JITTA

JOURNAL OF INFORMATION TECHNOLOGY THEORY AND APPLICATION

DESIGN THEORIES IN INFORMATION SYSTEMS – A NEED FOR MULTI-GROUNDING

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ABSTRACT

Within the information systems community there is growing interest in design theories. These theories are aimed to give knowledge support to design activities. Design theories are considered as theorized practical knowledge. This paper is an inquiry into the epistemology of design theories. It is an inquiry in how to justify such knowledge; the need to ground and how to ground a design theory. A distinction is made between empirical, theoretical and internal grounding. *The empirical grounding has to do with the effectiveness of the application of knowledge. External theoretical grounding relates design theory to other theories. One part of this is the grounding of the design knowledge in general explanatory theories. Internal grounding means an investigation of internal warrants (e.g. as values and categories) and internal cohesion of the knowledge. Together, these different grounding processes form a coherent approach for the multi-grounding of design theory (MGDT). As illustrations some examples of design theories in IS are discussed. These are design theories concerning business interaction which are based on language action theories.*

INTRODUCTION

Background and purpose

Information systems (IS) as a discipline is concerned with designed artefacts. The practice of information systems is an interplay between design and usage of such systems. Design as process (the IS development) and design as product (the developed IS) need to be addressed in IS research (Orlikowski & Iacono, 2001; Benbasat & Zmud, 2003). The design dimensions of IS can, however, be addressed in different ways. Much IS research may deal with design issues without explicitly using the notion of design, but using other conceptual labels. Much of traditional MIS and DSS research seems to describe and analyse IS features in relation to managerial and behavioural aspects in the context. Such research is seldom explicitly design oriented.

Mike Metcalfe acted as senior editor for this paper.

Goldkuhl, G., "Design Theories in Information Systems – A Need for Multi-Grounding", *Journal of Information Technology Theory and Application (JITTA),* 6:2, 2004, 59-72.

However, explanatory studies of this kind may explain effects of design decisions made and then serve as basis for the design of new information systems. As said, this is however often implicit in the pursued research.

As a reaction towards this lack of explicit design orientation in IS research, several scholars have argued for IS as a design science and for the development and use of design theories in IS (Walls et al, 1992; March & Smith, 1995; Gregor & Jones, 2003; Hevner et al, 2004). Walls et al (1992) present an important contribution. They define information systems design theory "to be a prescriptive theory which integrate normative and descriptive theories into design paths intended to produce more effective information systems" (ibid p 36). They specify the contents of a design theory. The scope of such a theory is both the design product and the design process. There are theory elements for both the design product and the design process. Walls et al use this conception of design theory when developing a theory for vigilant executive IS (ibid). Their approach to design theory has also been used by Markus et al (2002) and Jones et al (2003). Following Simon (1969) they integrate explanatory kernel theories into the design theory. Explanatory kernel theories are thus considered to be parts of design theories.

The works by Walls et al (1992), Gregor & Jones (2003) and Hevner et al (2004) are all important contributions to our understanding of design theories in IS research. What seems to be lacking are however clear epistemological relations between design theory and other knowledge elements. This paper is an inquiry into the epistemology of *design theory*, i.e. into codified and justified knowledge governing people's design work concerning IS. It is an inquiry in justification of such knowledge, which includes relations to other knowledge sources. My main concept is the *grounding* of knowledge. Grounding means justifying knowledge by claiming its validities. The concept of grounding however goes beyond a limited ex post check of validity. I accept a dialectical relation between the "context of discovery" and the "context of justification" (Kuhn, 1970). In one significant sense I follow the use of 'grounding' from the grounded theory (GT) approach (Glaser & Strauss, 1967; Strauss & Corbin, 1998). One strong claim in GT is that a theory should be both generated from empirical data and tested against empirical data. A grounded theory is one that is generated from data and validated through data. This means that when speaking of grounding we do not only address issues of validity control, but also issues of generation .

