

# TOWARDS A PROVOTYPING APPROACH IN SYSTEMS DEVELOPMENT\*

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## Abstract

This paper explores the notion of ‘provocation through concrete experience’ towards a provotyping approach. It addresses the question: How do we on the one hand, devise qualitatively new systems, and on the other hand, ensure their usability in a given practice? The notion of provocation through concrete experience is developed through an investigation of prototyping and activity theory. Exploration of this notion leads to the idea of the system developer ‘provoking’ concrete, everyday practice, by exposing current problems, calling forth what usually is taken for granted. Problems with current practice and a lack of mutual understanding, usually conceived of as hindrances to successful systems development, are used constructively. These ideas are compared to four related approaches: Future Workshops, Metaphorical Design, Cooperative Prototyping, and Organizational Games. The comparison serves the twofold purpose of contextualizing the new ideas as well as developing techniques for carrying them out.

*Keywords:* Provocation, practice, concrete experience, discrepancies.

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# 1 Introduction

Systems developers, engaged in developing new computer systems for an organization, are faced with a complex task. One reason for this complexity is the twofold nature of the demands on the system under development. On the one hand, it must fit into and support existing practice, in order to be used. On the other hand, the very reason for engagement is the need for changes (including a new computer system).

This problem is one instance of the more general contradiction between tradition and transcendence. Pelle Ehn, in his doctoral thesis *Work-oriented Design of Computer Artifacts* (Ehn 1988), gives an account of some of the dimensions of this contradiction.

One can focus on tradition or transcendence in the *artifacts* to be used. Should a word processor be designed as a traditional typewriter or as something totally new? Another dimension is *professional competence*. Should the ‘old’ skills of typographers be what is designed for or should ‘new’ knowledge replace these skills in future use? Along the same dimension is *division of labor and cooperation*. Should the new design support the traditional organization in a composing room or suggest new ways of cooperation between typographers and journalists? There is also the contradiction between tradition and transcendence in the objects or *use values* to be produced. Should the design support the traditional services a library has produced or should it support completely new services and even new clients. Tradition or transcendence, that is the question in design. (Ehn 1988, p. 129)

One can focus on tradition or transcendence, but the question is always that of tradition *and* transcendence—we are always to some degree bound in our tradition and, at the same time, have to transcend the present in order to solve our problems.

The dimensions in Ehn’s elaboration of the contradiction between tradition and transcendence each concerns *what to develop*. This paper focuses more on the problem of *how to find out*. In this respect the contradiction can be reformulated in more operational terms: *How do we on the one hand, devise qualitatively new systems, and on the other hand, ensure their usability in the given practice*. This is the basic question addressed in this paper.

In order to delimit the scope of the paper with respect to the systems development process, I will focus on the area where this question seems most important and most relevant: *between initial investigation and analysis of current practice and design<sup>1</sup> of new practices?*

The paper is organized as follows: In Section 2, prototyping and activity theory are investigated with respect to their potential contribution to the question raised. Prototyping addresses the question of ‘designing for usability,’ and activity theory addresses the question of using the present in the creation of the qualitatively new.

In Section 3, the central ideas from these two sources—provocation through concrete experience—are explored in the area between initial investigation and analysis of current practice and design of new practices. The main argument for undertaking ‘provocation through concrete experience’ is first established through a discussion of the taken-for-grantedness of practice. The issues of what to provoke and who should do it are further explored through the issues of discrepancies in a practice and the systems developer as a provocateur.

In Section 4, the ideas are compared to four related approaches: Future Workshops, Metaphorical Design, Cooperative Prototyping, and Organizational Games. The comparison serves the twofold purpose of contextualizing the ideas as well as finding techniques for carrying them out.

## 2 Two Sources of Inspiration

### 2.1 Prototyping

The notion of prototyping in systems development emerged in the late 1970’s (Naumann & Jenkins 1982, Bally *et al.* 1977) as a reaction against more traditional phase-oriented models (e.g. linear models, life-cycle models, waterfall models etc.) of how to develop computer systems (Avison & Fitzgerald 1988, Bally *et al.* 1977, Boehm 1988, Hekmatpour & Ince 1988, Lantz 1986). Two basic problems seem common to most of the critiques:

- The idea of successive and well defined stages with fully elaborated, and thereafter ‘frozen,’ documents, e.g. the requirement specification, is rather illusory. This viewpoint is taken by those emphasizing the ‘engineering’ aspects (Lyytinen 1987) of prototyping (Avison & Fitzgerald

1988, Hekmatpour & Ince 1988, Lantz 1986)

- The strategy of detached analysis of current organization and a logical design of the new, and the accomplishment of this strategy by ‘systems developers’ only, are not enough to ensure system usability. This viewpoint is taken by those emphasizing the participation and usability aspects of prototyping (Bødker 1987, Ehn 1988, Floyd 1987, Grønbæk 1988), building on foundations inspired by, among others, Polanyi (1967, 1984), Winograd and Flores (1986) and the later Wittgenstein (1958).

The significance of these problems depends on the situation. The more uncertain the situation, the more severe the two problems become.<sup>2</sup> Therefore, the drawbacks of more traditional approaches and the need for prototyping are issues most often raised in situations characterized by a high degree of uncertainty.

