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# Soft systems methodology and grounded theory combined – a knowledge management research approach?

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## Abstract

*This paper suggests that a combined soft systems methodology and grounded theory approach is an appropriate research methodology to investigate a knowledge management question. Both methodologies have in common surfacing and exploring participants' values and beliefs – in this sense they both share constructivist and interpretivist philosophical positions. The practical difference is that soft systems methodology values data from the perspective of the participant, while grounded theory develops theory from data interpretation by the researcher. Grounded theory and soft systems methodology share an anti-foundationalist ontology and a realist epistemology. Soft systems methodology has an applied axiology, while grounded theory has an Aristotelian axiology. Philosophical alignment between the methodologies and the researcher's own beliefs is close. Given this close alignment, integrating the methodologies as a research strategy offers the advantage of a more holistic explanation, because data will be examined from both the participants' and the researcher's weltanschauung, and therefore should provide deep understanding of the research topic.*

## Keywords

*Soft systems methodology, grounded theory, philosophical trinity, philosophical alignment, ontology, epistemology, axiology, methodology.*

## Introduction

There are many models in the marketplace that are touted as the solution to an enterprise's knowledge problems. Two examples are Nonaka and Takeuchi's *SECI Knowledge Spiral* (Nonaka & Takeuchi 2004), and Firestone and McElroy's *Knowledge Life Cycle* (Firestone & McElroy 2003). However there appears to be no models published in the literature that provide complete real-world examples that firstly illustrate the 'knowledge process' from end to end, and then explain, rather than describe, how it works. This makes it difficult to evaluate the models, let alone decide their utility in the business world. In addition, where examples are provided most models focus on commercial enterprises rather than public-sector organisations. In truth, most of the models in the literature are actually *models of knowledge* rather than *knowledge management models*, which explains why they are so difficult to operationalise. Also, a critical examination of the literature reveals that much of it is evangelistic and relies on a 'business guru' to justify its contention.

How then does an enterprise evaluate the utility of the various knowledge management models, particularly given there is no agreed definition of knowledge? Plainly there is a need to return to first principles and work out what knowledge truly is for an organisation, and what it really means to manage knowledge. Recently this has been recognised to some extent with pleas for research that provides an empirical basis for the argument (see for example Bouthillier & Shearer 2002; Edwards et al. 2003; Patriotta 2003). Therefore the motivation for my research is to provide an empirical basis from which a model of knowledge productivity<sup>1</sup> for a public-sector organisation can be developed. The expected outcome is to

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<sup>1</sup> Knowledge can be conceived as being a product – that is, it is a thing produced by action. Productivity is a measure of efficiency of production, which implies a comparison of input with output. Knowledge productivity

produce a model of knowledge productivity that can be applied with little modification anywhere in the public-sector, and possibly in the commercial-sector. The initial problem however, is to develop an appropriate research methodology, given it is such an esoteric and ethereal field.

### **The scope and structure of this paper**

This paper begins with a short discussion on ontology, epistemology, and axiology, where the ideas of the *philosophical trinity* and *philosophical alignment* are introduced. It is my contention that these concepts must be considered when choosing a research approach. This is followed by an account of soft systems methodology and grounded theory, with a particular emphasis on their underlying philosophical assumptions. The paper concludes by providing a handful of reasons why soft systems methodology or grounded theory might be integrated as a research approach.

### **The philosophical trinity and philosophical alignment**

The questions *What exists?*, *How do I know?*, and *What is valuable?* together form the philosophical trinity. Each question is a discipline in its own right, respectively known as ontology, epistemology and axiology.

Ontology is the philosophy of the world view of reality (Heron & Reason 1997). Sometimes, and in particular in the systems thinking schools, world view is called *weltanschauung* (see for example, Checkland 1999; Hitchins 1992). The seminal ontological question for a researcher is - 'Is there a "real" world out there that is independent of our knowledge of it?' The answer to this question firmly positions the researcher into one of two schools. The first school is often known as the essentialist or foundationalist school, and the second rather unimaginatively as the anti-foundationalist school. The essentialist school argues there are fundamental and enduring differences in social phenomena that exist in all contexts and across time. Such a position means that social phenomena can in essence be decomposed to constituent parts. On the other hand the anti-foundationalist school says that all social phenomena are socially constructed and as such must be positioned in time, space and culture.