In certain respects, my approach to the grounding of design theory deviates from GT. There is no restriction to inductive grounding onto empirical data as in GT. Other knowledge sources than empirical data are taken into account. A strict inductive procedure is avoided. The dialectics between data, focused theory and other theories are acknowledged. As Blumer (1954) puts it:

"Theory, inquiry and empirical fact are

CONTRIBUTION

This paper contributes to information systems research through elaboration of the notion of design theory. Design theory is considered as practical knowledge used as support to design activities. The main emphasis of the paper is the analysis of different grounding processes in relation to design theory. The validity of a design theory is seen as dependent on three grounding processes: empirical grounding (the grounding in observations and the practical application of the design theory), theoretical grounding (the grounding in external theories, often of explanatory character) and internal grounding (the grounding in the theory itself, its internal cohesion and consistency). The prescriptive nature of design theories is analysed and its relations to other knowledge forms (observations, explanations, concepts and values) are determined.

These different grounding processes form together a coherent approach, which is called multi-grounding of design theory (MGDT). The contribution of MGDT should be seen as a meta design theory that supports research and development of design theories in information systems. MGDT involves also a description of different ways to generate a design theory.

> *interwoven in a texture of operation with theory guiding inquiry, inquiry seeking and isolating facts, and facts affecting theory. The fruitfulness of their interplay is the means by which an empirical science develops."*

I make in this paper a distinction between *empirical, theoretical and internal grounding*. The empirical grounding has to do with the effectiveness of the application of knowledge. A main idea behind this approach is that design theories need to be grounded not only in empirical data. Theoretical grounding relates the design theory to other knowledge of theoretical character. One part of this is the grounding of the design theory in general explanatory theories. Internal grounding means an investigation of internal warrants (as e.g. values and categories) and internal cohesion of the knowledge. These different grounding processes together form a coherent approach, which is called multi-grounding of design theory (MGDT). It is a special case of multi-grounded theory as described by Goldkuhl & Cronholm (2003).

The crucial question for this work is: How do we know that a design theory is a good one? This question must be supplemented by the question "What do we mean by a good design theory?" Usefulness is the main validity claim of design theories (this will be explicated in section 2 below). A concern for both IS researchers and practitioners is not only to understand the contents of a design theory but also to reach a comprehensive and transparent understanding of why the design theory is considered useful and valid in other respects. Why should we trust the design theory?

Design theory as a practical theory

Design theories consist of knowledge of practical character; i.e. for practical purposes. The knowledge aims at contributing to design processes. Design is interpreted in a broad sense, involving "solving problems, creating something new, or transforming less desirable situations to preferred situation" (Friedman, 2003 p 507). Knowledge for design processes may not only involve prescriptions for the designing actions and for the design object. Following the pragmatic theories of Mead (1938) and Morris (1964) there is complementary knowledge besides such prescriptive knowledge. There may be knowledge supporting the preparatory stage of interpreting the initial situation; i.e. support to identify, perceive and conceptualize relevant objects, processes and properties that constitute the basis for the design intervention. There may also be knowledge supporting the assessment of the design intervention; i.e. knowledge for a post-evaluation to judge if design goals are fulfilled.

Design theories are aimed for and related to design activities and as such they are practical theories as described in the pragmatic tradition (Dewey, 1931; Cronen, 2001). The value of practical theories lies in their usefulness for inquiry processes (ibid). Cronen describes a practical theory to consist of "a heuristic model for guiding the inquirer in how to develop percepts and how to organize information for analysis and evaluation" (ibid p 26f).

Inquiry and design activities can be supported by design theories. The use of such theories informs the design process. There is a difference between a design process simply as practical art and a design process governed by practical design theories (Cronen, 2001; Friedman, 2003). Design theory will make a difference for design! Not all practical knowledge should be considered to be design theories. Only theorized practical knowledge should be conceived as design theory.

Examples of IS design theories

In Walls et al (1992), Markus et al (2002), Jones et al (2003) and Hevner et al (2004) examples of explicit design theories in IS are presented. As also indicated in several of these references there are numerous of other approaches in IS which may be labelled design theory as well. These other approaches may not yet have a structure according to the ideal design theory model by Walls et al (1992). However, there are different theoretical design approaches in IS which have been utilized in design endeavours for many years. The usage of such approaches in empirical design settings has contributed with new knowledge, which has lead to their revision. They fulfil the requirements of a design and test cycle (Hevner, et al 2004).