The proposed solution to problems with the traditional approaches—prototyping—seems to varying degrees to be based on three characteristics (Bannon & Bødker 1991, Bødker 1987, Bødker & Grønbæk 1989, Boehm 1988, Ehn 1988, Floyd 1984, Floyd 1987, Hekmatpour & Ince 1988, Naumann & Jenkins 1982, Wilson & Rosenberg 1988):

- Prototyping is primarily directed towards *construction of the future*. In prototyping one makes prototypes, ‘types’ that are preliminary versions of potential computer systems.<sup>3</sup>
- The need for *iteration* is taken seriously and is considered a constitutive part of prototyping. Somewhat simplified, the prototyping process can be described as: to ‘guess’ at one or more potential solutions; partly implement these ideas; apply/test the resulting prototypes: and, on this basis, construct a new (and hopefully better) ‘guess’—whereupon the process can start over again.
- Prospective users are enabled and encouraged to get *concrete experience* with the prospective computer system by using the various prototypes. In order to assess, for instance, the usefulness and usability of a computer application, one must use it in the given context—get ‘hands on’. This implies, in principle, that one cannot assess the prospective computer system before it is finished. The prototyping approach

tries to overcome this contradiction by the construction of a number of preliminary programs, thus gradually making the future more concrete.

Prototyping, naturally, has its strengths and weaknesses depending on the context: design of user interfaces, technical ‘engineering,’ general approach to systems development, etc. Assessments can be found in (Bødker 1987, Floyd 1984, Hekmatpour & Ince 1988, Naumann & Jenkins 1982, Wilson & Rosenberg 1988). Here, I restrict myself to strengths and weaknesses of prototyping as a potential (partial) solution to the problem in focus in this paper: How to get from investigation and analysis of current practice to design of new practices.

From this perspective, the emphasis on concrete contextualized experience and on the prototype as concrete medium is definitely a strength. If learning through concrete experience is important with respect to the design of future means (computer systems), it must be equally important with respect to investigation of current means, whether computerized or not.

Still, prototyping needs to be expanded in order to solve the problems in the area between investigation of current practice and design of new practices:

- First of all, prototyping is *directed towards the future* (potential computer applications). It does not normally consider how the new application can be based on current practice. On the one hand, current practice imposes a number of constraints on potential applications. On the other hand, current practice often contains the keys to what ‘guesses’ could be appropriate.
- Before the process of prototyping can be initiated, the participants must have some basic overall idea of what to develop. Otherwise, it is almost impossible to make the initial ‘guesses’ that constitute the start of a prototyping process.
- In the strategy of successive prototypes lies a danger of blindness (‘tunnel vision’) (Sol 1984), ‘model effect’ (Bally *et al.* 1977). Once the process of development of successive prototypes has started, the danger arises that one is led to elaborate the details of the current prototype instead of questioning its underlying premises. In the process, what was initially questioned becomes more and more taken for granted, and it becomes more and more difficult to consider radical changes.<sup>4</sup> To what

extent this is a danger to be avoided naturally depends on whether one is on the ‘right’ track or not, which again underscores the importance of the initial ‘guesses’.

- Prototyping provides very few concepts and techniques for understanding and handling the collective aspects: investigation of current practice and design of new practices is most often accomplished *by* a collection of people as well as *for* a collection of people.<sup>5</sup>

Thus, as a tool to get from the current to a preferable future practice, the idea from prototyping of learning through concrete experience can be used. However, the issues of basing the visions in current practice, overcoming blindness, and handling the collective aspects remain.

## 2.2 Activity Theory

*Activity theory*, as interpreted by Yrjö Engeström in *Learning by Expanding* (1987) and *Learning, Working and Imagining* (1990b), and further elaborated with respect to systems development by Bisgaard *et al.* (1989a, 1989b), explicitly addresses these issues.

Engeström takes his point of departure in what he calls the *futility of learning*.

The problem is that problem solving and structuring are essentially *reactive forms of learning*. Both presuppose a given context which presents the individual with a preset learning task. Learning is defined so as to exclude the possibility of finding or creating new contexts. However, it is *this* very aspect of human performance—or rather the lack of it—that is becoming the central source of uneasiness and trouble in various fields of societal practice. (Engeström 1987, p.2)

What Engeström suggests is that practitioners (those engaged in the practice in question) should themselves be enabled to find or create new contexts. Finding or creating qualitatively new contexts is what Engeström calls expansion. This, however, introduces a problem similar to the one addressed in this paper: How does one create a qualitatively new practice *and* ensure that it is founded in the current, historically developed practice?

In dealing with this question (as well as others) Engeström develops an extensive conceptual framework based on cultural-historical theory of activity. In order to give the reader an initial grasp of this framework, some of the main points are highlighted.

### **Activity**

In activity theory, a distinction is made among different levels of human agency: operations, actions, and activity. *Operations* are unconscious and triggered by conditions: when I write my signature, for instance, I am not aware of *how* I write the individual letters. *Actions* are conscious and directed towards fulfilment of goals: I am conscious of *what* I write, e.g. my signature, and its purpose, e.g. signing a document. These are two levels of an individual's agency. The third, *activity*, refers to the question of *why* an action is performed. In order to answer that, one has to take into consideration the entire collective activity, i.e. the culturally established traditions, rules, and meanings operating in the situation, e.g. the legal implications of writing one's signature, and that signing a document often means entering into a contract. Consider, for example, a primeval collective hunt.<sup>6</sup> An individual member of the group may perform the action of driving a herd of animals towards the other hunters. If the overall purpose, the 'motive,' is to collect food and clothes then this action of the individual member seems meaningless, and even self-destructive (frightening away the animals instead of killing them). Only when we take into consideration the division of labour, rules, and traditions of the collective activity does this individual action become, indeed, very meaningful. Activity is collective and directed towards the fulfilment of a motive (e.g. getting food and clothes), and realized through the individual actions (e.g. frightening off the herd), which in turn are carried out through unconscious operations (e.g. clapping the hands).

