GROUNDING THROUGH OPERATIONALIZATION – CONSTRUCTING TANGIBLE THEORY IN IS RESEARCH

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Abstract

The research interests of information systems (IS) researchers often lead to a tension between theory development on the one hand and practical application, such as the implementation of computer applications or business processes, on the other. This tension is, for example, made manifest in the various action research approaches typically used in IS research. This paper presents an approach to IS research that aims to maintain a link between the abstract and the concrete in order to construct 'tangible theory'. The approach is based on a perspective referred to as socio-instrumental pragmatism and on the concept of grounding knowledge in three different ways: internal grounding, external theoretical grounding, and empirical grounding. Specifically, the suggested approach puts forward the idea of operationalization of abstract knowledge into concrete forms that are more directly applicable in practice.

Keywords: Action research, grounding, operationalization, tangible theory, interpretive research.

This work has been financially supported by the Science Foundation Ireland Investigator Programme, B4-STEP (Building a Bi-Directional Bridge Between Software ThEory and Practice) and by the Swedish Knowledge Foundation's programme for the promotion of research in IT at new universities and university colleges in Sweden.

Paper accepted for the 12th European Conference on Information Systems (ECIS 2004) Turku, Finland, 14–16 June 2004

1 INTRODUCTION

Research within the field of information systems (IS) often seeks to establish what can be referred to as action knowledge, that is, theories, strategies and methods that govern people's action in social practices (Goldkuhl 1999). This interest can be traced back to the design orientation inherent in IS research (Ehn 1995, Dahlbom 1996, Hirschheim, Klein & Lyytinen 1996) and to the fact that our main interest as IS researchers often is 'in the contingent and exceptional more than in the general, in local design principles more than in general laws, … in the good and beautiful more than in the true' (Dahlbom 1996, pp. 42-43). At the same time, as scientists, IS researchers must deliver theoretical contributions. This may lead to a tension between two seemingly extremes. On the one hand we have the desire of developing theories. On the other, we have the desire of understanding these theories within a practical domain – we want to implement concrete artefacts, such as computer applications, design heuristics, or redesigned business processes (Moody 2000, Mathiassen 2002).

Most evidently, this tension is brought to the foreground in the various action research approaches that populate the IS research arena. In action research, part of the research goal is to bring about change to a problematic situation (Mumford 2001). Of course, not any problem solving will do, but 'research that involves practical problem solving which has theoretical relevance' (Mumford 2001, p. 12). This view of action research seems to be in line with the common use of the term within the field of IS (Avison, Lau, Myers & Nielsen 1999, McKay & Marshall 2001).

When addressing this tension between theory and artefact, between the abstract and the concrete, we must understand that the meaning of the term 'theory' is not always clear and that the term is used in many different ways in different contexts. The notion of theory is, according to Dahlbom & Mathiassen (1993), really a romantic notion 'stressing the importance of going beyond the observable phenomena to deeper, hidden layers of reality, in order to define concepts and identify general laws, in terms of which the chaotic flux of observable facts can be systematized and explained' (Dahlbom 1996, p. 41). According to Dahlbom, the term is often 'deromanticized' to simply mean 'an alternative conceptual schema to the one used by common sense, but the ambition remains the same, namely to bring order and sense to a complex world' (Dahlbom 1996, p. 42). For the purpose of this paper, we can think of theory in this 'simple, deromanticized' form – as an abstraction of something that forms a set of interrelated concepts.

Now, if we want to develop theory and at the same time design concrete artefacts, how do we make sure that the two are expressions of the same concept or idea? To make sure that theory is valid and founded on sound principles and data, we may say that the theory is being grounded, borrowing a concept from the research method Grounded Theory (Strauss & Corbin 1998). As we shall see in this paper, the notion of grounding is actually a key to our problem – a key that can shed some light on how to co-develop theory and artefacts, as well as on how to co-develop theory at multiple different levels of abstraction. This may be referred to as constructing tangible theory.

The aim of this paper is to present a framework for performing well-grounded knowledge development, to construct tangible theory, within the area of IS research. The framework is based on the idea of grounding, as discussed by Goldkuhl & Cronholm (2003), and of the possibility of operationalizing abstract concepts into more concrete forms of knowledge that can be readily applied in practice; thus keeping the link between the abstract and the concrete.

The paper proceeds as follows. Section 2 introduces an ontology (a worldview) that is the foundation for the suggested approach. Epistemological consequences of this ontology are presented in Section 3 in terms of the suggested approach to grounding of action knowledge through the concept of operationalization. In Section 4, research on the concept of IS actability (Ågerfalk 2003) is used as an illustrative example of the application of the concepts introduced. Finally, Section 5 summarizes and concludes the work.

