About experiments and style
A critique of laboratory research in information systems

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Abstract *Presents a critical review of the role of laboratory experiments in information systems research. In an attempt to highlight the issues raised by laboratory experiments, presents a thought experiment of such an experiment. The thought experiment indicates the problem of distinguishing between that which is done to complete the task and that which is done to complete the requirements of the experiment. Further develops an understanding of this problem by presenting the work of Heidegger, Merleau-Ponty and others. From this discussion, shows that people develop styles for coping in the world that do not allow them to "break up" the world into discrete objects, events, persons, and so forth. Based on this discussion, argues that it is impossible for the observer as well as the observed to know whether their style of coping in the experiment is a style of coping with the world or a style of coping with the requirements and constraints of the experiment. From this discussion, concludes that most laboratory experiments in information systems research have neither internal nor external validity. As such, they should be actively discouraged.*

Introduction

A large amount of published research in information systems is based around some form of laboratory experiment. In some areas such as decision support systems and group decision support systems this approach seems to dominate the field (Fjermestad and Hiltz, 1996). This may be due to the continued legitimacy of the positivist paradigm in the mainstream of the information system field. It may also be due to the availability of a technical base for this type of research. Nevertheless, it is our contention that much of this type of research is of limited use from an academic as well as a practical point of view. We will aim to show that this type of research contains fundamental problems that can not be resolved from within the design of the experiment itself.

To support our contention we will make use of a thought experiment to show that researchers using laboratory experiments cannot eliminate, or separate out, those behaviours that are done in order to fulfill the conditions of the experiment from these behaviours that are the focus of the research. We further support our contention by introducing the idea of an involved manager – using the work of Heidegger (1962) – to show that situated behavior is linked to a way of behaving (a style) that is rendered coherent in a particular form of life. Thus, a group of undergraduate students participating in an experimental study will render their behaviour coherent within the form of life called "being

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an undergraduate doing an experiment" which may or may not be similar to the behaviour of a manager in the form of life "being a manager doing a particular job". We conclude, therefore, that the space for experimental type research in information systems seems extremely limited, if present at all. This would seem surprising in the light of the high incidence of this type of research.

The paper is structured as follows. First, we will discuss thought experiments, what they are and how they can be used to challenge an existing paradigm. Second, we will discuss some laboratory experiments presented at the International Conference of Information Systems (ICIS), one of the leading forums for information systems research, emphasizing the concerns we have with this style of research. Third, we will present a thought experiment as a means to challenge the validity of laboratory research. Fourth, we will present the notion of an involved manager to contextualize the problems of laboratory research as well as to add weight to our argument. Finally, we will discuss some conclusions about research in general and laboratory research in particular.

Thought experiments

This section introduces the concept of thought experiments and overviews a classification of different forms of thought experiments. It then examines the relationship between thought experiments and theory as a means of explaining the power of effective thought experiments.

What is a thought experiment?

Thought experiments have existed in the area of computer-based systems for a number of years, although early computer-based thought experiments are most commonly found in the area of artificial intelligence (Searle, 1980; Collins, 1990; Maturana and Varela, 1992). It is only recently that they have been formally considered as a means of doing qualitative information systems research (Introna and Whitley, 1997).

What, then, is a thought experiment and how are they differentiated from other forms of demonstration, such as logical arguments or scenario analysis, to name a few. Introna and Whitley (1997) describe a thought experiment as:

> ... a coherent narrative of an unrealizable experimental situation, commensurate with the current paradigm, that is explicitly constructed in order to destroy or challenge the current paradigmatic position, or to support an emerging paradigmatic position.

In providing this description, they emphasise a number of key features. First, thought experiments are unrealizable either as a matter of principle or of practice. Thus, Einstein's (1949, p. 53) observer traveling at the speed of light is a thought experiment that is unrealizable in principle, while other experiments, particularly those exploring moral or ethical points, are unrealizable in practice.

Second, thought experiments are designed to operate within the current philosophical paradigm. This point is explored in more detail in the next subsection. Third, thought experiments differ from other forms of argument in that they are designed in order to have a particular result with respect to that

particular theoretical basis. Scenario analysis techniques, for example, operate within a particular paradigm and attempt to think through the consequences of the analysis within the paradigm for its own sake. Thought experiments, in contrast, are designed to have a particular effect on the paradigm they come from. They can (after Brown (1986)) either be destructive, that is they set out to destroy the philosophical assumptions from which they are drawn, typically by raising implicit contradictions, or they are constructive and support a new theoretical perspective or paradigm. Constructive thought experiments can either be conclusive, elucidative or conjectural (Introna and Whitley, 1997).