### **Mediatedness**

Any truly human action is analyzed as a mediated structure. Instead of a dualistic subject-object structure, human behaviour is seen as a triad, consisting of the subject, object, and mediating instruments—tools, signs, traditions, theories, methods, techniques, etc. Consider, for example, the relation between subject and object in the case of hammering a nail into a piece of wood. Clearly, the direction from subject to object (the fulfilment of the subject's

intention with the object) is mediated by the hammer. Equally important, however, is the opposite direction from object to subject: how does the subject experience the object? Issues such as the relative hardness of nail, wood, and steel (the head of the hammer) are difficult to establish without hammers or similar instruments; to the touch, wood, nails, and steel feel equally hard (assuming we are talking about fresh and hard wood). Likewise, when we broaden the scope from an individual action to a collective activity the mediated structure persists, as illustrated by Engeström's triangle depicting the structure of human activity (Figure 1).

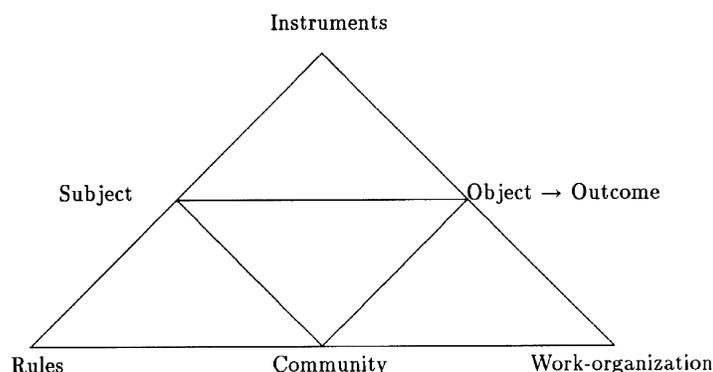


Figure 1: *Engeström's triangle depicting the structure of human activity*

The subject's relation to the community is mediated by rules, in this context a broad concept encompassing language, rituals, what is usually called rules, norms, etc. The relation between the community and the object (the work to be done) is mediated by the work organization: the community seen as a whole accomplishes the work to be done by delegating sub-tasks to individual members.

## Contradictions

The basic idea is that any activity is subject to both internal and external contradictions, and that these contradictions are the primary forces behind development. In *Learning by Expanding*, contradictions are, to a great extent, treated in the context of dialectical materialism, and explained through concepts like commodity, exchange value, and use value. As a consequence,

contradictions have an almost ontological status—they objectively *exist* independent of the individual subject. In short, development is conceived in the context of a dialectic resembling that of the later Hegel: Society is a dialectic totality, and development is in reaction to contradictions. But, contrary to the Marxian notion that we can reach a harmonious end of history, we can never overcome contradictions as such; whenever some contradictions are resolved, others arise.

### **The cycle of expansive development**

Expansive development is proposed as a means to handle the problem of the futility of learning, and is thought of as facilitated by ‘researchers’. The approach can be summarized as follows:

1. perform historical analyses of the activity in question, and of the contradictions that prompted its development;
2. elaborate current activity by exposing it to these contradictions;
3. on this basis, (hopefully) get the first ideas for a new activity;
4. envision an expanded activity—creating new contexts—with the help of springboards (innovative techniques);
5. elaborate this vision and try it out in a microcosm;
6. cope with the fact that the result is almost always unexpected, and that new contradictions arise;
7. eventually start a new cycle;

Thus, development is founded in the historically developed practice, and contradictions are seen as a resource rather than something to be avoided or brushed aside.

In relation to the focus in this paper, activity theory, also, has its strengths and weaknesses.

Taking the weaknesses first:

- The emphasis in the cycle of expansive development, up to the point where a new expanded activity is envisioned, is on detached analysis by researchers. Concrete experience, which activity theory—like prototyping—generally stresses, is not utilized in these early activities.
- The potential operative means, the cycle of expansive development, is too abstract. It is a general psychological and social methodology, not a methodology for systems development.
- The framework of dialectical materialism tends to give contradictions an ontological status they do not deserve. Even to the extent that contradictions act merely as epistemological instruments, they are usually overemphasized and thus overshadow other perspectives.

As for its strengths, activity theory does provide an instrument for understanding the connection between individuals and the practice in which they are engaged—activity. Likewise, it provides an understanding of how a new practice can be founded in present and past ones. Despite the problems with the notion of contradiction, the idea of utilizing contradictions as a resource rather than avoiding them or brushing them aside is very attractive.

### 3 Provocation Through Concrete Experience

Returning to the question posed in the introduction—How do we, on the one hand, devise qualitatively new systems, and, on the other hand, ensure their usability in the given practice?—the contributions from prototyping and activity theory can be summarized. The idea from activity theory is to create the new by exposing problems in current practice: to provoke. Provocation is here and in the rest of the paper used in the senses: (a) when the provoked is not a person: “*to call forth, invoke, to summon, invite*”; when (b) when the provoked is a person: “*to incite or urge...to some act or to do something, to stimulate to action.*”<sup>7</sup> The idea from prototyping is to provoke by actually trying out the situations in which these problems emerge: provoking through concrete experience. As stated in the introduction, the focus is on the area where the question of what qualitatively new systems to build versus their usability in current practice seems most important and most relevant: *between initial investigation of current practice and design of new practices.*

In the following three sections, these ideas will be explored in relation to the questions of ‘why,’ ‘what,’ and ‘who,’ focusing on issues where the ideas from prototyping and activity theory seem to provide new understanding rather than addressing the questions in general.

