decrease vulnerability in systems.]

Fielden (1996) considers that the ability to move dynamically to another dimensional plane informs mental modelling; to accept intuitive solutions, and release habitual thought processes, helps release mental clutter through activities such as meditation, movement, exercise and relaxation. Such stimulation aids in the ability to engage in disciplined thought processes. Releasing mental clutter is also a precursor for the qualitative researcher in information systems to engage with different mental models in parallel.

Sense-Making and Multiple Thought Processes

Ornstein (1991) argues that the ability to release rational thought processes is essential to rapid mental model formation. Wheatley (2000) further states the need to engage in mental model formation collaboratively and privately.

Csikszentmihalyi (1979) maintains that moving into the creative flow state is required to deal with rapid and discontinuous change. Bridges (1991) suggests the need to become aware of the transition states in dealing with change. His unstated assumption is that these are transitions in evolutionary change processes. Complex situations in information systems research require the ability to activate multiple thought processes.

Finding and Recognising the Anchor Points for Sense-Making

Both evolutionary and revolutionary SCMs require anchor points into pre-existing mental models. Generic anchor points are context dependent (Figure 2). These may be culturally, environmentally, socially and spiritually dependent. They tend to cluster within an environment as described in CDCM (Context Dependent Cluster Model) (Fielden & London, 2001). There is inevitably a complex set of context-dependent generic anchor points; these form a limited set. As human beings, we can store only a small number of items in our short-term memory.

CDCM is an evolutionary SCM based on principles of the complexity theory applied to organisations (Stacey, 1996) and soft systems methodology (Checkland & Scholes, 1990). CDCM establishes that these generic anchor points are within any given context where all participants are aware of the clusters of anchor points within the problem area.

It is the catalytic anchor points that are crucial for the alignment required in reducing resistance to change (Fielden, 2002). In moving between multiple sets of qualitative research results gathered from different methodological approaches, it is important that this resistance to change be diminished.

In times of rapid change it is this limited set that is required to accommodate rapid change. This may include acceptance by others within the current context; ability to make sense within the change domain; and the need to ground new ideas to enable rapid mindset change.

Possible generic anchor points are: alignment with existing systems within the current context where there are sufficient points of similarity for acceptance. Included in this set may also be respect -- for others and from others; accountability – both self and others; respect for the environment, personal integrity and the ability to move rapidly between rational, emotional and spiritual mindsets. Generic anchor points are required to 'lock in' new ideas in times of rapid change so they are not dismissed through resistance and non-acceptance. Generic anchor points are required for both evolutionary and revolutionary SCMs (Fielden, 2002).

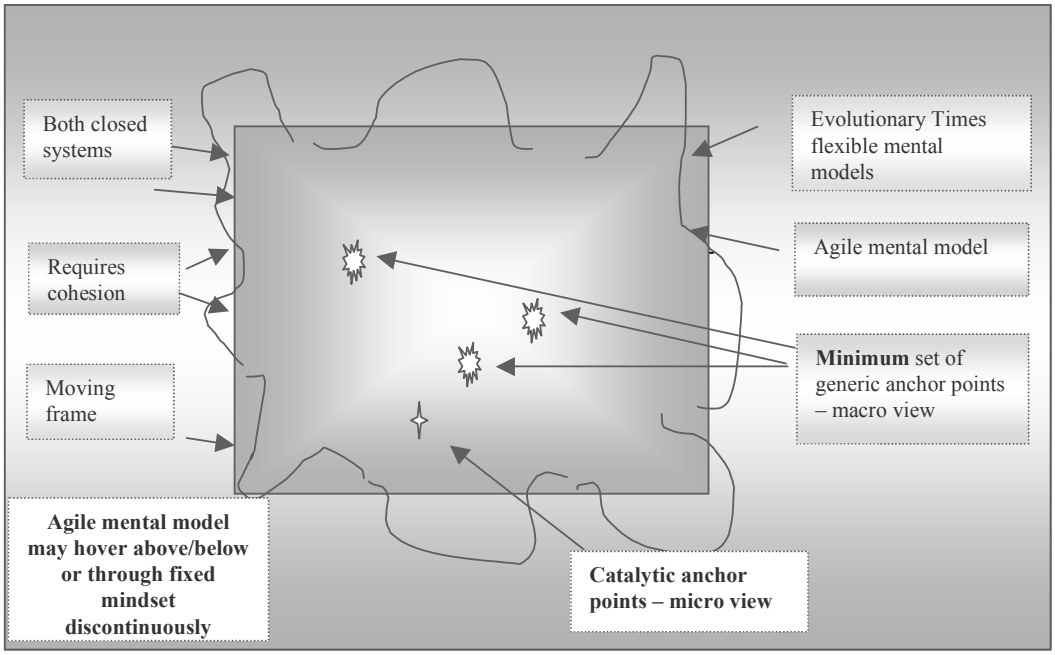

Figure 2. Dynamic Model Formation (AMMF Representation)