As said above there are numerous of IS design approaches which may count as design theories. I will just mention a few, which I have acquaintance of due to personal research interest. There are several approaches, based on language action (LA) theories, for design and evaluation of business interaction. There are approaches like Action Workflow (Medina-Mora et al, 1992), DEMO (Dietz, 1999), MRM (Lechner & Schmidt, 2000) and BAT (Goldkuhl, 1998). These approaches comprise generic structures for business interaction, which are assumed to be used as *design templates*. For example, Action Workflow divides business interaction into four phases (preparation, negotiation, performance, acceptance) performed by two roles (customer, performer). These LA approaches are more oriented towards the design product (by giving an ideal pattern) than towards the design process. They govern design and evaluation mainly through the direction of designer's attention towards certain phenomena. The different constructs in the LA models govern the designers' thinking. One can say that the degree of prescriptiveness for procedures is not so high but the specific LA framework offers a high degree of conceptual prescriptiveness.

I introduce these design theories (as I dare to call them) here and I will return to these later in the paper (A brief example discussion below) when discussing and giving examples of grounding efforts.

VALIDITY OF ACTION KNOWLEDGE

Practical knowledge and rationality

Practical knowledge can be more or less rational. Weber (1978) talks about *practical rationality*, which consists of three types of sub-rationalities. The two first are related to purposive-rational action and the third to value-rational action in his action typology.

1) *Instrumental rationality* means the appropriateness of the means to given ends.
2) *Rationality of choice* means the setting of ends in relation to values.
3) *Normative rationality* means the evaluation and application of ethical principles in action.

The identification and differentiation of these three rationalities is important. The three rationalities are put together under the label of methodical-rational conduct of life (cf also the analysis in Habermas, 1984 p 168ff). The integration of them into the notion of practical rationality is important since it transcends a limited technical rationality (1). Practical rationality is not restricted to only finding the best techniques to given ends. It also includes the choice and legitimation of ends in relation to values (2). And furthermore it is taking into account the intrinsic value principles in the performance of action (3). A narrow purposive-rational action can be challenged to be the case of ”the end justifies the means” and thus ruling out other important values. Practical rationality means the integration of purposive rationality and value rationality. This implies the *multi-functionality of action* involving both intrinsic values and intended purposes. Weber (1978) stated that purposive-rational action and value-rational action was to be seen as analytic categories, but they seem often to have been misinterpreted as distinct empirical classes. Action is often both purposeful and value rational (bearing intrinsic values

Rescher (2000) describes well the need for both instrumental rationality (1) and axiological rationality (2) and the integration of them:

> *"Rationality has two sides: an axiological (evaluative) concern for appropriateness of ends and an instrumental (cognitive) concern effectiveness and efficiency in their cultivation. The concept of rationality fuses these two elements into one integral and unified whole, seeing the that the inherent purposiveness of values make them part of the rational enterprise" (ibid p 174).*

The notion of practical rationality is necessary when we speak of grounding of practical knowledge. Action rules (prescribed means) must be possible to relate not only to empirical consequences but also to ends (goals) and values. The relation to values is made on two levels; values ”outside” action as expected results and consequences (2), and also values within action, i.e. expressed when performing action (3).

Practical knowledge and validity claims

How do we know that some practical knowledge is good knowledge? This is the problem of practical knowledge validity. We can talk about the grounding of practical knowledge (design theories). Grounding means putting arguments in favour of this knowledge so actors can be more confident in using the knowledge. This is an argumentative view on knowledge (Toulmin, 1958; Habermas, 1984). Claiming the validity of knowledge is presenting good reasons as arguments for the knowledge.

There is however not one simple way to the grounding of knowledge. I follow Habermas (1984) who states that different character of knowledge (expressed in different forms of sentences) requires *different forms of grounding*. ”Starting from the analysis of sentence forms, we can go on to clarify the semantic conditions under which corresponding sentence is valid.” ”…. the meaning of grounding changes in specific ways with changes in sentence form.” (ibid p 39).

In the analysis of the rationality of different communicative actions Habermas presents different *validity claims* that can be raised. This is another important issue concerning the grounding process that should be taken into account. I follow Habermas' perspective on rationality and grounding in general. This is translated into two important principles for my analysis:

1) The grounding of practical knowledge must be done in accordance with the epistemological character of such knowledge.
2) Different groundings (validity claims) can be raised in connection to this knowledge.