### 3.1 Why Provocation: The Taken-for-Grantedness of Practice

In order to take current problems as points of departure, we must first get hold of these problems. As will be argued, however, current practice and its problems are to a large extent taken for granted, i.e. they are ‘invisible’. In order to handle a problem it must somehow become more ‘visible’. It is to this end, that provocation through concrete experience is proposed.

Regarding the individual handling of an artifact, an instrument in Engeström’s terms, it is widely recognized that the artifact, *in use*, becomes ‘invisible’ (Winograd & Flores 1986, Heidegger 1979, Ehn 1988, Polanyi 1984). This is one of the reasons why prototyping encourages trying out the handling of the artifact in order to get concrete experience. In the terminology of activity theory: when a subject performs an action, the focus is on the object—the what—not the handling of the mediating instrument—the operations, the how. The instrument becomes ‘invisible’.

Considering practices, activity theory provides an explanation of ‘invisibility’ of more general mediators, such as rules, work organization, language. When we move from the level of individual action to the level of collective activity, we have to deal with the how (operations), the what (actions) and the *why* (activity). The reason for introducing the level of activity was exactly to be able to answer the why question; the actions of the individual ‘hunter’ frightening the animals seemed senseless without considering the entire activity. Why is this good (or bad), why is it done the way it is, why is it done at all, etc., all become central questions when problems in the existing practice are of concern.

An explanation of the invisibility or taken-for-grantedness of practice can be found in the meaning of mediatedness in activity theory. Instruments, rules and work organization are all mediators. Instruments—on the level of activity these are kinds of ideologies—mediate primarily between subject and object; rules, in the broad sense of the word including language, between subject and community; and work-organization between community

and object.

In our everyday practice we usually communicate with others by focusing on the object of conversation, not the words used: We act according to the rules, norms, and values prescribing proper behaviour in the given community, we usually do not discuss or contemplate them. In the act of collaborative work, meta-questions concerning participants' roles and qualifications rarely surface. In this respect, rules, language, work-organization, and ideologies, function to a large degree as artifacts in individual use in that they mediate between the subject and what is in focus, and thus, they become transparent and taken for granted. Moreover, it is only by virtue of this taken-for-grantedness that they function properly.

To a large extent, *answers to the why questions are taken for granted*—they are 'invisible'. In everyday life, engaged in different practices, we do not constantly ask ourselves questions about why we do the things we normally do. And there are good reasons for this: we would not be able to do much else, and would probably end up in 'existential crisis'.

Bødker & Pedersen (1991), also address the question of the taken-for-grantedness of practice. They explain the phenomenon in terms of 'culture' or 'systems of meaning' and formulate it as follows:

The workplace is seen as *being* a culture. The values and beliefs of the culture are understood to have grown out of experience, and are conceptualized as a system of meanings underlying artifacts, symbols, and work practices. Although referred to as a system, the culture is not explicit but implicit; that is, hidden behind or in the various artifacts, symbols, workroutines, and established patterns of cooperation. (Bødker & Pedersen 1991)

Edgar H. Schein in *Organizational Culture and Leadership—A Dynamic View* (1985) defines culture, his object of study, as the shared basic assumptions and convictions that are taken for granted because they repeatedly function in the everyday practice. Argyris & Schön in *Organizational Learning: A Theory of Action Perspective* (1978) emphasize the distinction between the implicit assumptions that guide an organization's actual performance, theory-in-use, and the explicit reasons, what it 'says' it does or is supposed to do, espoused theory.

Thus, when the issue is that of utilizing current problems as a resource in the development of a new practice, we cannot accept these problems at

their ‘face value’. We must go deeper. We have to understand some of the why’s and how’s. These questions cannot be answered by observation alone (this yields the what and perhaps the how, but not the why), nor by asking only individuals, we have to ‘ask’ the practice.

## 3.2 What to Provoke: Discrepancies in a Practice

As mentioned, activity theory suggests the idea of creating the new by exposing current problems. Therefore, inspired by activity theory, three general types of potential problems are presented. In what follows, the examples are from an ongoing project between the Computer Science Department in Aarhus and a branch of the National Labour Inspection Service (NLIS).

**Discrepancies between different goals.** Engeström, building on Marx, argues that these discrepancies are caused by contradictions between the use value and the exchange value of commodities produced by the practice. More generally, these discrepancies often stem from the fact that people are, at the same time, engaged in several practices with different goals (e.g. the practice of the local branch, the practice of the whole organization, the practice of family life, etc.). In NLIS the inspectors, on the one hand, try to ensure safety of the work environment by discussing with workplace representatives what is wrong and how the situation could be improved, etc. On the other hand, what is demanded from the central organization in NLIS is measurable data about the work in order to legitimate the organization politically, e.g. time spent in the field on workplaces, number of workplaces visited, and number of charges made. Thus, if the inspectors do their jobs ‘properly’ by spending time in discussion with the workplace representatives, their performance according to the statistics delivered to the central organization will decrease.