2 SOCIO-INSTRUMENTAL PRAGMATISM AS FOUNDATION

All research, as a form of human conduct, relies fundamentally on the ontological standpoint of the individual researcher (Walsham 1993). The ontological foundation of this work is based on what Goldkuhl (2002) coined *socio-instrumental pragmatism*. The term reflects an emphasis on humans acting in a social world, supported by various instruments (such as language and other external objects). Figure 1 depicts the main categories within the ontology. Inspired by the three worlds ontology by Popper (1975) and Habermas (1984), our point-of-departure is humans acting in an external world to the actor by *intervening* in it and thus changing it, and *interpreting* it in attempts to make an understanding of it. The external world thus consists of various *artefacts* (such as IT systems) and communicative *signs* (such as messages) as results of action. Humans act in a *natural environment*, and the external world thus consists also of different natural phenomena (such as waterfalls and the sun). Acting in the world requires an understanding of it, acquired through earlier interpretations. That subjective understanding, together with a person's intentions, abilities, emotions, *et cetera* can be referred to as their *personal cognitive base*. The personal cognitive base, as well as the person themselves is part of that person's *subjective world*. In order for two people to communicate, they must share a common understanding of the world communicated about as well as of how to communicate about it. Such common understanding can be referred to as the people's *shared cognitive base*, which, together with the people themselves, constitutes their *inter-subjective world*. In addition to performing interventions directed towards the external world, one can perform *reflective action* based on and directed towards one's own subjective world.

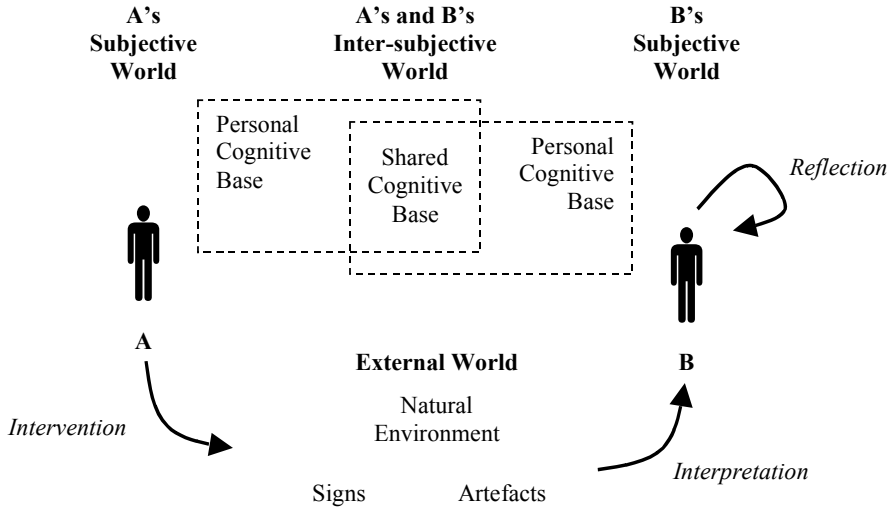

Figure 1. Different realms of the world (adapted from Goldkuhl 2002).

In the spirit of this ontology we can distinguish at least five different aspects of action knowledge: a *subjective* aspect, an *inter-subjective* aspect, a *linguistic* aspect, an *action* aspect and a *consequence* aspect (Goldkuhl 1999). The subjective aspect of knowledge refers to knowledge that is part of a human's personal cognitive base and is related to the notion of 'tacit knowledge' (Polanyi 1958). The inter-subjective aspect refers to knowledge shared by several people as parts of their inter-subjective worlds. The linguistic aspect refers to knowledge that is (or that can be) expressed as communicative signs, for example, as written strategies or policies. As the name suggests, action knowledge is expressed, or manifested, in action. This is the action aspect of knowledge. Finally, traces of the action knowledge might be found in materialized artefacts, which constitute the consequence aspect.

Let us consider an example to clarify these concepts. In order to study the construction of a particular IT system, we can choose to investigate the actual system, which would constitute an artefact existing in the external world. To get more insight, we may also consult different descriptions and models of

the system produced during the development process. These would then constitute communicative signs created to gain inter-subjective understanding of the system. Another way to learn about the system would be to study developers' actual performance of development actions, which would be governed by the developers' subjective and inter-subjective understanding of the system to be built and of systems development in general. From a research point-of-view, it is important to see that tacit as well as non-expressed linguistic knowledge are *unobservable* while explicitly stated linguistic knowledge, as well as actions and consequences, are *observable*.

It is furthermore important to realize that knowledge viewed as a consequence in one context might be viewed as a tacit aspect, a linguistic aspect or an action aspect in another, depending on what we choose to focus. That is, a piece of knowledge must always be understood in relation to other pieces of knowledge. We return to this recursive nature of action knowledge below when discussing the concept of grounding. Empirical IS research is often concerned with inter-subjective observable knowledge, such as method prescriptions with method-following actions and consequences. Nonetheless, unobservable knowledge is important since action is always influenced by unarticulated prerequisites, which of course complicate systems development (Fitzgerald, Russo & Stolterman 2002).