How these two principles are used is described below.

Practical knowledge: Prescriptions vs. explanations

The form of knowledge is obviously one key to the grounding of knowledge. What can we say about the form of practical knowledge? As stated above, practical knowledge means knowledge used to govern human action. One can describe this as rules for action or prescriptions for action. I do not reduce all kinds of practical knowledge to prescriptions, but in the following I will use action prescription as a prototype for practical knowledge and for my analysis of grounding principles for such knowledge. A prescriptive statement is described in the following general way:

Perform act A in order to obtain goal G

A prescriptive statement does not only consist of a reference to a certain kind of act. It also includes a reference to a goal that is assumed to be attained when performing this kind of act (Goldkuhl, 1979). A prescriptive statement will also often include some reference to situations and other action conditions of importance (Argyris & Schön, 1996).

When analysing the validity of practical knowledge I will use this prescriptive statement and its ”sentence form” as the basis against which validity claims of different kinds can be raised. The epistemological character of this kind of practical knowledge is thus *prescriptions for actions in order to reach certain goals*. This is how the first of the two principles above is applied.

Is the suggested prescription an appropriate way to reach the given goal? This is a main validity evaluation to meet. What effects will the prescribed action have? Will it lead to the desired effects? Putting it in this way, one establishes a clear relation to causality. If action is performed (=cause) then the desired goal is reached (=effect). We are now facing a classical problem: The relation between is and ought to. There has been a long discussion concerning if *ought to* can be derived from *is*[1]. The prescriptive statement expresses what *ought* to be done. A causal statement (if cause then effect) is no expression of *ought to*, but describes what *is*; a state of affairs.

Is it then possible to derive what *ought to* be done from what *is*? An explanatory statement can be transformed into a prescriptive one. I will not call this a pure derivation from *is* to *ought to*. *Is* is however used as a basis for derivation into *ought to*. My description of this classical problem looks the following way:

An explanatory statement: If cause C then effect E ("is")

An investigation into what states are desired, a list of goals G

An identification of effects E that equals goals G

A prescriptive statement: If act A then Goal G ("ought")

where act A equals cause C and Goal G equals effect E in the explanatory statement

It is not possible to derive *ought to* from *is* directly. It is necessary to state what is *desired* (part of *ought to*) and this is distinguished from what *is*. If one knows what is desired then it is possible to derive *ought to* from *is* and the stated goal. What is desired is not possible to express just with reference to cause and effect. Desires and goals are always what people want to achieve. To summarise: Is + wish = ought to.

This discussion of *is* and *ought to* shows an important relationship between causal and prescriptive statements. Figure 1 depicts the relationships between prescriptive and explanatory statements. To concretise this discussion I will use an example for illustration. I pick an example from Norman (1988). One of the main messages in his book is that a device should present its action possibilities clearly to its users; a principle of action visibility that can be traced back to the affordance theory of Gibson (1979). There is a possible cause-effect link here: *If action alternatives of a device are clearly visible, then the actor can evaluate what actions to perform.* The then-part of this clause (the effect) is judged concerning its desirability. By support of other parts of Norman's design theory[2], the need to evaluate action possibilities is deemed to be desirable. The explanatory statement above can hence be re-formulated into a prescriptive one: *Action alternatives of a device should be made clearly visible, in order to let the actor evaluate what actions there are to perform.*

One important grounding of prescriptive statements and practical knowledge can be carried out with reference to empirical observations concerning actions and their effects. But this is not the only one to be made. Since there are other epistemological relationships concerning practical knowledge there will be other types of groundings also.

I have introduced the prescriptive statement as the prototype form for practical knowledge. This does not of course include all possible types of practical knowledge, but this is here seen as the core of practical knowledge and design theories. A prescribed action (as it is part of the prescriptive statement) is seen as an *action rule*. It describes the type of action suggested to be performed. There is a clear difference between the main validity claims concerning prescriptive and explanatory statements. In regard to the latter truth is the main validity claim to be raised. This is not the case concerning prescriptions. A prescription is not true or false. It is more or less useful. Thus, *usefulness* is the key validity claim for prescription. A vindicated efficiency of a prescription is of course open to empirical reviews and can thus be transformed into issues of truth. This can be understood from the discussion above concerning the relationships between the prescriptive and the explanatory.