Thought experiments and theory

The previous section has pointed out how thought experiments operate within an existing paradigm in either a constructive or destructive manner. It is therefore useful at this point to discuss briefly the relationship between a paradigm, research and the use of a thought experiment to challenge the existing paradigm.

According to Kuhn (1970), a paradigm is much more than just the methods used by a community of researchers. A paradigm is a way of looking at the world. It highlights what the interesting questions are and which questions are unimportant. It specifies what can be considered as a candidate fact and what results are to be treated as anomalies that can be discarded for the time being. The paradigm provides the basis for evaluating research and the methods used to undertake that research.

Thus, if a thought experiment successfully challenges (in its destructive mode) an existing paradigm or proposes (in its constructive mode) a new paradigm, the potential changes are wide ranging. If the paradigm changes, then different interesting questions are asked, different candidate facts come into existence and different research methods become acceptable.

The potential impact of a well constructed thought experiment is thus huge, and it is because they operate from within the existing paradigm that they can be so effective. The thought experiment changes the whole world of the researcher and can't be explained away in terms of problems of experimental design or errors in data collection and analysis. It is in a sense immune to the problem of the underdetermination of experimental data because it does not rely on experimental data.

An effective thought experiment must therefore be based on known and accepted terms and concepts. A thought experiment does not succeed if it does not, in fact, operate within the existing paradigm. It must start from conditions that everyone accepts and understands and make only reasonable steps at each stage of the experiment. Indeed, the more standard the stages of the experiment, the more effective it is. This can best be illustrated by Searle's (1980) Chinese Room thought experiment which operates within the existing paradigm of artificial intelligence, indeed it was specifically written to correspond with the workings of conventional systems.

The background to the thought experiment must also be made explicit. In order to carry the reader along in its narrative, all assumptions made must be clearly stated. The thought experiment fails if some unstated background assumption suddenly plays a significant role in the experiment.

Some laboratory experiments in information systems

The thought experiment presented in this paper is concerned with the use of laboratory experiments in information systems research. This section therefore provides a brief review of some of the issues associated with such laboratory experiments and describes three such experimental studies.

A large amount of published research in information systems is based around some form of laboratory experiment. For example, in the area of group decision support systems Fjermestad and Hiltz (1996) provide a summary of 122 empirical studies found in refereed journals and conferences between 1971 and 1996 that are based on controlled experiments. They define controlled experiments as situations where there were "two or more conditions deliberately created and contrasted, and other variables were controlled in some manner; and there was at least one independent and one dependent variable, which was measured and statistically analyzed" (Fjermestad and Hiltz, 1996, p. 347).

They express concern, however, with the way that many of these studies are undertaken. For example, they report that only 4 per cent of the studies used established rather than *ad hoc* groups, and over 90 per cent use students as the subjects. Their concern arises because the systems and techniques that are being studied are meant to be used by managers in commercial settings and these managers typically are based around established forms of life. The *ad hoc* nature of the experimental subjects may therefore introduce a different context to that found in the organisational setting.

Fjermestad and Hiltz (1996) also note that the duration of many of the experiments is typically quite short, with 62 per cent of the experiments being completed in less than one hour. Thus, the subjects are able to come to terms with the technology, become accustomed to working with the other members of their *ad hoc* group and are able to solve the task they have been set in less than 60 minutes.

To illustrate the nature of these problems, three experiments that were presented at the 1996 International Conference on Information Systems will be briefly described. These were chosen because ICIS papers are assumed to be exemplary and ICIS can be viewed as the expression of the "state of art" of the field. As such these experiments can be seen as a reasonable view of the way experimental research functions in the field. In each case, the issues of concern raised by Fjermestad and Hiltz (1996) can be seen.

The first experiment is described by Suh (1996) who examines the effects of communication media on intellective and negotiation task performance. The experiment described in this paper tests media richness theory by using subjects drawn "from *undergraduate business classes* at a large Korean

university" (Suh, 1996, p. 105, emphasis added). For one task the subjects were given an inheritance tax calculation case to solve. The problem was developed based on a "*real but simplified* case with the help of a certified public accountant" (Suh, 1996, p. 105, emphasis added). The task was completed by most subjects in less than 25 minutes as most students were familiar with the kind of task "because they had taken at least two accounting courses" (Suh, 1996, p. 105). The second task in the study was based around negotiation. The subjects had to imagine that they were in charge of the construction of a new building for the university's business school. An unexpected cut in the budget means that three facilities have to be discarded and the students must therefore negotiate which facilities to lose. As a result of these two experiments, Suh (1996, p. 109) makes various claims about the applicability of media richness theory and argues that it might be "too high or too simple to predict *managers'* media choices or individual effectiveness" (emphasis added).