Epistemology is the philosophy of knowledge and justification (Audi 2000). The researcher's epistemological stance is determined in part by his or her ontological position, even if this is not specified. This is because a theory of the nature of knowledge, or the world, is at the same time a theory about knowledge of the world; hence there are large overlaps between epistemology and ontology. The shaping epistemological question for a social researcher is - 'Can "real" or "objective" relations between social phenomena be identified, and if so how?' The answer to this compound question positions the researcher into one of three schools - idealists, empiricists, or realists. Idealists subscribe to the view that all knowledge refers to a human consciousness rather than an objective reality, and that reality does not exist independently of consciousness. Idealist epistemology takes many forms, the most common being rationalism, which tends to treat knowledge as the construct of the process of actually knowing. On the other hand empiricists suggest knowledge is derived through sensation, and that the process of knowing is largely passive. In this sense knowledge is a photocopy of what exists outside consciousness, albeit an incomplete and somewhat distorted photocopy. For an empiricist ontology and epistemology are virtually identical, because what is known is the same as what is. Realists hold the middle ground. They believe that knowledge is gained from

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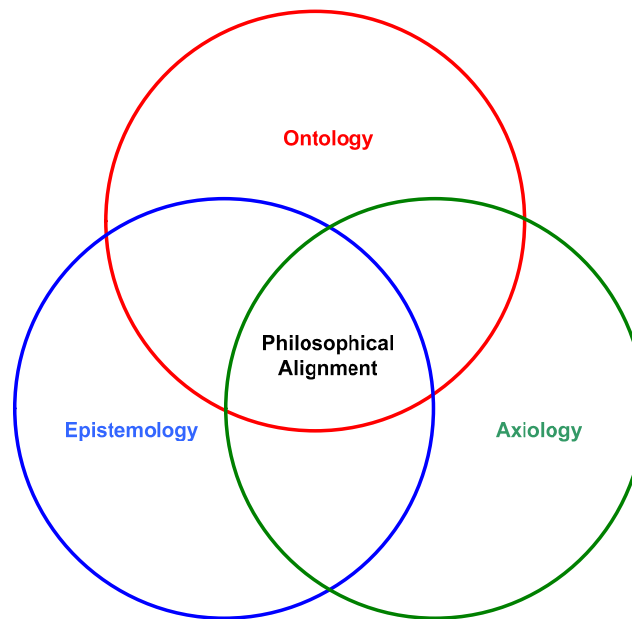
is therefore the purposeful, deliberate, and conscious action of creating, applying, organising, and measuring knowledge.

our senses and the use of reason. Reason makes use of principles and categories that do not emanate from the object of knowledge, but rather are derived from experience and reflection. Further they maintain that perception is mediated by social and cultural factors, and therefore is not an independent phenomenon as posited by empiricists. In this sense a realist epistemology sees knowledge as both created and constructed, and the result is more or less an accurate depiction of the object or phenomena as it exists.

Ontology and epistemology deal with truth, however axiology is about values and ethics (Mingers 2003). Axiology is also called value theory, and includes the disciplines of ethics, pragmatics, and aesthetics. Values provide the standard for the evaluation of epistemological and ontological claims. So the crucial axiological question for a researcher is – *What is the ultimate purpose of the inquiry?* The literature is much less clear about schools of axiological thought, however broadly there are two positions. The first position is valuing knowledge for its own sake and as an end in itself: this is the Aristotelian School (Heron & Reason 1997). Simple understanding is valued above all else. The second position values knowledge as a means to inform, transform, or enable positive change: this might be called the ‘Applied School’.

The philosophical trinity is part of the essence that makes the quantitative and qualitative research paradigms quite different. The quantitative research paradigm typically has an essentialist ontology, empiricist epistemology, and either an Aristotelian or applied axiology. Often this is called the positivist tradition. On the other hand the qualitative research paradigm characteristically has an anti-foundationalist ontology, a realist or idealist epistemology, and an applied or Aristotelian axiology. The realist epistemology in this approach gives rise to the constructivist research tradition, and the idealist epistemology results in the subjectivist tradition of inquiry.