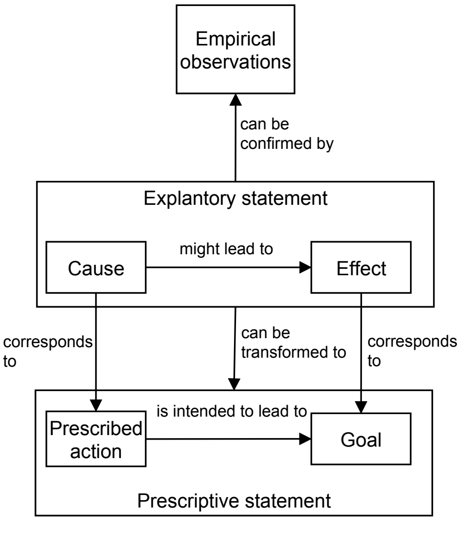

Figure 1 Relationships between prescriptive and explanatory statements

I have, thus, asserted that the main validity claim of prescriptive action knowledge is usefulness. But since this kind of knowledge has different epistemological relationships other validity claims can be raised according to the second principle from Habermas (1984). This will be investigated in the following section.

DIFFERENT GROUNDING PROCESSES OF DESIGN THEORIES

When we talk about the grounding of knowledge this means an establishment of an argumentative relationship between this piece of knowledge and some other part of knowledge. The other piece of knowledge is considered as a warrant (a good reason) for the part of knowledge in focus.

The justification of design theories (as practical knowledge) can be made in relation to three different kinds of knowledge

- the design theory itself
- empirical observations
- other knowledge of theoretical character

I talk about three different classes of grounding related to these three different sources:

- Internal grounding
- Empirical grounding
- Theoretical grounding

This is depicted in figure 2.

To justify practical knowledge is to reconstruct, formulate and evaluate its knowledge basis as warrant, and as a result of this scrutiny claim the validity of the focused knowledge. The claims for validity can differ depending on what epistemological relationships there exist between the practical knowledge and its different warrants. The prototype for practical knowledge/design theory is in this paper said to be the action rule. Action rules have relationships to

- other action rules
- goals and values
- categories
- empirical observations
- theoretical explanations

I refer to figure 3 as a basis for the discussion concerning different grounding processes.

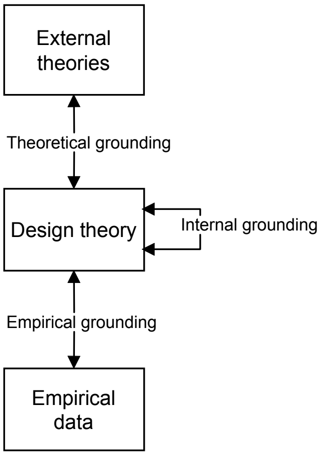

Figure 2 The grounding of design theory in relation to three main sources of knowledge

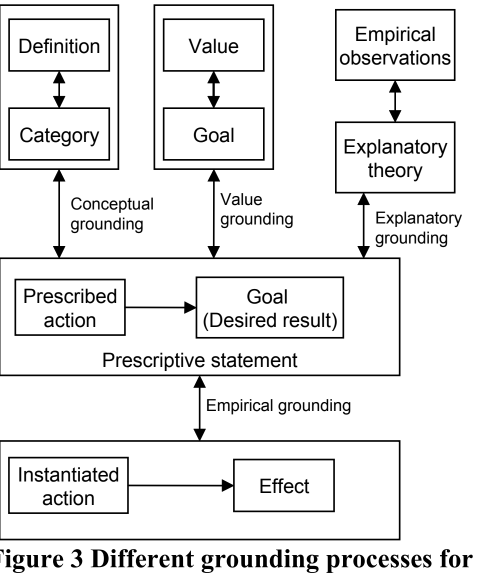

Figure 3 Different grounding processes for practical knowledge

Value grounding

As has been described in section 2 above an action prescription includes an explicit (or at least implicit) reference to a goal to be attained. The legitimacy of a prescribed action rule lies in the goal and associated values that are intended to be reached and expressed through the action. In a proper grounding of a design theory it is impossible to exclude grounding in goals and values. The different sub-rationalities of practical knowledge (mentioned above) have a clear reference to value aspects. This counts especially for the rationality of choice and normative rationality.