**Discrepancies between different elements of the practice.** In Figure 1, a practice is depicted as an entirety of: subjects acting; tasks to be performed; means of performing them; organization of work; rules, language, traditions, and norms; communities; and objectives. Rather than constituting a ‘synthesis,’ these elements often ‘counteract’ one another. For example, introducing new work tasks while retaining old instruments to accomplish them may introduce discrepancies between

the new tasks and the old instruments; the introduction of new computer applications can result in discrepancies between these and the old division of labour; intended rules of safety routines can be in opposition to the need to get things done. In NLIS, to a large degree, work is organized according to the inspectors' trades: i.e. health-worker, craftsman, engineer, etc. But the objects of their work, workplaces, display problems in all these areas. Hence, the inspectors either encounter problems they lack the competence to solve, or they do not notice the problems at all.

**Discrepancies between actual and prescribed practice.** Argyris & Schön (1978) conceptualize this discrepancy as the difference between espoused theory and theory-in-use, see Section 3.1. Engeström perceives the discrepancy in a historical light and calls it a contradiction between an old and a new activity. In general, every organization formulates procedures, rules, divisions of labour, etc. for what should be done, how and why. Often, this differs considerably from what is actually going on. An organization may 'decide' on a new way of doing things (new company policy, introduction of new computer systems, etc.), but this does not necessarily mean that the decision is in fact effective: that those involved actually act according to the new way. In any practice, one can probably find many remnants of old practices. In NLIS, for example, a reorganization was carried out, as a response to the discrepancy between the organization according to the trades of the inspectors and the object of their work. The organization shifted to a structure based on autonomous groups with the intention that organizations of a given type should now be treated by a single group. It turned out that many of the inspectors (the oldtimers) had a conception of their role as a 'lonely cowboy' (their expression), a remnant from the old practice counteracting the new group-based practice (Markussen 1992).

New computer systems are inevitably confronted by discrepancies in the current practice, usually resulting in the system not being used as intended. An example (Bisgaard *et al.* 1989a, p. 71): in a public office in Denmark the rules held that a certain type of transaction (providing the customers with loans) could only be carried out semi-annually; this was implemented in the new accounting system. However, a long-lasting practice had been to

provide customers with these loans whenever they needed them. As a result, the employees actually did the accounting manually, followed by a transfer of the information to the system every six months.

The idea from activity theory is to try to turn the question of discrepancies upside down, taking the discrepancies as a starting point, with the purpose of transcending them, rather than dealing with them afterwards.

### 3.3 Who Provokes: The Systems Developer as Provocateur

If we consider a situation in which systems developers enter a given practice in order to develop a new application, the idea of provocation through concrete experience seems to provide two new perspectives: the role of ‘the systems developer as provocateur,’ and what could be called ‘active use of lack of mutual understanding’.

The role of the provocateur can be characterized by distinguishing between three ideal types (imagined extremes) reflecting the roles of the system developer in traditional systems development, prototyping, and provocation through concrete experience. Imagine the practitioners—those engaged in the practice to be developed—as on a journey. The distinction is made as to the location of the systems developer in front of, beside, or behind the practitioners.

- As an *expert*, the system developer investigates different possibilities, finds out which one is best, and presents the solution to the practitioners as the route to follow. This role resembles the role of a ‘traditional’ systems developer entering a practice encompassing problems, making surveys, suggesting solutions, and so forth. The expert can be said to stand *in front* of the practitioners outlining *the* way to go.
- As a *facilitator*, the system developer outlines possibilities and supports the practitioners with techniques to explore these possibilities. This role partly resembles that of a systems developer in participatory systems development. In exploratory prototyping, for example, the goal is to provide alternatives for the practitioners to try out (Floyd 1984). The facilitator can be said to stand *beside* the practitioners, supplying them with the means to find out for themselves which way to go.

- As a *provocateur*, the system developer investigates the present and past in order to help the practitioners experience what is wrong with the present before making decisions about the future. The provocateur urges or invites realization—both in the sense of becoming aware of and in the sense of making real—of current problems in order to decide what is needed in the future. This role is the ideal type in provocation through concrete experience. In this respect, the provocateur can be said to *stand behind* the practitioners supplying the means to find out about the present in order to know what to look for and what to avoid in a future.

Which role to choose depends on the concrete situation. Using the ideal types, one can explore which ideal roles to choose in what ideal situations. If the situation is one in which it is possible ‘objectively’ to decide beforehand what might characterize a satisfactory solution (speed up the word processing; create statistics over the number of books registered in our system; transform files in this format into files of that format; etc.), the most suitable role is most likely the one of an expert—assuming the necessary competence is present. If the situation is one in which we cannot find such ‘objective’ criteria, when the question involves usefulness, handiness, ‘contributory-ness,’ fitness etc., the most suitable role is likely to be facilitator or provocateur. The choice depends on the extent to which the problems are known beforehand. When the situation is one of problem elaboration or problem ‘definition’—we know that something is wrong, but not what or why—the approach taken, as I have argued above, should be provocation through concrete experience, with the system developer as a provocateur. When the problems are (more or less) known, and the approach taken is directed towards possible solutions, the suitable role is likely to be facilitator.