Clearly then it is important that researcher understands his or her own philosophical posture and declares it to their audience. What the researcher is seeking is the ‘sweet spot’ where the overlap between ontological, epistemological and axiological positions is maximised – this I call philosophical alignment, which is illustrated at Figure 1.



**Figure 1: The philosophical trinity and philosophical alignment<sup>2</sup>**

Philosophical alignment leads to another trinity: the alignment between the researcher's belief system (the philosophical trinity), the research paradigm, and the research methodology. The central question of a methodology is - 'How can a researcher discover whatever they believe can be known (Guba & Lincoln 1998)?' Philosophical alignment provides the desired logic attributes of the methodology, where methodology is defined as:

... a generic combination of methods that is commonly used as a whole – as in soft systems methodology, strategic options development and analysis, or survey methodology covering the design and analysis of questionnaires (Mingers 2003, p. 559).

The fundamental realities of both qualitative and quantitative research are that no single methodology serves as a panacea for any given situation, and each methodology has many methods. Hitchins (1992, p. 225), coming from a systems perspective, says the seven essential attributes of a methodology are: it applies to any system; is simple; is comprehensive; is creative and innovative; is for individual and team use; is supported by tools and methods; and is proven in practice. To this list I would add that a methodology must have a clear philosophical position, based on the philosophical trinity. These attributes combined to distinguish methodology from methods, and mean in practice that a single method can be used in many methodologies.

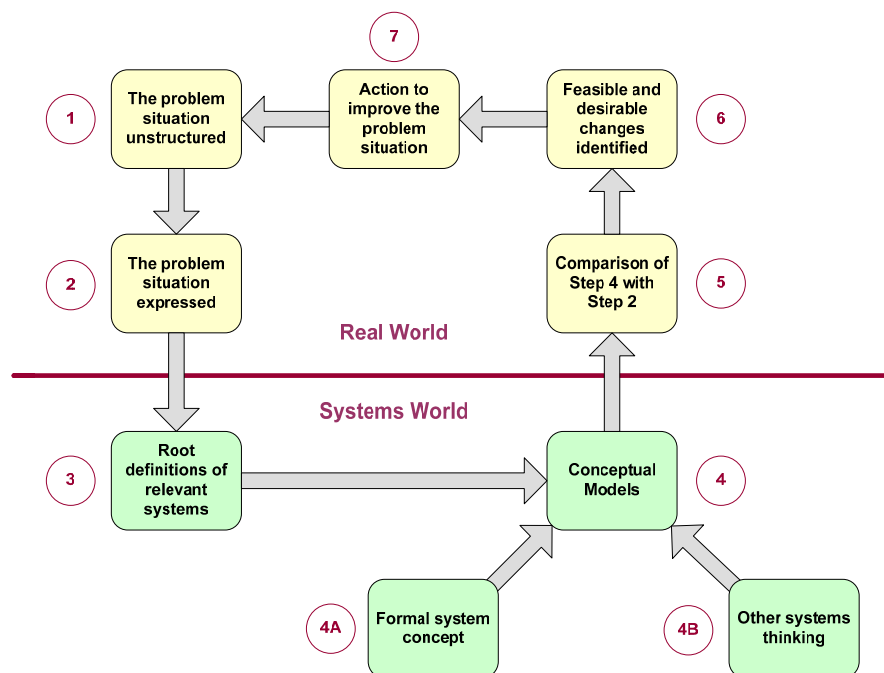
At this point I will change the discussion to a consideration of soft systems methodology and grounded theory, to expose the philosophical assumptions underlying them, and to see if they can be philosophically aligned.

<sup>2</sup> Some authors would call the position of philosophical alignment *logic* (see for example, Doctor Andrew Chucky's website at <http://www.ditext.com/philof/ofphil.html>, noting that Chucky substitutes ontology for metaphysics). I am tempted to call it methodology, however one can have a philosophical alignment of beliefs without conducting research and therefore having a requirement for a methodology.

## What is soft systems methodology?

Soft systems methodology was developed by Professor Peter Checkland, Professor Gwilym Jenkins, Doctor Brian Wilson, and Doctor David Rippin, at the Lancaster University in the early 1970's and first published as a methodology in 1981 (Platt & Warwick 1995, p. 19). Soft systems methodology has its foundations in action research and general systems theory, but has evolved into a methodology in its own right. It is characterised by involvement in a problem situation and learning by doing. It is further characterised by trying to see a system from as many perspectives as possible, and through the eyes of others rather than the researcher.