A second experiment is described by Peace and Galletta (1996) who are studying software piracy behaviour. The subjects here were part-time graduate students who were asked "to *role-play* as computer using professionals in organizations that produced 'widgets'" (Peace and Galletta, 1996, p. 214, emphasis added).

A third experiment, by Sia *et al.* (1996) explores the possibility that group support systems might cause groups to make more extreme decisions. Here the task that "520 information systems *undergraduates* from a large university" (Sia *et al.,* 1996, p. 332, emphasis added) faced was to select a scheme, among a number of alternatives, "to increase the market share of *their organization*" (Sia *et al.,* 1996, p. 331, emphasis added). Their study aims to "maximize internal validity rather than generalizability or *realism*" (Sia *et al.,* 1996, p. 334, emphasis added) and they note that caution should be exercised when generalizing the results to "organizational groups and settings" (Sia *et al,* 1996, p. 331).

Each of these experiments could obviously be criticized on the basis of the survey by Fjermestad and Hiltz (1996). However, we want to make more explicit the core of their concern. The reflexive involvement of participants in experiments is a classical problem first made explicit in the Hawthorn experiments. In the Hawthorn experiments it became clear that participants (factory workers on an assembly line) are not only reflexively aware of the fact that they are involved in an experiment but also anticipate the expectations of those "observing" them, and act accordingly. In other words, they do not only act out the conditions and constraints of the experimental design but also concern themselves with what they conceive of as successful behavior with respect to the expectations of the researchers. In our terminology: they act, not only in order to complete the task but also in order to complete the experiment as an experiment. This is obviously not a novel conclusion. However, it is our contention that it is always impossible to separate these two, that it is always impossible for both the observer and the observed to distinguish between that which is done in order to complete the requirements of the experiment, and that which is done in anticipation of the expectations of the observer(s). If this

contention can be sustained then controlled experiments would not only have low external validity (which is generally accepted) but they will also have low internal validity. The so-called extraneous variables have not been controlled. The most important extraneous variable, namely that of the continual mediation of the reflexive awareness of the participant in the experiment as an experiment can not be controlled either by the participant or by the observer. If this contention can be sustained, as we hope to demonstrate in the next section, then it raises serious doubts about the validity of experimental research in the field.

A thought experiment

In this section we want to present a thought experiment as a means to highlight the issues discussed above. The essence of our contention above is that it is impossible for the observer and the observed to separate those actions/behaviors that come about as a result of the experimental design and constraints and those that come about in anticipation of the expectations of the observer(s). In order to explore this contention we will make use of a thought experiment. In the thought experiment we want to make it possible for the participants to make the distinction between action for the task and action for the experiment and see what we may learn from this.

Imagine that we have three groups of individuals developing a budget for a project. Each group has a worksheet that provides the detail of the project as well as detailed guidelines on how to go about developing the budget. The groups are also told that the budget is for an actual project to be implemented based on their results. The groups consist of, say, five members and are gathered together in three rooms supplied with the necessary equipment (paper, pencils, computer with a spreadsheet application, and so forth). Let us imagine that they are observed by an omnipresent observer who has the ability to ask them questions about the task they are performing in a way that does not distract them from that task. Let us further imagine that the participants performing the task can always discern why they are doing what they are doing. The purpose of the observer is to elicit the reasons why they develop the budget in a particular way and not another. Imagine this first group is a group of bright school children (mostly eight years of age) who have no experience of budgets whatsoever yet they have enough general common sense to understand and execute the task. The second group is a group of undergraduate accounting students who have some actual experience of developing budgets and have done some budgeting exercises as part of their introduction to accounting course. The third group is a group of experienced managers who have many years of experience in doing budgets but no formal accounting training whatsoever.

We will now observe our three groups performing the tasks of developing the budget. Let us apply our special thought experiment ability to ask questions without interrupting the individuals. Furthermore, we can expect them to know exactly why they are doing what they are doing.