Furthermore, the idea of provocation yields a new perspective on the *degree* to which the systems developer needs knowledge about the field he/she investigates; one ‘half’ of the issue of mutual understanding. Lack of mutual understanding between practitioners and systems developers is most often seen as a hindrance to joint systems development. Ehn & Kyng, for example, have suggested that designers, in an attempt to acquire some degree of mutual understanding, should spend a year or two getting acquainted with a new area before doing actual design (Ehn & Kyng 1987). From the perspective of provocation through experience this issue is perceived differently:

- By obtaining mutual understanding, a mutual ‘blindness,’ i.e. a mutual taken-for-grantedness, is acquired as well. One runs the risk of becoming unable to see the forest for the trees.
- Instead the idea is actively to utilize—initial—lack of mutual understanding. In order to provoke a practice, it is often more fruitful to come from the outside with different viewpoints, than coming from the inside taking the practice for granted.

Of course, it is a question of balance—of entering and understanding a field of enquiry whilst remaining outside with different points of view and provocative tools and ideas.

## 4 How to Provoke—A Comparison to Related Work

The ideas so far can now be summarized. In our everyday practice many of the answers to the why questions (in the literature referred to as meaning, culture, tacit knowledge, motives, etc.) are taken for granted, primarily because they are developed in our everyday, collective, and concrete experience. Provocation through concrete experience offers the opportunity to call forth the usually taken for granted discrepancies of current practice.

What I address now is how to bring all this about. The ideas presented above are compared to related approaches, with two intentions: to get inspiration from the operational ideas in these approaches, and to place the notion of provocation through concrete experience in a broader context.

Based on the discussion so far, the comparison will focus on the following tensions:

|                                   |                                   |
|-----------------------------------|-----------------------------------|
| Investigation of current practice | Construction of a future practice |
| Focus on current discrepancies    | Focus on a preferable future      |
| Concrete experience               | Detached reflection               |
| Provocateur                       | Facilitator                       |

## 4.1 Future Workshop and Metaphorical Design

### Future Workshops

The future workshop is a technique originally developed for citizen groups wanting to influence town planning, environmental protection, and the like. They were originally introduced by Jungk and Müllert in *Future Workshops: How to create desirable futures* (1987), and extended for systems development by Kensing in *Generation of visions in systems development* (1987). It is a technique for finding possible solutions to common problems among a group of people. Future workshops are meetings facilitated by one or two people from the outside, and consist of three phases: Critique, Fantasy, and Implementation. The general idea is to take as point of departure a critique of the current state of affairs through a ‘structured brainstorm’; turn this critique into constructive fantasy; assess the constructed visions with respect to what can be realized; and try to implement these visions.

Future workshops and provocation through concrete experience are similar in the sense that they take current problems as the point of departure and try to turn them into constructive means for further development, but the reasons for applying them are very different. The basic reason for applying Future Workshops is as a means to support resource-weak groups, whereas the reason for provocation is the taken-for-grantedness of everyday practice. This, I think, leads to the two main differences between future workshops and the ideas presented here.

- Future workshops are purely intellectual/reflective and detached from the practice they are meant to change—the discussions are *about* the practice, not *in* the practice. On the contrary, the provocation proposed here is accomplished through concrete experience *in* the practice.
- The role of the ‘systems developer’ in Future Workshops is one of a facilitator setting the stage, ensuring that everyone is allowed to speak, etc., but not intervening at the content level. The provocateur role proposed in this paper involves calling forth, actively intervening at the content level.

## Metaphorical Design

Metaphorical Design, as presented by K. Halskov Madsen in *Breakthrough by Breakdown* (1986), is an approach aimed at getting people to talk about and reflect on their daily work in new ways by breaking down “the unreflected being of the members in an organization.” The primary means to this end is the use of metaphors. The understanding of the organization in terms of other phenomena is utilized on the grounds that knowledge about these phenomena may become a potential source of inspiration in the design.

The similarities between metaphorical design and provocation through concrete experience involves the reasons for application; both try to call forth what is usually taken for granted by provoking, deliberately creating breakdowns, and the the systems developer is seen by both as a provocateur.

The dissimilarities involve the question of *how* to call forth:

- As with future workshops, metaphorical design is purely intellectual (reflective) and detached from the practice on which it is meant to shed new light.
- Contrary to Future Workshops, Metaphorical Design is not (explicitly) based in current problems. The metaphors seem to come almost out of nowhere. Accounts are given of how to choose metaphors, but these accounts concern characteristics of metaphors in general, not characteristics of the concrete situation the approach is meant to change.

## Future Workshops and Metaphorical Design combined

Kensing & Madsen, in *Generating Visions: Future Workshops and Metaphorical Design* (1991), try to combine Future Workshops and Metaphorical Design. This combination is closer to the ideas in this paper than the two approaches in isolation. The metaphorical design contributes the idea of the system developer as provocateur, while future workshop contributes the technique of basing the approach in current practice. Still, a major dissimilarity between the combined approach and provocation through concrete experience is the question of detached reflection versus concrete experience.

The provocateur in the combination of future workshops and metaphorical design makes use of metaphors to get participants to *understand* current practice in new ways by *thinking about* it in alternative ways. The emphasis

on ‘understand’ and ‘thinking about’ comprises the main difference between the combined approach and the ideas proposed in this paper: detached reflection versus concrete experience. By substituting ‘experience’ and ‘doing’ for ‘understand’ and ‘thinking about,’ one can see the basis for a new approach: to get participants to *experience* current practice in new ways by *doing* it in alternative ways.