The Checkland seven-step methodology is the best known of the soft system methodologies<sup>3</sup> and is often thought of as 'the soft systems methodology.' It is depicted at Figure 2.



**Figure 2: Checkland's soft systems methodology**

Checkland's soft systems methodology is concerned with human activity systems. A human activity system is defined as:

... a notional purposive system which expresses some purposeful human activity; activity which could in principle be found in the real world. Such systems are notional in the sense that they are not descriptions of actual real-world activity (which is an exceptionally complex phenomenon) but are intellectual constructs; they are ideal types for use in debate about possible changes which might be introduced into a real-world problem situation (Checkland 1999, p. 314).

Human activity systems by their nature are complex. They are considered to be holistic, subjective, process oriented, in a state of constant flux, and often non-rational. Further, they act based on an interpretation of the world, but there are always several world views because

<sup>3</sup> Other methodologies include Social Systems Design, Viable Systems Diagnosis, Interactive Planning, Soft Systems Dynamics Methodology, Soft Systems Methodology Plus, Strategy Assumption Surfacing and Testing, Critical Systems Heuristics, and Total Systems Intervention, however these are considered no further in this paper.

individuals interpret the world differently. This means that for a soft systems methodologist there is no single correct answer to a problem situation. It also means the models derived from the methodology are neither valid nor invalid, but rather represent a particular worldview or *weltanschauung*. Human activity systems are also considered to be emergent. For example, a surgical team can successfully operate on a patient, but the individual components of the team, such as surgeons, anaesthetists, and nurses can't on their own. They must be 'organised' in a particular way to function as a 'surgical team', hence the surgical team is emergent. The surgical team is a holon – an autonomous component system - of a larger human activity system called a hospital, which in turn is a holon of a state health system. Emergence is therefore a key characteristic of a human activity system, or any system for that matter. The system emerges from its components and the whole is greater than the sum of its parts (Hitchins 1992).

Concomitant with the notion of emergence is the concept of layers and hierarchy. Reality is considered to exist in layers, and the various layers allow different system components to emerge. These layers are in a hierarchy, but the hierarchy does not imply an inferior/superior relationship. This is because many of the layers are holons and are therefore autonomous in their own right. The state health care system, which consists of many hospitals, which in turn has many surgical teams, is a good example of this notion. Each layer provides a different degree of fidelity and abstraction, but each layer may be required to give an adequate description of the system and is necessary for an explanation of how the system works. Inevitably in human activity systems layers are abstractions that are perceived differently by the various actors, depending on where they fit into the system.

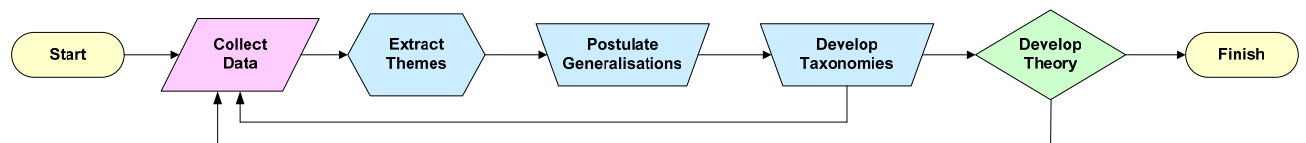
All systems have communication channels and receptors that enable internal and external situational awareness. These communication channels are used by control mechanisms to react to change so the system can survive. System stability stems from the self-reliance and independence of holons, which can handle many circumstances and problems on their particular level of existence without asking higher level holons for assistance. However holons can and do receive instruction from and, to a certain extent, may be controlled by higher level holons. The subordination to higher level holons ensures the effective operation and cooperation of the larger whole. This assumption is important because it means that any explanation of how a human activity system works must acknowledge both the existence and influence of higher and lower level holons. It also means that where the system boundary is positioned will influence the resultant model, explanation, and solution.

These assumptions position Checkland's soft systems methodology as having an anti-foundationalist ontology, because systems are socially constructed; a realist epistemology, because knowledge is both created and constructed by an individual; and an applied axiology, because the resultant knowledge is used for purposive action. So where is grounded theory philosophically positioned?