3 PRINCIPLES FOR THE GROUNDING OF KNOWLEDGE

The ontology underlying this work (Section 2) has consequences for the generation and validation of knowledge – that is, it has epistemological consequences. In order for a piece of knowledge to make sense to someone it must be possible to integrate with that person's personal cognitive base – it must be possible to include in that person's subjective world. Such internalization means to justify the knowledge for oneself – to rationalize it. To do that, the person may compare the knowledge with their previous experience (intrapersonally); matching it with other people's beliefs and intentions by way of shared cognitive bases; and trying it out in the external world to get empirical justifications.

3.1 Three Grounding Processes

Rationalization of new knowledge may be compared with Weber's (1978) notion of practical rationality. Such a notion is necessary in order to ground action knowledge since prescribed means must be possible to relate not only to empirically observable consequences but also to intended ends and values (Goldkuhl 1999). According to Weber (1978), rationality consists of three sub-rationalities: *instrumental rationality* (means in relation to ends), *rationality of choice* (ends in relation to values) and *normative rationality* (ethical principles in relation to action). Furthermore, the concept of grounding of knowledge assumes that rationality is argumentative and discursive, which means that it is possible to argue the validity of the knowledge in inter-subjective dialogues. This view, with its roots in Habermas' (1984) social-critical concept of rationality, is the key to an important distinction between true and valid – something is 'true' for somebody if that somebody accepts it as valid and useful. 'Claiming the validity of knowledge is presenting good reasons as arguments for the knowledge.' (Goldkuhl 1999) Hence, grounding of action knowledge is to present such good reasons for it that other people accept it as valid. This can be done by argumentatively relating the focused knowledge to three different knowledge sources acting as warrants for the knowledge under scrutiny. These three knowledge sources give rise to three different grounding processes. Understanding these three grounding processes is important in order to understand how the validity of action knowledge can be claimed (Goldkuhl & Cronholm 2003).

First, the knowledge can be related to its own background knowledge, which assumes that knowledge partly justifies itself. This *internal grounding* includes reconstructing and articulating assumptions that might tacitly be taken for granted. Explicated knowledge can be understood in terms of the concepts used to express it. To define these concepts and to analyse relationships between them is to perform a conceptual grounding of the knowledge. Articulating the background knowledge also means relating it to its underlying goals and values. Concepts used and their anchoring in goals and values also need to be consistent and free from internal contradictions and ambiguities. Therefore, the cohesiveness of the

knowledge needs to be assessed. Second, relations to other existing knowledge of theoretical character can be established and scrutinized. This *external theoretical grounding* means to perform conceptual grounding and value grounding with a focus on these external relations. It might also include the grounding of the knowledge in existing explanatory theories. Third, the knowledge can be analysed in relation to empirical observations. This *empirical grounding* means to ground the knowledge through applications and observations, which includes assessing its practicability. The three grounding processes are summarized in Table 1.

Internal grounding	**External theoretical grounding**	**Empirical grounding**
• Knowledge reconstruction • Conceptual grounding • Value grounding • Evaluation of knowledge cohesion	• Conceptual grounding • Value grounding • Explanatory grounding	• Application and observation grounding

Table 1. A summary of the different grounding processes (Goldkuhl 1999).

3.2 Concepts, Operationalizations, Applications and Consequences

In addition to the aspects of knowledge existence mentioned in Section 2, action knowledge might exist in different forms of abstraction – from 'pure' abstract theoretical knowledge to knowledge directly applicable in everyday situations. As IS researchers we often deal with abstract concepts and there is a need to operationalize these into more applicable and empirically testable forms. For example, Schoop and Quix (2001) use quite abstract concepts of coordinating mechanisms of language as action, which are operationalized into concrete tool support for negotiation in electronic marketplaces. This idea of operationalization assumes two basic categories: the *concept* and the *operationalization* of a concept. The concept is always more abstract than its operationalization and both need to be an explicitly stated linguistic aspect of the action knowledge under scrutiny. This is necessary in order to observe and communicate the analysis between researchers and reporting the results of the research. Of course, they need not be explicated initially, even though it is preferable since the externalization of knowledge into written formulations requires precision and hence the very externalization process becomes an important part of internal grounding of both the concept and its operationalization. Thus, the formulation and externalization of a concept and its operationalization implies internal grounding and external theoretical grounding. The operationalized concept can then be applied in practice whereupon consequences arise. Let us refer to these two instances of the action knowledge as *application* and *consequence*, respectively. The first represents an action aspect of the knowledge and the second represents a consequence aspect. Both instances are possible to relate to empirical observations and data and thus together constitute the empirical grounding of the action knowledge. To summarize, one piece of knowledge can be instantiated and studied in (at least) four different shapes: as a concept, as an operationalization of the concept, as an application of the operationalization, and as a consequence of the application. Important relationships between these concepts, the different grounding processes (Section 3.1) and different aspects of knowledge (Section 2) are shown in Table 2.