## 4.2 Cooperative Prototyping

Cooperative Prototyping, as presented by Bødker & Grønbæk (1989, 1991, and Grønbæk 1991), is a variant of prototyping where part of the design of a future computer artifact is done cooperatively by designers and prospective users. Contrary to approaches where prototype design is carried out in ‘the laboratory’ and later ‘tested’ in a prototyping session with prospective users, this approach emphasizes the benefits from the interplay among prospective users and designers in the design of the prototype ‘on the spot’.

The main similarity between cooperative prototyping and the ideas outlined in this paper is the focus on concrete experience. The idea of concrete experience came after all from prototyping. A further similarity is the close interaction at the content level in cooperative prototyping. The main dissimilarity is the focus of cooperative prototyping on the construction (design) of the future computer artifact, whereas the ideas here are more directed towards provocation of current practice.

Turning to the question of how to provoke through concrete experience, the close, open-ended interaction around the prototype in cooperative prototyping seems attractive. The focus, though, should not be on the prospective users using their knowledge about current practice to design the future computer application. Interaction around the current prototype, and the knowledge and experience gained hereby, could instead be used to call forth and elicit discrepancies in current practice. In fact, Bødker and Grønbæk, inadvertently, touched upon this possibility:

we focus on one cooperative prototyping session involving a user who did not appear to be inclined to ‘play in the future’. Though the session was initially viewed as largely unsuccessful, closer inspection led to the recognition of a potentially different interaction style between users and designers around a prototype. In this

case, the prototype was just as clearly a catalyst for discussion, but of a quite different form. Rather than feeling moved to drive the prototype, the user offered incidents and work procedures she saw as relevant to the part of the prototype being viewed. (Trigg *et al.* 1991)

Trigg, Bødker, and Grønbaek elaborate this possibility of a different interaction style between users and designers around a prototype in *Open-Ended Interaction in Cooperative Prototyping: A Video-based analysis* (1991), and suggest broadening the concept of cooperative prototyping to encompass sessions like this.

Using the prototype to call forth aspects of current practice does not so much require changes in the prototype itself, as a shift in focus from the design of the future application towards experiences in current practice. In other words, the prototype itself is left unchanged, but, the intention in using it is turned upside down. The intention is to use the prototype as a concrete medium for falling forth experiences in current practice, instead of focusing on how the prototype could be improved.

### 4.3 Organizational Games

Ehn, Mölleryd & Sjögren, inspired by the later Wittgenstein, have proposed ‘Playing in reality’ (1990). Here, a role-play resembling the ordinary work situation is set up with the practitioners as actors.

The **playground** is a subjective but collectively negotiated interpretation of the work organization in question. The **professional roles** are the union of individual professional ambitions and the need for qualifications from an organizational perspective. The **situation cards** introduce prototypical examples of breakdown situations. **Commitments** are made by individual role players as actions related to a situation card. **Conditions** for these commitments are negotiated, and an action plan for negotiations with the surrounding organization is formulated. (Ehn *et al.* 1990, p. 110)

As in cooperative prototyping, organizational games focus on concrete experience by simulating daily work. Furthermore, the idea of exposing a

practice to breakdowns through role-playing is a kind of provocation. Moreover, organizational games bring the collective aspect more into focus. The focus, however, in this approach is on commitments and negotiation of conditions, i.e. ‘construction’ of the future.

The idea of an organizational game focusing on concrete experience and provocation of the collective practice seems useful in relation to the notion of provocation through concrete experience. However, it must be modified to shift the focus from commitments to the future towards provocation of the present.

## 5 Towards a Provotyping Approach

This paper took the following question as its point of departure: How do we on the one hand, devise qualitatively new systems, and on the other hand, ensure their usability in the given practice? In particular, the question focused on the area between initial investigation/analysis and design. Inspiration arose from two sources: prototyping, addressing the question of how to design for usability, and activity theory, addressing the question of how to create the qualitatively new *and* found it in current practice. The result was the idea of combining provocation and concrete experience. The idea was elaborated by addressing the questions of why, what, and who, leading to a notion of the *systems developer as provocateur provoking discrepancies in the concrete, everyday practice to call forth what is usually taken for granted*. This notion provides a new perspective on discrepancies and mutual understanding. Discrepancies were taken as the point of departure, and thus seen more as a resource than as problematic or irrelevant. Initial lack of mutual understanding was found to be not just a problem, but also a resource in avoiding blindness. Subsequently, through a comparison to related approaches, the ideas were contextualized and techniques for carrying them out outlined.

The basic idea was to get participants to *experience* current practice in new ways by *doing* it in alternative ways. From the above comparison at least three different ways to accomplish this can be seen. One is to use alternative artifacts such as on-the-shelf ware, prototypes, and mock-ups as vehicles for provocation—provotypes. The intention is to use them as concrete media for calling forth experiences in current practice, instead of focusing on how they,

or the use of them, could be improved.

In NLIS experiments were carried out investigating the possibility of shifting from the current purely textbased word processor to a graphical one. A new word processor was bought and tried out. The goal in part was to investigate how this word processor could support the work to be done. A critical aspect, however, became visible when people experienced the new possibilities. Formerly, the format of outgoing letters was taken as given, but in experiencing the ease of changing fonts, styles, and graphics the format became a changeable, ‘present-at-hand’ object. This led to the issue of flexibility versus standardization in the format of outgoing letters.