- *School children.* In response to the question "What are you doing?" the children reply that they are doing these sums according to the rules they were given. When asked why they are doing this, the children reply that they are part of an experiment and that this is what they were told to do. If asked why they are doing it in a particular way (and not in another way) they respond that they are following the instructions as closely as they can because they think this is what the "teacher" wants them to do. For them the essential "task" is to follow the instructions as closely as possible in order to get it right.
- *Students.* When faced with the first question the students may reply that they are doing estimates and some calculations. When pressed in a little more detail they may say they are developing a budget for a project. When asked why they are doing this, they reply that they are doing it because their accounting professor has asked them. They are not exactly sure why the professor has asked them to do this, but they think it is to generate data (observations) for a research project she is doing, in order to have it published in a journal. If asked why they are doing it in a particular way they may respond that they are sort of trying to follow the guidelines and some of the principles they were taught in accounting – since this is what they think the professor would want them to do. They may also add that they have done it before for some actual projects and the way they are doing it here seems to have worked in those cases. For them the task is doing the budget in a way they would consider it ought to be done by someone who had already completed an accounting course.
- *Managers.* When the managers are asked what they are doing, their responses are markedly different. They may initially respond that they are doing some financial calculations to develop a budget. However, when pushed further they may respond that they are developing a budget in a way that would place the project on a sound footing. They may also remark that budgeting is the most important part of a project's success and should be done with due care. If asked why they are doing it in a particular way they may respond that they have incorporated some of the guidelines provided, they also know that it makes sense to do much more than that. For example, they also developed some alternative scenarios to check how realistic and robust their budget would be under changing circumstances, and so forth. If asked why they are doing it in this way they may remark that this is the way it is done if you don't want to get yourself into trouble (as any seasoned financial administrator knows). They may also comment that they think the accounting professor may be impressed with the way they have tackled the problem.

Thus, our ability to ask the subjects what they are doing reveals that their actions are related to two things. They may be doing certain things to complete the task of developing an actual budget or they may be doing things to satisfy

the conditions/requirements of the experiment (guidelines, preceived expectations of the observers, and so forth). We can therefore summarise these relations as in Figure 1.

Thus, the school children's actions are mostly related to satisfying the requirements and constraints of the experiment. The children are not developing a budget, rather they are following the instruction as provided by the experimenter. Even if the result looks like a budget it does not represent the compromises, trade-offs and commitment to financial resources, that an actual financial budget represents. The managers actions, in contrast, are mostly meaningful in terms of the task at hand, namely that of producing a sound and reasoned budget for an actual project. The undergraduates lie somewhere between the two. They are completing the task of developing a budget but some of what they are doing (such as trying to follow the guidelines and incorporating accounting principles) are to satisfy what they see as the conditions/requirements of the experiment as an experiment.

What happens when we now remove the conditions behind the thought experiment? We have now lost the ability to distinguish those activities that relate to the experiment and those that relate to the task. In the case of the children and the managers the problem is not that pronounced (but only because of the way we have set up the thought experiment). In the case of the children we would expect their behavior to be largely the result of the completion of the experiment, i.e. following the instructions as closely as possible. Similarly, we would expect the managers' behavior to be largely driven by the completion of the task. The case of the undergraduates, however, is less clear. Some of what the undergraduates are doing relates to the task of preparing a budget, but some also relates to dealing with the experiment and the experimental situation (such as their perception of the expectations of the professor).

So what is the essential point of the thought experiment? Simply this: if we use (observe) real managers in real situations doing real things then the task/experiment distinction is not an issue because we no longer have an experiment but an ethnographic study. Likewise, we will not consider using children since we want to learn something more from our experiment than that it can be completed. Thus, experimental studies always tend to be in the middle category. This is the category where we impose experimental constraints but are unable to identify in what way these constraints mediate the behavior of the participants. Simply put, we cannot make the task/experiment distinction with any level of certainty. Clearly there are measures that can be taken to try to control for this (for example, by varying the experimental situation we can try

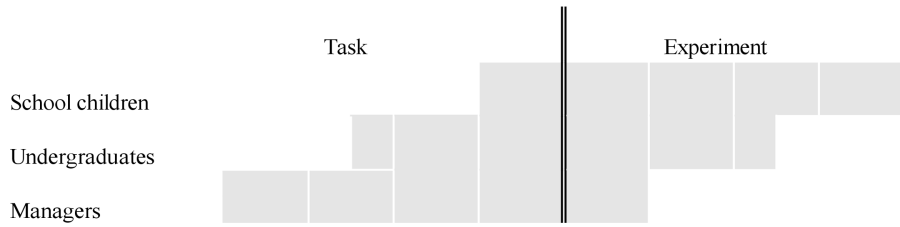

Figure 1.
Relation of actions to task and experiment

to isolate experimental factors) but the fundamental problem of subjects acting implicitly, in part, to satisfy the conditions of the experiment cannot be removed with any level of certainty. Further, we have no way of making certain our (un)certainty; there simply is no fixed point.