Inter-subjective linguistic aspect		Inter-subjective action aspect	Inter-subjective consequence aspect
Concept	**Operationalization**	**Application**	**Consequence**
Internal grounding and External theoretical grounding		Empirical grounding	

Table 2. Important relationships between the concepts introduced.

Note that the consequence instance of the action knowledge, as well as an operationalization, can be considered as a concept in its own right. That is, we can choose to focus, for example, the consequence as 'the piece of knowledge' and operationalize it, *et cetera*, to eventually arrive at even more specific

applications and consequences. As suggested above, this recursive character is inherent in the nature of action knowledge. In practical research work, this recursiveness can be used as a means to go further into specific applications (see Section 4, specifically Table 4). It can also be used for the purpose of grounding of the 'main' concept under scrutiny by operationalizing it in different forms and in more than one 'level' of application.

3.3 A Possible Research Strategy for the Grounding of Action Knowledge

Within the concept of grounding of knowledge we must conceptually distinguish between the *generation* and the *validation* of knowledge. Even though the two are usually quite intertwined, it is possible to talk of a 'context of discovery' and a 'context of justification' as two distinct entities. Traditionally, knowledge is generated and validated either inductively or deductively. In the case of induction the knowledge source for generation is purely empirical observation. Some qualitative researchers, such as early advocates of Grounded Theory (e.g. Glaser & Strauss 1967), even claim that knowledge should be strictly generated from empirical data and not from preconceptions and pre-formulated hypotheses. With a deductive approach knowledge is generated from external knowledge of theoretical character or simply through 'internal' construction of hypotheses. The knowledge is then validated through, for example, empirical observations.

An alternative approach to strict induction or deduction is what can be referred to as a reflective approach (Alvesson & Sköldberg 2000), sometimes referred to as abduction, which also seems to be acknowledged in more recent approaches to Grounded Theory (e.g. Strauss & Corbin 1998). The idea is to continuously develop theory based on external theories and on empirical observations and to let the evolving theory play an active part in collecting and interpreting data in a recursive manner (cf. Walsham 1993, Goldkuhl & Cronholm 2003). One reason for adopting such an approach is that it is impossible to be completely free from bias (Strauss & Corbin 1998) and being explicit about preconceptions makes the research process more transparent, and the results more valid (cf. Yin 1994). A reflective approach helps to remedy some of the problems with a strict inductive approach. For example, it helps direct attention to phenomena known to be relevant in practice. Reflective research also means that interpretation becomes central. Since interpretation is a fundamental aspect of life (see Section 2) it should be acknowledged as an important aspect of research, especially within a socially oriented field such as IS. Interpretation takes place when theory is interpreted and related to empirical data, and when empirical data is interpreted and related to evolving as well as externally existing theory. A reflective approach also means that the research process *per se* is considered a subject for constant interpretation and refinement (Alvesson & Sköldberg 2000). In a sense, such a research strategy implies aiming at several moving targets simultaneously. To handle that complexity, it is important that researchers are sensitive towards their own actions and conceptions; that is, reflect upon what they are doing.

Interpretive research is often contrasted with the positivistic research tradition (e.g. Walsham 1993, 1995, Braa & Vidgen 1999). While positivists reckon with an objective reality, interpretivists acknowledge that different people will interpret a situation differently. 'Typically, positivism is concerned with reducing the area of investigation in order to be able to make reliable predictions and explanations, while interpretivism is concerned with making a reading of a situation in order to gain understanding.' (Braa & Vidgen 1999, p. 27) When acknowledging humans as subjects with free will trying to make sense of the world by interpreting it based on their own preconceptions, scientific results need not necessarily be regarded as objective truths. As stated above, from a pragmatic standpoint, the issue is not whether something is true or not, but whether it is useful in practice. In order for a researcher to build up his confidence in the results, to become 'certain' (Mumford 2003), which is a necessity if others are to be convinced, first hand experience of the phenomena of study is imperative. This idea goes well with a reflective approach since data, abstractions, and theory, as well as the very process of working with these phenomena can be continuously evaluated, refined and expressed (cf. Weber 2003).

In interpretive research, theory plays an important role in that an interpretation is always based on the interpreter's background knowledge. Within the field of IS, theory and conceptions of information systems and their use within businesses and society are often the object of study. Therefore, theory naturally plays a central role; not only as background knowledge, but also as a primary phenomenon under investigation. Presumably, in most IS research there is a need to continuously refine the theory and to reflect over its pros and cons, and also to admit that sometimes the wrong road was chosen.

4 RESEARCH ON IS ACTABILITY – AN ILLUSTRATIVE EXAMPLE

This section uses research on the concept of IS actability (Ågerfalk 2003) as a way to exemplify and explore further the concepts introduced above. In this work, as we shall see below, the main concept was that of actability *per se*. Actability is a concept for the understanding of information systems as tools for business action and communication, which draws on social action and linguistic theories to understand the use and development of IS. This concept was developed and validated through three different operationalizations: a systems development method, an evaluation method and a descriptive analytic framework for studying IS-related phenomena.