### **What is grounded theory?**

Grounded theory was developed by Barney Glaser and Anton Strauss in the late 1960s as a methodology for extracting meaning from qualitative data collected in the field. It is used to generate a theory that explains a process, or processes, about something at an abstract conceptual level in a specific context or setting (Glaser & Strauss 1967). Typically the researcher does not begin with a preconceived theory, unless his or her purpose is to elaborate and extend an existing theory. Instead the researcher begins with an area of interest, or an idea, and allows the theory to emerge from the data (Strauss & Corbin 1998, p. 12). This

means that data must be drawn from multiple sources. Data is usually collected by means of interviews or focus groups, but can also use observation and questionnaires. The general steps in grounded theory are depicted at Figure 3.



**Figure 3: The general steps in grounded theory**

Grounded theory is an inductive rather than a deductive methodology. The intent is to develop an account of a phenomenon, or phenomena, which identify its major categories, the relationship between the categories, and the context and processes which are occurring (Becker 1993). The result is a middle order theory, as opposed to grand theory or a hypothesis, which explains the phenomenon (Alston & Bowles 2003).

Glaser and Strauss have parted ways since publishing their original work, resulting in two distinct schools of Grounded theory. Glaser's approach is more 'pure' in that he selects an area for study and allows the issues to emerge in the course of the research. The Glaser approach might be called an emergent design, because while the procedures are explicit, the categories and codes are derived entirely from the data. On the other hand Strauss and Corbin's approach might be called a systematic design because the researcher can predetermine the subject of inquiry (Douglas 2003, p. 45), and the approach is more structured than Glaser's. In a systematic design there is an explicit sequence of procedures and rules, and the categories and codes can be preset to some degree because of findings from other research. Because of the variances between the Glaser approach and the Strauss and Corbin way the researcher must make explicit which school they are following (Geiger & Turley 2003, p. 581).

Grounded theory has its origins in symbolic interactionism, hermeneutics and phenomenology (Goulding 1999, p. 866; Star 1998, p. 220). Researchers start with an area of interest, collect the data and allow relevant ideas to develop. Rigid preconceived ideas are seen to prevent the development of theory (Strauss & Corbin 1998). The seminal assumption is that a theory formed during data collection will be more applicable than one developed before a study begins (Glaser & Strauss 1967, p. 32).

The notion of theory is of itself an important assumption in grounded theory. Theory is not considered to be a perfect end-product, but rather an ever-emerging, complex constructed entity (Strauss & Corbin 1998, pp. 21-4). Theory is defined as:

... a set of well-developed categories (e.g., themes, concepts) that are systematically inter-related through statements of relationship to form a theoretical framework that explains some relevant social, psychological, educational, nursing, or other phenomenon. The statements of relationship explain who, what, when, where, why, how and with what consequences an event occurs (Strauss & Corbin 1998, p. 22).

The resultant theories need not deal in falsifiable propositions, but meaning must be sought within context, and positioned in time and space. Further multiple meanings must be accommodated. Facts are always considered to be theory loaded and value laden (Goulding 1998, p. 53).

Emergence is also a key assumption in grounded theory. Data, information and knowledge are seen as emergent phenomena that are actively constructed. They therefore can only have meaning when positioned in time, space and culture, and are only relevant in an experiential world (Goulding 1999).

These assumptions position grounded theory as having an anti-foundationalist ontology, because meaning is socially constructed and positioned in time and space; a realist epistemology, because knowledge is emergent and gained from the researcher's senses and reason; and an Aristotelian axiology, because the resultant knowledge is a middle order theory that may, or may not be, used for purposive action.

At this point the philosophical assumptions for soft systems methodology and grounded theory have been identified – they are closely aligned. The next section discusses why the methodologies might be used and combined as research strategy.

### **Why integrate the methodologies?**

Real world activities are *hows* related to a specific *what*, which is usually implicit rather than explicit. In social situations the *whats* can be difficult to define and many problems might be considered to be *wicked* – that is they are complex, dynamic, systemic, emergent, difficult to resolve, and confounding to manage (McLucas 2003, p. 220). Knowledge management is of itself a wicked problem.