Conceptual grounding

All statements (of value, prescriptive, explanatory or other kind) include the use of categories. To talk about the world means using linguistic codes with reference to intersubjective mental concepts. Action rules and stated goals include the use of words and a grounding of practical knowledge cannot be done without an analysis of the concepts used. A conceptual analysis should include an analysis of the existing and possible definitions of categories. Are the categories clear and understandable? Are they proper delimitations of phenomena in the world? A conceptual grounding means an investigation of the ontological basis for prescribed action in the world. The adequacy of used categories is analysed and made transparent through reasoning and definitions.

Explanatory grounding

Explanatory statements together with formulated goals can be converted to prescriptive statements as described above. This shows a clear epistemological relationship between prescriptive and explanatory statements. Prescriptive statements can thus be grounded in explanations of a theoretical nature.

This is not the same as the empirical grounding described below. Empirical grounding is about the application of the distinct suggested action rules. Explanatory grounding is instead a kind of theoretical grounding and only indirectly related to empirical observations. Such explanatory statements can be on a more abstract level and must therefore be derived and translated to a more concrete level of prescriptive statements.

Explanatory grounding means that action rules and other practical knowledge are given justification in general explanatory theories, which are often on a more abstract level than the practical knowledge itself. Such explanatory theories require of course empirical confirmation to be worth serving as a warrant. These theories correspond to "kernel theories" as mentioned in my Introduction above. As opposed to Walls et al (1992) I do not conceive kernel theories (explanatory theories) to be indispensable parts of design theories. An explanatory theory might be part of a design theory, but does not need to be so.

Empirical grounding

Is the prescribed action really successful in practice? Will it lead to desired consequences? This is the empirical issue concerning a design theory. Such knowledge can be evaluated and justified with reference to actual performance of action and the effects of such actions estimated as good ones.

Empirical grounding means that the application of practical knowledge (action rules) is observed and then evaluated. In empirical grounding one is giving a direct reference to empirical findings. This is opposed to explanatory grounding which only gives an indirect grounding (via general theoretical explanations) to empirical data, as was described just above.

Empirical grounding may be performed in different ways. One can observe design actions performed (as "cause") and their results and consequences (as "effect"). The causal-pragmatic relations will be reconstructed and inferred from the observations made. This can be called observation grounding. A slightly different approach can be taken: An explicit test can be made where prescriptions are presented and followed by actors in their design work. The action knowledge in the proposed design theory is consciously applied and consequences are recorded. This can be called application grounding and involves, of course, observations.

Internal grounding

Internal grounding means the grounding of a design theory in its own background knowledge. This means that a design theory, at least partially, holds its own justification, which can be more or less explicit. Many times, I think, this justification in background knowledge is rather implicit. The background knowledge needs to be articulated and reconstructed (Polanyi, 1958; Habermas, 1984; Goldkuhl & Lyytinen, 1984).

It is not until after the background knowledge (with different categories, rules and values) has been reconstructed and formulated that it is possible to formally connect the focused practical knowledge with its internal warrants.

Internal grounding includes conceptual grounding and value grounding. It can also consist of an evaluation of knowledge cohesion. This means how the different knowledge parts are related to each other and that there is a meaningful and logical consistency.

Theoretical grounding

In theoretical grounding we are dealing with external warrants for the design theory. We are justifying the practical knowledge of the design theory with theoretical knowledge that is considered external in relation to the design theory. There might be established theories that we use for this external grounding. Theoretical grounding can consist of conceptual grounding, value grounding and explanatory grounding.

Summary of grounding processes

I summarise the three different grounding processes below with their different sub-processes:

- Internal grounding
  - knowledge reconstruction
  - conceptual grounding
  - value grounding
  - evaluation of knowledge cohesion
- Theoretical grounding
  - conceptual grounding
  - value grounding
  - explanatory grounding
- Empirical grounding
  - observation grounding
  - application grounding

DEVELOPMENT OF DESIGN THEORIES THROUGH MULTI-GROUNDING

Alternation between generation and validity control

Justification of design knowledge is not totally separated from generation of that knowledge. This means that there are clear links between the ”context of discovery” and the ”context of justification”. As stated in my Introduction above, theory can be generated from and tested against empirical data, as is the case in grounded theory (Glaser & Strauss, 1967). In the multi-grounded design theory approach (confer also Goldkuhl & Cronholm, 2003), grounding can be performed in relation to other knowledge sources.