4.1 Research Strategy Adopted in the Actability Research

The empirical research on actability was conducted according to a case research strategy. Yin (1994, p. 13) defines 'case study' as 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident'. He further argues that a case study approach is most beneficial when the study's questions concerns 'how' and 'why' questions.

The intimate relationships between concepts, operationalizations, applications and consequences, as described above (Section 3.2) indeed suggest that the borders between phenomenon and context, in general, are hard to distinguish. As a consequence, it was unclear from the outset which were the actual units of analysis (i.e. the phenomena to study). This led to the borderline between phenomenon and context being allowed to shift back and forth over time in a dialectic manner. Sometimes the concept was in focus, with its operationalization as background. Sometimes it was exactly the other way around. Such focus shifts are essential in order to succeed with the suggested approach that intertwines the context of discovery and context of justification (see Section 3.3).

According to Yin (1994), the unit of analysis is related to the fundamental problem of describing what the 'case' is. 'The key issue in selecting and making decisions about the appropriate unit of analysis is to decide what it is you want to be able to say something about at the end of the study.' (Patton 1990, p. 168) In the cited actability research, the high level units of analysis were the three operationalizations of actability, and by extension the concept of actability *per se*. The reason for treating the operationalizations as units of analysis is that the operationalizations evolved over time and tracking this evolution was important. The research design was an embedded one (Yin 1994), which means that different levels of empirical units were studied. For example, the work on the systems development method involved several different settings with different foci ranging from professional developers working with the proposed method to pure theoretical reflection.

Figure 2 summarizes the overall units of analysis used. The different units of analysis can be allocated to three distinct levels (or focal areas), referred to as the levels of *theory*, *practice* and *approach*. At the practice level, the research was concerned with actors who, within a business context, performed business actions through and by means of information technological artefacts. These three components constitute different units of analysis, which must be understood in relation to each other; for each unit the other two constitute its context. Different practices were studied by use of the evolving actability operationalizations. These operationalizations, *per se*, constitute further units of analysis. The interest was in different properties (constituents) of the operationalizations and to what extent they directed attention to, and helped to explain, relevant phenomena within the practices studied. This included the

attitudes of users of the operationalization, such as researchers and other external participants, and how the understanding of the practice and the operationalization developed. At the level of theory, the research was concerned with the concept of actability and the repercussion the development of knowledge of the other two levels had on it.

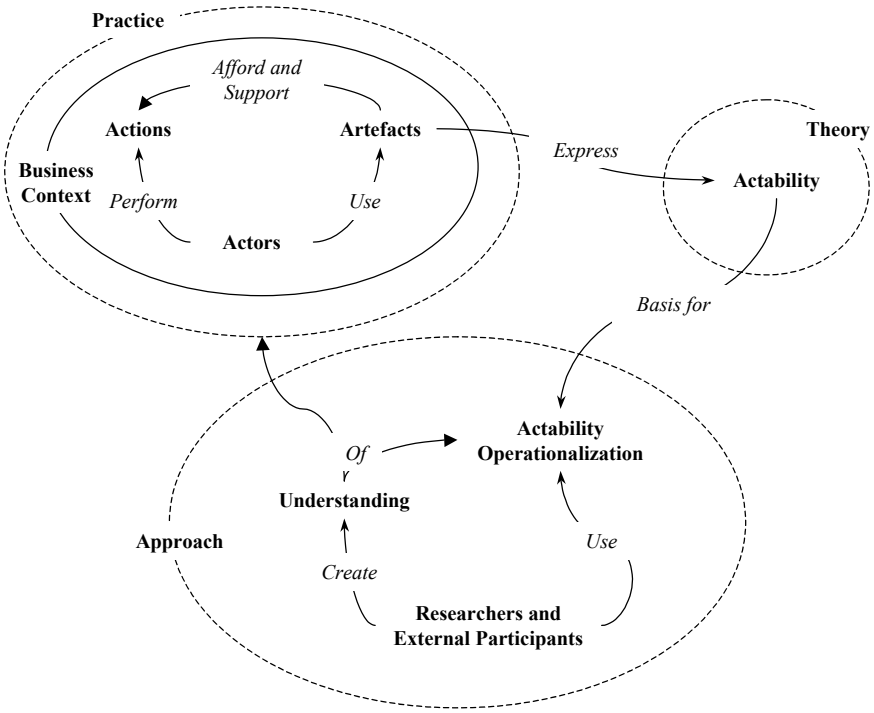

Figure 2. Principal units of analysis in the actability research (Ågerfalk 2003).

If comparing Figure 2 with Table 3 and the discussion in Section 3.2, we can see that the level of theory constitutes the overall concept, which is operationalized into the level of approach. The operationalization is then applied to study the level of practice. During such applications, consequences arise. All three levels contain units of analysis, which when focused constitute concepts in their own right.