Catalytic Anchor Points in SCMs

Catalytic anchor points are required at the micro or individual level for alignment in times of rapid or discontinuous change (Fielden, 2002). Catalytic anchor points are the key to alignment for the necessary acceptance of rapid, discontinuous or revolutionary change (Figure 2). These anchors need to be situated both within the reference mindset and the rapid change landscape. Whilst the dominant mindset paradigm is either fixed or evolutionary, there is little or no capacity to align rapidly. Flexible mental model formation is possible as human potential is extended (Fielden, 1996). The ability to recognise catalytic anchor points to act promptly within a rapidly changing landscape of multiple mindsets is essential. As these anchor points are individual and may be hidden from external view, they are not always immediately obvious. Developing reflexivity is an essential skill for qualitative researchers in information systems. Without reflexivity, there is no recognition of these catalytic anchor points. Figure 2 is a representation of the peaks in figure 1.

IS Development Processes Required in Designing Interactive Interfaces

In wrestling with the complexities of designing interactive interfaces (Alm, 2003) implies the presence of adaptive SCMs designers. She states that 'we lack a normal well functioning model of artefacts' interfaces (here she is discussing physical interactive devices). A proliferation of standards and guidelines for design do not help designers – because there are too many of them. The complex paradoxes that arise with interactive devices are hard to design for with formalised systems. 'Even though people appreciate natural complexity which allows them to select and integrate information freely, they have difficulties in handling formalised complexity which requires a particular kind of experience and logic.'(Alm, 2003) Conflicting requirements of flexibility, control, cultural interpretations and unanticipated consequences require the interactive device designer from a logical, scientific to an adaptive mindset. The implication here is that the designer has utilised an adaptive SCM in order to cope with the complexities arising.

Future Trends for Making Sense of Qualitative Results in Information Systems Research

Postgraduate training in research methods in information systems should include SCM landscapes. Just as information systems professionals and software engineers learn the profusion of information systems development methodologies as part of their professional training (Avison & Fitzgerald, 1995) — so information systems researchers in qualitative research require a disciplined approach to the interpretation of qualitative research results. Education, awareness of and experience with SCMs will complement the skill set required for information systems researchers in a complex and dynamic world.

Development of a set of SCMs is another future direction in this area. This paper, in introducing these ideas, points to further work required in exploring the rich landscape of SCM's. Just as there are a plethora of research methods in qualitative research in information systems to reflect the diversity of activities, so too is there a need for a set of SCM's to inform sense-making activities in interpreting qualitative research results.

Interpreting results of qualitative research has been regarded as difficult - fraught with accommodating multiple points of view in complex problem domains. It is recognised (Denzin & Lincoln, 2000) that there is no clear or straightforward solution to interpret qualitative research results in information systems. An adaptation of (Bain et al., 1999) five-point reflection scale to the reflective researcher highlights the multiple reflective levels that a qualitative researcher in information systems is expected to make sense of in research results.

In this paper, the rich interpretive landscape of symbolic sense-making conceptual models (SCMs) have been explored, both as a generic and an individual set of skills, required by qualitative researchers in information systems in a complex world.

This paper is confined to interpreting qualitative research (Table 1). Though sense-making conceptual models are independent of any qualitative research method, it needs to be aligned with the chosen research method, the individual researcher and the research area. Characteristics of symbolic SCMs inhabiting a theoretically rich, multi-factored sense-making landscape, provides the basis for interpreting qualitative data in information systems research.

A further direction is the development of a set of 'critical incident' training procedures for qualitative researchers in information systems. An example of such a set has been developed at Carnegie Mellon University in response to dealing with secure systems development. Sense-making in the face of rapid change requires instant responses of frontline emergency workers.

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