The involved manager

Our thought experiment has highlighted what we argue to be a fundamental problem with information systems laboratory experiments. However, it does not provide a sufficient theoretical argument for why this problem arises. The purpose of this section is to introduce a theoretical basis for understanding this phenomenon, a perspective based around the notion of the involved manager.

Conceptualizing involvement

This new way of thinking about the relationship between individuals and technology draws on the work of Heidegger (1962 [1937]) and Dreyfus (1991) and the insightful development of these ideas by Spinosa *et al.* (1997). In particular, we are concerned with the particular individuals we typically call managers and the computer-based technology found in management information systems (Coyne, 1995; Introna, 1997).

Heidegger's work provides us with a vocabulary for talking about individuals and technology and the relationships between them. By means of this vocabulary, we will be able to articulate the basis of the problems raised by the thought experiment. Let us take a familiar starting point for the development of this new vocabulary: managers using computer-based systems in the execution of their tasks. The normal way to think about this relationship is to view the managers as actors (or agents) that engage with artifacts in some particular way to complete some task, in the same way that we can view a person opening a door as a person engaging with the opening mechanism, hinges, etc. to enter or leave a room. Analytically this view may be useful (especially if you design doors), however, the managers are not just there merely doing things. The "doing of things" is not meaningful in itself. Rather, the "doing of things" is meaningful within a mutually referring whole in which the managers are always already concernfully entangled. In short, the managers are always already involved in the world.

Whenever we find managers we always find them already involved. The world, for managers, is not a set of neutral objects, people and relationships that simply appear "before" them. There is always already something at stake, some results that matter more than others, some outcomes that are valued more than others. The world is not things but rather possibilities, possibilities for making some things happen and others not. The world surrounds the managers as possibilities to be engaged, possibilities that solicit their response. The door is not an object to be opened/closed – as it would be for the carpenter who designed or installed it. It is rather a possibility to enter or not, to confront or not, to request or not. The computers on their desks are a possibility to send e-mail, to develop contacts, to sell products, and so forth. Their world is an involvement whole where possibilities hang together, refer to one another as a

meaningful whole, and in which each object, event, action finds its meaning in the whole that makes it stand out as a particular possibility to do this or that. This is their world of work that they are always already in (involved in, engrossed in) even before entering the office and also after closing the door when they go home. When not at work, managers may also be involved in the "world" of tennis or the "world" of theatre, etc.

These different sub-worlds make up the existence of the manager and these worlds are typically not discrete entities which can be conceptually and practically separated, rather they are interconnected wholes, each of which presupposes the existence of other sub-worlds. In playing tennis, the manager may become friends with someone who could be useful in the business world. Similarly, the world of business may become involved in the world of theatre (either through sponsorship or by client events), thus again demonstrating the relationship between different worlds.

Each particular sub-world has three characteristics (Spinosa *et al.,* 1997, p. 17). It is a totality of interrelated equipment, each of which is used for a particular purpose and these activities enable people performing them to have particular identities. Thus the sub-world of a typical office environment consists of equipment such as spreadsheets which are used to produce budgets, and the production of such budgets is the task of people we describe as managers, personal assistants, office workers and the like. In the tennis world we often have balls, the court, rules, etc. used by players, coaches, administrators, and so forth, to produce a game, entertainment, etc. Again, these elements hang together in a mutually referring meaningful whole called the world of tennis.

We consider this relationship between the elements as constituting a sub-world because they are only meaningful within the sub-world, because they fit with the practices we have for them. Taken in isolation, each element in itself is meaningless. If we did not have practices for producing or requiring budgets then spreadsheets would not be encountered as meaningful. Without the practices of producing budgets the sheet could only be considered as a block of plastic and an encased piece of glass.

The managers' ability to cope within a sub-world arises because they develop styles for participating within them. The style coordinates action. It determines how and when things and people matter, and specifies what is transferred from situation to situation. Thus the style of office work enables us to coordinate our actions in the process of preparing a budget and other activities, it highlights the important factors – getting the budget right and out on time – and allows us to transfer our understanding of one office environment to another. These styles, or ways of coping, do not emanate from conscious design or deliberate choices. Rather these styles represent a sort of "maximal grip" that the manager achieves in coping with the world. To make this notion a bit more explicit let's look at the maximal grip notion when viewing a painting in an art gallery[1]. If we observe patrons viewing a picture we notice that they tend to gaze at the painting and then slowly move their body until it has a maximal grip on the painting. That is, when there is just enough light,

just the right distance, no reflections, no interference from other patrons, and so forth for the painting to "open up", hang there as available for viewing. At that moment, the person has a maximal grip on the painting. A style is such a maximal grip on the world.