Inter-subjective linguistic aspect		Inter-subjective action aspect	Inter-subjective consequence aspect
Concept	**Operationalization**	**Application**	**Consequence**
Actability	Development Method	Specification of requirements	Requirements specifications
Actability	Evaluation Method	Evaluation of existing and re-designed systems	Evaluation reports and re-design suggestions
Actability	Analytic Framework	Analysis of IS phenomena	Description of IS phenomena
Internal grounding and External theoretical grounding		Empirical grounding	

Table 3. Actability operationalizations with applications and consequences (Ågerfalk 2003).

The case research strategy is often associated with qualitative research approaches (e.g. Benbasat, Goldstein & Mead 1987). In line with that notion, the research on actability was performed according to a qualitative research tradition. According to Patton (1990, p. 167): 'One of the strengths of qualitative analysis is looking at program units holistically. This means doing more than aggregating data from individuals to get overall program results. When a program, group, or community is the unit of analysis, qualitative methods involve observations and descriptions focused directly on that unit.' Hence, a qualitative approach offers support for the required focus shifting between the different embedded units of analysis at different levels, as depicted in Figure 2.

The initial research was an explorative study in which early ideas were tried and refined, and as the concept of actability stabilized, the research approach to use became a more open question. The reason for favouring qualitative action research was to gain experience, and draw conclusions, from working with different operationalizations of actability. The operationalizations are complex phenomena *per se*. In addition, they were under development and continuously change. Such circumstances require closeness between the observer and the observed in order to gain rich and balanced data. Closeness in itself does not necessarily imply action research; to that end observations would suffice. However, in accordance with the reflective stand taken, active participation makes it possible to adapt the study to changing circumstances and, as was central to this work, try out emerging ideas instantly. Furthermore, the circumstances made it difficult to specify expected results in advance, which also speaks in favour of a qualitative approach.

4.2 The Grounding of Actability

The grounding of actability followed what has been discussed above (Section 3), i.e. internal grounding, external theoretical grounding and empirical grounding. The main sources for external theoretical grounding were various contemporary IS knowledge domains, primarily within IS development (ISD), requirements engineering (RE) and communication modelling (CM), including the language/action perspective (Schoop 2001) and organizational semiotics (Stamper 1997). Additionally, usability-related knowledge (e.g. Bevan 1995, Carroll 1997) influenced the work. The different external sources of knowledge were reconciled and re-interpreted from a social action perspective to form the concept of actability – the internal grounding process.

As stated above, actability was operationalized in three different ways for the purpose of empirical grounding (see Table 4). Note that in Table 4, the operationalizations are labelled concepts, as distinct from Table 3 in which they were referred to as operationalizations of the concept of actability. This is due to the recursive nature of action knowledge discussed in Section 3.2.

Concept	**Internal Grounding**	**External Theoretical Grounding (Main Sources)**	**Empirical Grounding**
Actability	Purely internal	ISD + RE CM Usability	An IS development method based on actability An IS evaluation method based on actability An analytic framework based on actability
Development Method	Internal and in relation to actability	RUP/UML, User Centred Design, Rapid Application Development	Development projects Classroom experiences
Evaluation Method	Internal and in relation to actability	Usability evaluation methods, General evaluation methods	IS evaluation projects
Analytic Framework	Internal and in relation to actability	The semiotic framework, The notion of practice	Analysis and description of the Internet-based information system and the local electronic marketplace

Table 4. Grounding of the different concepts (adapted from Ågerfalk 2003).

Since action knowledge is recursive by nature, so is the process of grounding it. Therefore, a particular concept can be grounded both internally, externally and empirically. The result of (or rather the operationalization used for) empirical grounding can then be focused as a concept in its own rights to which the three grounding processes apply as well. Table 4 shows the three groundings of actability *per se* and of its three operationalizations. The adopted principle is that the grounding of an operationalization, for example the actability evaluation method, internally, externally and empirically yields an empirical grounding of actability, which is the main concept under scrutiny. As shown in Table 4, the internal grounding of an operationalization includes the grounding of it in its actability 'legacy' as well. As stated above, actability was externally grounded mainly with respect to ISD and

RE, CM, and usability. Each operationalization was then externally grounded in more specific approaches within these larger areas, as shown in Table 4.

4.3 The Actability Research Process

A reflective approach that acknowledges all three sources of knowledge (internal, external and empirical) as important for both generation and validation was used in the actability research. With such an approach, different external theories can be used as a source for generating knowledge. This knowledge can then be applied in practice and empirical data collected, which typically will have repercussion on the knowledge under development. The knowledge can also be related to other external theories (and/or the ones used for its generation) to achieve external theoretical validation. This way generation and validation go hand in hand during an accumulative grounded knowledge development.