The emergence of practical knowledge will often develop through the practitioners' continuous application of former practical knowledge in their institutionalised actions. The development of practical knowledge seems to be interwoven with the performance of action. Such knowledge is regularly taken for granted in practice and no explicit grounding occurs (Berger & Luckmann, 1966).

The issue raised here is the development of *grounded practical knowledge* as design theories (not just practical knowledge taken for granted). Or to put it in another way: How can generation and grounding be performed in a way as to strengthen the different validities of design theories?

I follow the division between design theory, other theories and empirical observations (cf figure 2 above). Different types of empirical generation can be distinguished. 1) Already explicit practical knowledge can be modified through the application of it. Practical experiences can be used as a basis for change of a design theory (Cronen, 2001). I call this *explicit modification*. 2) The continuous emergence of action knowledge from practice, as mentioned above, is of course one form of knowledge generation, which must be acknowledged. But this *tacit induction* of action rules does not create a design theory directly. As Friedman (2003 p 519) states it: “design theory is not identical with the tacit knowledge of design practice”. 3) Such action rules can however be made explicit through an active reconstruction and articulation (Polanyi, 1958; Habermas, 1984; Goldkuhl & Lyytinen, 1984). I here call such a reconstructive process an *articulate induction.* This means that successful actions are identified, reconstructed and made explicit as action rules and then incorporated into a design theory.

Contrary to the inductive ways to generate knowledge from the empirical, there can be a *deduction from external theories*. In such cases general theories are used as a basis for ”drawing conclusions” which are added to the body of practical knowledge. External general knowledge (kernel theories) is translated and incorporated into the design theory. The deduction from external theories should not be seen just as a process of logical derivation. General theories can be used in a more creative way as sources for inspiration.

Design theory can be developed without any specific inspiration from outside sources. I call this ”*inside development*” which can include a continuous knowledge refinement or an introduction of new ideas/constructs. What is pure inside development and not made with any inspiration from outside (from practical experiences or general theory) will of course be problematic to judge in many situations. My purpose here is however to construct some ideal types as a basis for our understanding of the generation and grounding of design theories. I have summarised the different ideal types in a table below (table 1).

I mentioned grounded theory (GT) above as one approach for generating knowledge with a strong emphasis on induction (Glaser & Strauss, 1967). How is GT related to MGDT? GT is one strategy for generation and grounding of knowledge, which can fit into the multi-facetted MGDT concept. MGDT acknowledges the possibility and the importance of working with an empirically inductive approach. But at the same time MGDT stresses the importance of a more holistic approach shifting between induction and deduction and incorporating other elements as well (found in table 1 and the text above).

A brief example discussion

I return to the examples of IS design theories introduced in my Introduction above (Action Workflow, DEMO, MRM and BAT). A brief discussion concerning grounding of these theories will be pursued below.

These approaches have all, more or less, theoretical roots in language action theories (Searle, 1969; Winograd & Flores, 1986). These external language action theories function as kernel theories (to use the design theory terminology of Walls et al, 1992) for the design approaches. The theoretical constructs in LA theories (as e.g. in speech act theory; Searle, 1969) function as conceptual and explanatory grounding for parts of the mentioned design approaches. Another pivotal LA reference (Habermas, 1984) treats issues of normative rationality, which then function as a general value grounding. For value grounding more specific for business interaction and IT usage, one must search for other sources.

The development of these design theories can come from different sources. The work by Reijswoud (1996) concerning DEMO is an example of this. Reijswoud relates DEMO to several (kernel) theories on communication as a kind of theoretical grounding. This theoretical grounding involves discussions of both explanatory, conceptual and value character. He also uses DEMO in two case studies and gain experiences as a basis for improvement (empirical grounding). The approach of MRM was originally not influenced by LA theories (Schmid & Lindemann, 1998). After inclusion of LA constructs the generic framework was modified (Lechner & Schmid, 2000). This is an example of change of a design theory through derivation from external theories.