Soft systems methodology can be used to model real world *whats*, and equally to model alternative *hows* for improvement. Indeed Gao, Meng and Nakamori (2002) suggest that soft systems methodology is a valuable research approach to study knowledge management, and that some of its value is 'to offer inspiration on how to learn continuously and effectively (Gao, Meng & Nakamori 2002, p. 13).' Soft systems methodology lends itself to develop a set of structured research questions to a *wicked problem*. It is also useful to assist in building a road-map of the research project, and to show the logical dependencies of the various research activities in multi-disciplinary research activities (Hindle et al. 1995), particularly given that the research process in this circumstance is of itself a purposeful human activity and therefore is part of a human activity system. Soft systems methodology can also be used as part of the research triangulation process, which confirms, amplifies or refutes findings.

Similarly grounded theory is useful in situations where little is known about a topic or problem area, or to generate new and exciting ideas in settings that have become static or stale. It is a powerful and thorough research method for collecting and analysing research data, and can provide deep insight into the real issues associated with phenomena. Further it forces deep consideration of the variables by the researcher. The power of grounded theory lies in the depth of analysis and the resultant explanation. A good grounded theory explains rather than describes, which gives it a predictive quality (Douglas 2003, p. 51). Because of the depth of analysis grounded theory results in deep understanding of phenomena. Grounded theory is a sound research approach for any behaviour that has an interactional element to it (Goulding 2005, p. 296).

A comparison of the two methodologies reveals that they are both seven-step processes, with remarkable similarities. This is illustrated at Table 1, which lines up the methodological steps.

Methodology		
Steps	Soft Systems Methodology	Grounded Theory
1	The problem situation unstructured	An unexplained phenomena or process
2	The problem situation expressed	The phenomena or process identified for study
3	Root definitions of relevant systems	Data collection and coding
4	Conceptual model construction	Theme extraction
5	Model and problem situation comparison	Postulate generalisations
6	Feasible and desirable change construction	Develop taxonomies
7	Action to improve the situation	Theory development

**Table 1: A comparison of soft systems methodology and grounded theory**

It is immediately apparent the two methodologies are complementary<sup>4</sup>. For example steps 4 and 5 result in similar outcomes, albeit they are expressed differently. Further many of the same methods, tools and techniques can be used in either methodology. For example the use of questionnaires and interviews are common to both methodologies. It is also not inconceivable that focus groups could also be used as a data source in both methodologies, or that a rich picture could be used as the end product to depict the derived grounded theory.

With regard to the philosophical trinity both methodologies share an anti-foundationalist ontology and a realist epistemology. The axiology is different, which is what in part differentiates the two methodologies. That said both methodologies share the assumption that the problem or the phenomena determines the final model or theory. Both methodologies have in common surfacing and exploring participants' values and beliefs – in this sense they both share constructivist and interpretivist philosophical positions. The practical difference is that soft systems methodology values data from the perspective of the participant, while grounded theory develops theory from data interpretation by the researcher. Therefore it seems logical that by integrating the two methodologies the research question will have a more holistic explanation: this is perhaps the primary reason to integrate the two methodologies.

## Conclusion

Choosing an appropriate research strategy is difficult. It requires a deep and honest reflection of one's own beliefs. It requires commitment to the relationship between the philosophical trinity, the research paradigm, and the research methodology or methodologies. The philosophical trinity answers the questions *What exists?*, *How do I know?*, and *What is valuable?*, each question being a discipline in its own right. It is my contention that the researcher is seeking the 'sweet spot' where the overlap, or philosophical alignment, between ontological, epistemological and axiological positions is maximised. It is also my contention that the researcher must clearly understand their own philosophical posture and enunciate it to their audience.

So to conclude, my own philosophical attitude has an anti-foundationalist ontology, a realist epistemology, and an applied axiology, which positions me in a constructivist tradition qualitative research paradigm. Grounded theory and soft systems methodology share an anti-foundationalist ontology and a realist epistemology. Soft systems methodology has an applied axiology, while grounded theory has an Aristotelian axiology. Philosophical alignment between the methodologies and my own beliefs is therefore close. Given this close alignment,

<sup>4</sup> The juxtapositions of the soft systems methodology and grounded theory entries in the table is not meant to infer equivalence, rather the intent is to show the two methodologies are complementary.

integrating the methodologies as a research strategy offers the advantage of a more holistic explanation, because data will be examined from both the participants' and my own *weltanschauung* – this should provide deep understanding of the research topic.