This research process implies that internal grounding and external theoretical grounding of actability were highly intertwined with its empirical grounding and hence with its different operationalizations. This called for both conceptualization (through internal grounding and external theoretical grounding) and application (empirical grounding). Naturally, the empirical research within this overall framework was carried out differently within different empirical contexts; the all-pervading approach being the reflective approach described above.

Within this framework, an operationalization of actability was applied in practice and data continuously collected, typically through interviews, observations and field notes based on experiences from interventions (i.e. action research). The data collected was then analysed and suggestions for modification of the operationalization identified. As a means for structuring the analysis, the data was categorized and interrelated in a structured way, similar to that of Grounded Theory (Strauss & Corbin 1998). To this end, conceptual modelling (such as entity-relationship modelling) was used as a way to picture and describe the generated categories. During analysis, actability and the focused operationalization were used as tools that directed attention to phenomena relevant for the situation at hand. During this iterative process of operationalization, application and conceptualization, repercussion on the concept of actability itself occurred as a natural consequence. This way actability was continuously developed conceptually while being empirically validated.

4.4 Grounding versus Relevance, Reliability and Validity

When judging the quality of research it is common to apply the quality criteria relevance, reliability and validity. The question of a study's relevance may be approached from two perspectives. A study may be scientifically relevant but have limited practical usefulness. On the other hand, a study may have high practical value but suffer from limited theoretical contributions. To some extent, the proposed view on research as constructing well-grounded arguments for what is usable rather than for what is true means that relevance becomes an integrated part of validity. Something that is irrelevant can simply not be useful. The all-pervading approach in the actability research to achieve practical relevance was to work closely together with practitioners, both developers and users.

Reliability has to do with whether a study would yield the same results given that it was performed once again, perhaps by another researcher. On a general note, reliability is problematic in relation to qualitative studies since interpretation by definition precludes reliability in the traditional sense. Therefore, it is more important that a study is argumentatively valid. If the underlying conceptualizations and choices made are transparent, the study is reliable. Consequently, authors should strive to be explicit on these points, and also present how concepts have evolved over time.

A related issue is the question of the possibility of drawing general conclusions from only one or a few cases (Lee & Baskerville 2003), which is inherent in the research design described above. According to Walsham (1993, p. 15), 'the validity of an extrapolation from an individual case or cases depends not on the representativeness of such cases in a statistical sense, but on the plausibility and cogency of

the logical reasoning used in describing the results from the cases, and in drawing conclusions from them'. This is in line with Yin (1994) who argues in favour of analytical abstraction rather than statistical. That is, 'cases are not "sampling units" and should not be chosen for this reason. Rather, individual case studies are to be selected as a laboratory investigator selects the topic of a new experiment… the method of generalization is "analytic abstraction", in which a previously developed theory is used as a template with which to compare the empirical results of the case study' (Yin 1994, p. 31). Again, it seems to be a question of argumentative rationality, of providing good reasons as arguments for the claimed knowledge.

5 CONCLUSION

This paper has presented an approach to ground (generate and validate) action knowledge in IS research. The specific issue elaborated is that of the tension between theory development and practical application often found in IS research. Three generic grounding processes with corresponding knowledge sources have been discussed: internal grounding, external theoretical grounding and empirical grounding. To exemplify the concepts introduced, research on IS actability (Ågerfalk 2003) has been used as an illustration. This research has been described as a reflective, case study based qualitative process where the actability concept was generated and validated by means of three, partly overlapping, operationalizations. The first focused on actability as a foundation for IS development, the second on evaluation of actability in existing systems, and the third on using actability as a descriptive analytic framework for understanding IS-related phenomena. The concept of operationalization has been elaborated and suggested as an important link to overcome the tension between the abstract and the concrete – between theory and practice.

'Sure it works in practice, but will it work in theory?' The question was brought up by Erik Clemons during his keynote speech at the 1999 IRMA conference in Hershey, Pennsylvania – a question with humorous undertones but with serious implications. One aim of IS research should be to develop knowledge that 'works' both in theory and practice. To theorize about practice and to make theory practical is, according to this author's belief, the task with a capital T of IS research. Unfortunately it sometimes seems easier to try to change good practice than to change bad theory. Careful selection and management of the relationships between concepts, operationalizations, and consequences may be one way of maintaining the link between theory and practice as a way of avoiding impracticable theory – that is, a way of constructing tangible theory in IS research.

References

Ågerfalk P.J. (2003). Information Systems Actability: Understanding Information Technology as a Tool for Business Action and Communication. Doctoral dissertation, Department of Computer and Information Science, Linköping University, Linköping, Sweden.

Alvesson M., Sköldberg K. (2000). Reflexive Methodology: New Vistas for Qualitative Research. SAGE, Thousand Oaks, CA.

Avison D.E., Lau F., Myers M.D., Nielsen P.A. (1999). Action Research. Communications of the ACM, 42(1), pp. 94–97.

Benbasat I., Goldstein D.K., Mead M. (1987). The Case Research Strategy in Studies of Information Systems. MIS Quarterly, 11(3), pp. 369–388.