In a prototyping session involving a researcher and three people from NLIS the researcher was demonstrating a part of the prototype concerning the registration of the inspectors’ weekly travel, relating the current prototype to the existing practice. At one point, the researcher was interrupted by one of the participants: “we don’t do it that way.” After discussing and trying out how to fix the prototype, the question was turned around to become “*why* don’t you do it that way?” A discussion between two inspectors made it clear that what was at stake was not a question of procedure, but a question of economy and control. It turned out that in the present way of registering the inspector’s travel it was not possible to check where they had been when, but it would be possible according to the new proposal.

Nothing in the preceding investigation indicated anything special concerning the registration and nobody questioned the present procedures. Subsequent analysis of the session indicates that the issue was brought to the surface because:

- the concreteness of the prototype resulted in the raising of the issue and maintaining it as a problem to be solved,
- the why question turned the issue away from the prototype towards current practice,
- the presence of more than one inspector triggered a discussion about why they did register the way they did.

In a mock-up (Bødker *et al.* 1987) session with the people from NLIS, the researchers tried to demonstrate the possibilities in using electronic communication in the case handling using the present procedures as point of

departure. It turned out, however, that the real challenge was not as much to envision a future use as to understand current practice. Until then, people thought they agreed on how the case handling should be and was done, but concrete experiences with the mock-up showed otherwise.

If the focus in the specific investigation is directed more towards the current practice in general than the use of artifacts, inspiration from the organizational games can be utilized. The approach must, however, be modified to shift the focus from commitments to the future towards provocation of the present. The professional roles of the participants should not be preferred future roles, but those actually 'played' in current practice. Instead of focusing on 'solving' problems through commitments and negotiations, the attention should be turned towards: what goes wrong, why, and how does it relate to other parts of the practice. In organizational games the focus is on solving specific problems in a given context, in provocation through concrete experience it is the context, the practice, that is questioned. Therefore, instead of using situation cards presenting isolated problematic situations one should try to make longer coherent scenarios provoking the current context from different angles. By retaining the ordinary roles and shifting the focus from problem solving to problem elaboration or problem 'definition,' 'playing in reality' can be used to provoke the given practice through concrete experience by means of situation cards raising problematic situations concerning the part of current practice under investigation.

A third approach is to visit other workplaces similar to the one in question. Similarity could mean that the other workplace visited has the same sort of problems or has found solutions that might be applicable. The ideal visit, in the context of provocation through concrete experience, involves actually trying out the alternative ways of doing things. In NLIS today, letters to companies ordering them to change work procedures are today written in the office. An investigation of the possibilities in using portable computers included a visit to tax inspectors using portables in their inspection. Not only did the visit provide concrete experience concerning potential use of portables in inspection service in general, but also, it raised new questions about the quality of current work. The use of portables (and a printer) to compose letters on the spot called forth issues concerning the degree of importance of present procedures. How important is the possibility to check with colleagues and source materials, give it one more thought, ask a secretary to proof read, etc?

The conceptualizations presented in this paper can be used as a vehicle to understand what is already going on in parts of systems development. As illustrated by the given examples, incidents of provocation through concrete experience do take place. The ideas in this paper can serve to understand and encourage such incidents.

Another way of utilizing the ideas is to apply provocation through concrete experience in order to create new practices on the basis of current ones. I suggest calling such an approach *provotyping*. Though the term suffers the drawback of being rather close to prototyping, it embodies the ideas well. On the one hand, provotyping resembles prototyping with respect to the need for concrete experience by working with concrete ‘types’. On the other hand, the intention is not to ‘guess’ a possible solution (‘proto’), but, as in activity theory, to *provoke* current practice.

Provotyping as outlined here, is intended to be used between the activities of initial investigation/analysis of the current and design of the new. The object of provotyping is current practice, as in investigation/analysis, but the focus is on furthering change, as in design.

Provotyping can serve as a bridge between analysis and design. It uses the results of analysis by taking as point of departure a general knowledge about the organization in question. And it facilitates the construction of first ‘guesses’ in a prototyping process by providing ideas as to what should be changed and what should remain.

## Notes

1. The expression ‘design of a practice’ is chosen in order to emphasize the deliberate effort to change a current practice towards a more preferable, prospective one, it is not meant to denote a detailed prescription for a new practice.
2. For a discussion on the concept of uncertainty in systems development, see (Davis 1982, Mathiassen & Stage 1990).
3. Lantz: *The Prototyping Methodology* (Lantz 1986), however, expands the notion of prototyping to encompass the whole development process, including initial activities directed towards identifying problems in the current organization. However, what he actually proposes concerning these initial activities is two purely sequential phases (‘Determine Feasibility’ and ‘Study Present System’) carried out through traditional analyses by observation and interviewing, and resulting in ‘Schematic Diagrams,’ ‘Document Description Worksheets,’ and ‘Data Flow Diagrams’. When these two phases are completed, the ‘real’ prototyping begins.

4. For this reason, several authors propose initial design of alternative prototypes and/or mock-ups (Floyd 1984, Hekmatpour & Ince 1988, Kyng 1988)) but this seldom occurs in practice (Grønbæk 1988).
5. Exceptions to this are Pape and Thoresen: *Development of Common Systems by Prototyping* (Pape & Thoresen 1987) and Cooperative Prototyping (Bødker & Grønbæk 1989, Grønbæk 1990). The latter is discussed in Section 4.
6. This example originally was given by Leont'ev. Here it is rephrased from (Engeström 1990a).
7. Both definitions are from the Shorter Oxford English Dictionary.

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