These different approaches have been used in many design and evaluation case studies. There has been a continual revision of these approaches based on empirical observations and experiences from the application of those design theories. One example of this is BAT. Axelsson et al (2000) report from application of the BAT model in a large inter-organisational project. They identified some problems using the original BAT model (Goldkuhl, 1998) when studying different contractual levels in business interaction. These experiences had a great influence on a larger revision of the BAT model (Goldkuhl & Lind, 2004). In this revision the authors (ibid) did not only refer to empirical observations (i.e. empirical grounding). They also ground their revisions in other theories concerning business

Table 1. Grounding of a Design Theory: Shifting Focus

	Generation	Validity control
The level of design theory as such	***Inside development***: Continuous refinement or idea based design introducing new constructs	***Internal grounding***: Reconstruction of practical knowledge and its background knowledge; conceptual and value grounding; evaluation of knowledge cohesion
The level of other theories	***Deduction***: Derivation from external theories including values, categories and explanations	***Theoretical grounding***: Grounding in values, categories/definitions and explanations
Empirical level	***Explicit modification***: Changes made based on application and observation ***Tacit induction***: Emergence of tacit action rules based on experiences ***Articulate induction***: Reconstruction of action rules from practice	***Empirical grounding***: Based on *application* of action rules and *observation* of actions and effects

interaction (theoretical grounding). They also base their work on an articulation and conceptual analysis of the different constructs in the BAT model (Lind & Goldkuhl, 2003); which can be seen as internal grounding.

CONCLUSIONS

Practical knowledge is knowledge often taken for granted and closely tied to action. I do not in general question the practical coupling of this knowledge and that people must have confidence in such knowledge in their actions. I think this a necessary starting point for an analysis of practical knowledge, but we cannot stop there and let the knowledge be dormant in its implicit and action oriented form. The acknowledgement of these features of practical knowledge does not mean that we should accept that practical knowledge should always stay on this relatively implicit level. I do not claim that practical knowledge should always be scrutinized and transformed into explicit knowledge. However to be more confident in using practical knowledge there is a need for justifying such knowledge; the development of practical knowledge cannot always be carried out in silence. I argue that it is important that practical knowledge should be grounded and that development of practical knowledge should be performed in close relationship with the grounding of such knowledge. There is a great potential in practical knowledge to be systematized and grounded into design theories.

Design theories do not only emerge from practice and practical knowledge. They emerge also from general theories of explanatory character and from ideas of good design (underpinning values).

Multi-grounding of design theories (MGDT) is an approach for creating and justifying practical knowledge. It is an approach that transcends knowledge which is purely taken for granted and only tied to action. The development of a *multi-grounded design theory* should

- be performed with *recurrent* efforts for knowledge improvement
- be based on *empirical* studies concerning its *application*
- include the *reconstruction* and *evaluation* of its own background knowledge
- include the connection of it to *other knowledge sources* (as e.g. general theories)
- be performed with *explicit grounding* in different types of knowledge (empirical, conceptual, explanatory and value grounding)

- alternate focus on *generation* and *justification* of knowledge
- alternate focus on the *design theory* itself, *empirical knowledge* concerning its application and *other theories* of relevance

MGDT is an approach that guides the IS researchers and practitioners to raise questions concerning design theories. The three main questions are:

- What are the empirical grounds for the design theory?
- What are the theoretical grounds for the design theory?
- How is the design theory internally grounded?

MGDT is actually a design theory in itself. It is a meta design theory; i.e. a design theory for developing and justifying design theories. This means that what applies to design theories should also apply to MGDT. The principles for multi-grounding stated in MGDT should also be used for MGDT itself. MGDT is a recursive theory. The objects of MGDT include not only other design theories but also MGDT itself.

This paper consists of some parts of theoretical grounding of MGDT. Some observational grounding was briefly exposed in section 4.2 above. The MGDT has been applied in several studies (development of design theories and other similar approaches). It is beyond the scope of this paper to account for these studies and its application grounding. Some examples are Lind & Goldkuhl (2002), Ågerfalk (2004) and Cronholm (2004). Future research will articulate the MGDT meta design theory more clearly and provide further grounding of it.

[1] This discussion goes back at least to Hume (1739).
[2] I claim that it is very clear that ”The psychology of everyday things” (Norman, 1988) should be considered to be a design theory.

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