Bevan N. (1995). Measuring Usability as Quality of Use. Software Quality Journal, 4(2), pp. 115–130.

Braa K., Vidgen R. (1999). Interpretation, Intervention, and Reduction in the Organizational Laboratory: A Framework for in-Context Information System Research. Accounting, Management and Information Technologies, 9(1), pp. 25–47.

Carroll J.M. (1997). Human-Computer Interaction: Psychology as a Science of Design. International Journal of Human-Computer Studies, 46(4), pp. 501–522.

Dahlbom B. (1996). The New Informatics. Scandinavian Journal of Information Systems, 8(2), pp. 29–48.

Dahlbom B., Mathiassen L. (1993). Computers in Context: The Philosophy and Practice of Systems Design. Blackwell, Cambridge, MA.
Ehn P. (1995). Informatics: Design for Usability. In The Infological Equation: Essays in the Honor of Börje Langefors, (Ed, Dahlbom B.) Gothenburg studies in information systems, Gothenburg University, Gothenburg, Sweden, pp. 159–174.
Fitzgerald B., Russo N.L., Stolterman E. (2002). Information Systems Development: Methods in Action. McGraw-Hill, Berkshire, UK.
Glaser B.G., Strauss A.L. (1967). The Discovery of Grounded Theory: Strategies for Qualitative Research. Aldine, New York, NY.
Goldkuhl G. (1999). The Grounding of Usable Knowledge: An Inquiry in the Epistemology of Action Knowledge. Linköping University, CMTO Research Papers 1999:03, Linköping, Sweden.
Goldkuhl G. (2002). Anchoring Scientific Abstractions: Ontological and Linguistic Determination Following Socio-Instrumental Pragmatism. In Proceedings of the European Conference on Research Methods in Business and Management Studies (ECRM 2002), MCIL, Reading, UK.
Goldkuhl G., Cronholm S. (2003). Multi-Grounded Theory: Adding Theoretical Grounding to Grounded Theory. In Proceedings of the 2nd European Conference on Research Methods in Business and Management Studies (ECRM 2003), MCIL, Reading, UK, pp. 177–196.
Habermas J. (1984). The Theory of Communicative Action. Polity Press, Cambridge.
Hirschheim R., Klein H.K., Lyytinen K. (1996). Exploring the Intellectual Structures of Information Systems Development: A Social Action Theoretic Analysis. Accounting, Management and Information Technologies, 6(1–2), pp. 1–64.
Lee A.S., Baskerville R.L. (2003). Generalizing Generalizability in Information Systems Research. Information Systems Research, 14(3), pp. 221–243.
Mathiassen L. (2002). Collaborative Practice Research. Information Technology & People, 15(4), pp. 321–345.
McKay J., Marshall P. (2001). The Dual Imperatives of Action Research. Information Technology & People, 14(1), pp. 46–59.
Moody D.L. (2000). Building Links between IS Research and Professional Practice: Improving the Relevance and Impact of IS Research. In Proceedings of the 21st International Conference on Information Systems, Association for Information Systems, Atlanta, GA, USA, pp. 351–360.
Mumford E. (2001). Advice for an Action Researcher. Information Technology & People, 14(1), pp. 12–27.
Mumford E. (2003). Information Systems Research and the Quest for Certainty. Journal of the Association for Information Systems, 4(4), pp. 197–205.
Patton M.Q. (1990). Qualitative Evaluation and Research Methods. 2nd ed., SAGE, Newbury Park, CA.
Polanyi M. (1958). Personal Knowledge: Towards a Post-Critical Philosophy. Routledge & K. Paul, Chicago.
Popper K. (1975). Objective Knowledge: An Evolutionary Approach. Clarendon Press, Oxford.
Schoop M. (2001). An Introduction to the Language-Action Perspective. ACM SIGGROUP Bulletin, 22(3), pp. 3–8.
Schoop M., Quix C. (2001). DOC.COM: A Framework for Effective Negotiation Support in Electronic Marketplaces. Computer Networks, 37(2), pp. 153-170.
Stamper R.K. (1997). Organisational Semiotics. In Information Systems: An Emerging Discipline?, (Ed, Stowell F., Mingers J.) McGraw-Hill, London, pp. 267–283.
Strauss A.L., Corbin J.M. (1998). Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. 2nd ed., SAGE, Thousand Oaks, CA.
Walsham G. (1993). Interpreting Information Systems in Organizations. Wiley, Chichester.
Walsham G. (1995). The Emergence of Interpretivism in IS Research. Information Systems Research, 6(4), pp. 376–394.
Weber M. (1978). Economy and Society. University of California Press, Berkeley, CA.
Weber R. (2003). Editor's Comments: The Reflexive Researcher. MIS Quarterly, 27(4), pp. v–xiv.
Yin R.K. (1994). Case Study Research: Design and Methods. 2nd ed., SAGE, Thousand Oaks, CA.