The fundamental point of our discussion is that through styles the manager copes with the world in a way that makes the world "disappear" as discrete things, objects, events, persons, and so forth and appear as a continuous landscape of possibilities. In this landscape of possibilities the manger develops a repertoire of styles for doing things, for going about her task, that does not require the manager to break up the world into things, events, persons, and so forth. In fact, when the manager becomes particularly skilled at doing certain things it becomes almost impossible to break up the style into the whys, the whats and the what fors. It is done in that particular way because it works – this is just how it is done. Polanyi (1966) refers to this as tacit knowledge. Merleau-Ponty (1962) argues that the knowledge has become embodied. Heidegger (1962 [1937]) says the world has become ready-to-hand, simply available for use.

Reassessing laboratory experiments

This vocabulary now enables us to give an account of the problem with the laboratory experiments described above. When the research is undertaken, the purposes for doing what is done changes. In our thought experiment, the undergraduates do not relate to the project, the computer and the instructions only as possibilities for completing the task of producing a budget. It is also a possibility for their professor to get publications and promotion and then perhaps to receive financial rewards for participating. The sub-world of the experiment is different to the sub-world of the office. The equipment is often the same, but the purposes for using the equipment are, as we have seen, different. Similarly, the identities are different. The undergraduates are subjects in the experiment, they are not managers in the organization. Although the particular behavior exhibited by the students may look similar to the behaviors of the managers the style they actually engage is markedly different. The style to deal with an experiment is not the style to deal with the world of work.

Let us recap on the three sample experiments presented at ICIS in 1996. In the first, the students were asked to solve simple accounting problems. Their style for tackling them, however, will be based on the style that they tackle problems in their accounting courses and not the style with which a professional accountant would do so. Similarly, in the negotiating task they approach the problem with the style of students in a laboratory experiment and not with the style of university administrators working with a constrained budget.

A similar problem arises in the second study, where the students were explicitly told to role-play as computer-using professionals. In this study all the students were part-timers and therefore they may have more of the style of computer-using professionals than the undergraduates pretending to be university administrators. However, their style is still influenced by the fact that they are role-playing in an experimental situation.

The third study also has undergraduates trying to imitate the role of professional managers. Again, as they are unlikely to have learned an appropriate management style, they will tackle the problem using the most suitable style they know, namely as undergraduates tackling a problem that has been set for them by their teacher.

Conclusions and some reflection on wider issues

It seems that there are strong reasons to believe that experimental research in the information systems context is fraught with some very serious problems. The very conditions that are set up to provide them with internal validity (i.e. decontextualisation through experimental control) are the conditions that render their conclusions inappropriate for involved managers – or for that matter any involved actor in the world. Clearly, no form of research will be able to remove or isolate all behavior related to the conditions of the research process itself. However, as we have seen in this paper, laboratory experiments make this situation worse by deliberately introducing extra behaviors related to the research process. Nevertheless, it should be clear that there is a need to locate or situate research in the world if we want to become more confident about the appropriateness of our conclusions.

What conclusion can we draw from this that would enable us to make our research more "real" and perhaps more relevant? Clearly, research efforts should always strive to be situated in the world of work itself. The less the research is situated in the world of work the less confident we can be that we are observing styles of coping with the world rather than styles of coping with the experiment. Would there be any situations for which laboratory type experiments would be appropriate?

We would argue that these situations would be extremely limited. One may be able to conceive situations in which they may be valid, however, as Suchman (1987) has shown, even the interaction with basic office equipment is situated, and therefore in need of situated research approaches. Furthermore, even in situations where the simulation of the work environment is quite profound and highly sophisticated (such as flight simulators for the training of pilots) it is acknowledged that the style for coping with the simulated environment needs to be corrected by actual flying hours. If our argument is valid then most of the laboratory experiments in information systems research have neither internal nor external validity. As such, this form of research should be actively discouraged and the results of this type of research viewed with due caution. This is our concern.

Note

1. Thanks to Hubert Dreyfus for this example presented in his lecture on the occasion of receiving an honorary doctorate at the University of Erasmus at Rotterdam.

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