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## References

- Alston, M & Bowles, W 2003, *Research for social workers. An introduction to methods*, 2 edn, Allen and Unwin, Crows Nest.
- Audi, R 2000, *Epistemology: a contemporary introduction to the theory of knowledge*, Routledge, London.
- Becker, P 1993, 'Common pitfalls in published grounded theory research', *Qualitative Health Research*, vol. 3, pp. 254-60.
- Bouthillier, F & Shearer, K 2002, 'Understanding knowledge management and information management: the need for an empirical perspective', *Information Research*, vol. 8, no. 1.
- Checkland, P 1999, *Systems Thinking, Systems Practice*, John Wiley and Sons, Chichester.
- Douglas, D 2003, 'Grounded theories of management: a methodological review', *Management Research News*, vol. 26, no. 5, pp. 44-52.
- Edwards, J, Handzic, M, Carlsson, S & Nissen, M 2003, 'Knowledge management research and practice: visions and directions', *Knowledge Management Research and Practice*, vol. 1, pp. 49-60.
- Firestone, J & McElroy, M 2003, *Key issues in the new knowledge management*, Butterworth Heinemann, New York.
- Gao, F, Meng, L & Nakamori, Y 2002, 'Systems thinking on knowledge and its management: systems methodology for knowledge management', *Journal of Knowledge Management*, vol. 6, no. 1, pp. 7-17.
- Geiger, S & Turley, D 2003, 'Grounded theory in sales research: an investigation of salespeople's client relationships', *The Journal of Business and Industrial Marketing*, vol. 18, no. 6/7, pp. 580-94.
- Glasser, B & Strauss, A 1967, *The discovery of Grounded Theory*, Aldine, Chicago.
- Goulding, C 1998, 'Grounded theory: the missing methodology on the interpretivist agenda', *Qualitative Market Research: An International Journal*, vol. 1, no. 1, pp. 50-7.
- 1999, 'Consumer research, interpretive paradigms and methodological ambiguities', *European Journal of Information Systems*, vol. 33, no. 9/10, pp. 859-73.
- 2005, 'Grounded theory, ethnography and phenomenology: A comparative analysis of three qualitative strategies for marketing research', *European Journal of Marketing*, vol. 39, no. 3/4, pp. 294-308.
- Guba, E & Lincoln, Y 1998, 'Competing paradigms in qualitative research', in N Denzin & Y Lincoln (eds), *The landscape of qualitative research - theories and issues*, Sage Publications, California, pp. 195-220.
- Heron, J & Reason, P 1997, 'A participatory inquiry paradigm', *Qualitative Inquiry*, vol. 3, no. 3, pp. 274-94.
- Hindle, T, Checkland, P, Mumford, M & Worthington, D 1995, 'Developing methodology for multidisciplinary research: A case study', *Journal of the Operational Research Society*, vol. 46, no. 4, pp. 453-64.
- Hitchins, D 1992, *Putting systems to work*, Wiley, Chichester.

- McLucas, AC 2003, *Decision making: risk management, systems thinking and situational awareness*, Argos Press, Canberra.
- Mingers, J 2003, 'A classification of the philosophical assumptions of management science methods', *Journal of the Operational Research Society*, vol. 54, pp. 559-70.
- Nonaka, I & Takeuchi, H 2004, 'Theory of organizational knowledge creation', in I Nonaka & H Takeuchi (eds), *Hitotsubashi on knowledge management*, John Wiley and Sons, Singapore, pp. 47-91.
- Patriotta, G 2003, 'On studying organizational knowledge', *Knowledge Management Research and Practice*, vol. 2004, no. 2, pp. 3-12.
- Platt, A & Warwick, S 1995, 'Review of soft systems methodology', *Industrial Management and Data Systems*, vol. 95, no. 4, pp. 19-21.
- Star, L 1998, 'Grounded classification: grounded theory and faceted classification', *Library Trends*, vol. 47, no. 2, pp. 218-32.
- Strauss, A & Corbin, J 1998, *Basics of qualitative research. Techniques and procedures for developing grounded theory*, Sage Publications, California.