8 THE POVERTY OF SCIENTISM IN INFORMATION SYSTEMS

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Abstract

In the 17th century, Thomas Hobbes outlined the program of scientism which proposes that laws of human nature can be found by the same methods as employed in the natural sciences. By the application of such scientific laws of the social universe, it would then be possible to design for the improvement of the human condition. This paper presents evidence from the literature for two claims: (1) The current orthodoxy in information systems research tries to implement the Hobbesian program by believing in the possibility of a scientistic engineering theory of information systems design; (2) This is bound to fail. Hence the conclusion must be that Information Systems will remain a dubious science as long as it tries to emulate the so-called scientific method as the only ideal of academic inquiry. The most visible symptoms of the poverty of scientism are paradigmatic anomalies—crucial research issues which cannot be resolved within the scientistic tradition because they transcend its paradigmatic assumptions. The need for affirmative pluralism is offered as a fruitful avenue to improve the status of information systems in academia and practice.

"Whatever presents itself as empiricism is sure of widespread acceptance, not on its merits, but because empiricism is the fashion."
– Betrand Russell, *The Philosophy of Bertrand Russell*

"The orthodox model of natural science is now itself no more."
– Anthony Giddens, *Profiles and Critiques in Social Theory*

Introduction: The Scientific Method—A Doubtful Approach?

Examples of doubtful sciences are astrology, alchemy or scholasticism. Doubtful sciences lack either proper methods or legitimate problems or both. This paper questions the methods by which research about information systems is conducted. IS—and the abbreviation with the capital initials of "Information Systems" is used to refer to the academic discipline as opposed to information systems as its object of inquiry—will remain a doubtful science as long as it continues to strive to develop its stock of knowledge primarily through the practice of the so-called scientific method. In order to explain this, two diverging attitudes about the nature of science need to be distinguished. One of these emphasizes objectivity and rigor of methods whereas the other historical context and relevancy of results.

Scientism Versus Science

The first view of the nature of science, emphasizing rigor, goes back to Descartes and holds that all of science must imitate the methods that have lead to the immense progress in mathematics and the natural sciences. Until the early 20th century these were called the "exact" sciences and in the current philosophical literature their methods are refereed to as the empirical-analytical approach. It defines a fairly rigorous set of canons by which the practice of science has to proceed, e.g., as described in Popper (1968) or Lakatos (1970), and these constitute the only route to valid knowledge. Any human activities not following these methods may still be worthwhile pursuing, because they are practical or art or religious contemplation or whatever else, but they do not lead to valid knowledge and hence are not part of science. This strict version of the concept of science will from now on be refereed to as scientism (cf. Habermas 1973; Cameron 1979; Apel 1980; McCarthy 1982, pp. 1-52).

Conflicting with scientism is the wider notion of science which admits any form of scholarly inquiry as a possible route to knowledge. As an example, consider the following definition: "We conceive of 'science' essentially as a knowledge improving enterprise" (Radnitzky 1970, p. l). Such a wide definition would have to admit those methods which have been practiced by the classic thinkers and by the humanities to improve our knowledge. Most great books of mankind have not been compiled by sticking very close to the empirical-analytical method as preferred by "scientists." All that the great thinkers (including the inventors of the scientistic program) needed were intellectual discourse (or "reflective conversation" as a method of inquiry;" cf. Morgan 1983, p. 406) and a good library. Of course, this is not to preclude the consideration of results achieved by scientism, quite to the contrary, but it includes much more. This wider inclusive notion of science is the pursuit of knowledge by whatever scholarly means. Unfortunately, the English language has no word for this broad concept of science like the German *Wissenschaft*. Instead such phrases as scholarly inquiry, non-scientistic research or simply a broader concept of science must be used. The label "science" will be used as a generic concept which embraces both scientism and "other" modes of inquiry.

What are the difficulties with scientism when applied to the development of information systems? An example, which admittedly is exaggerating the problems by placing the question of successful information systems into a different time and culture, is used to pinpoint some of the issues for the purpose of introduction.

Scientistic Information Support for Alexander the Great

> Imagine that SK, a rigorous decision modeler and information scientist, is to travel both into the future and the past. From the future, he is to pick up a 6^{th} generation pocket PC 370 and then meet Alexander the Great before he headed East to carry out the far reaching plans for the liberation of the Greek cities from the tyranny of Persia and the establishment of a Greek federation (approximately 334 B.C.). SK is plagued with anxieties about another information systems failure. Naturally, the Great General would prefer to query an oracle before going into battle. How could he be convinced—with all due respect—that this was unscientific? Could our time traveler, indeed, assure the emperor of the right answer by running his user-friendly simulation modeling system of the battle to come? Even at the risk that SK is likely to loose his head if he was wrong? And if not, how could it be explained to the General that ambiguous answers obtained from sensitivity analysis are scientifically acceptable, whereas ambiguous answers obtained from the oracle are, of course, evidence for lack of proper method? And then there is the question of social acceptability. Even if SK was able to convince the General of the validity of the simulation, more than on anything else the outcome of the battle depended on the morale of the troops. If the troops did not believe the model's prediction and thought the Gods must be asked before the battle, it would lower their commitment if the oracle was ignored. No oracle, no victory. This attitude must lead to a weakening of morale which could, of course, be reflected by changing the morale parameters in the model. But then SK was no longer "objectively observing," but actually intervening in the battle by weakening the General's army. Should he be executed for aiding and abetting the enemy? And if not, could he justify his intervention to himself if his own life depended on the victory as much as that of everyone else?

This hypothetical story raises the following questions: How does scientistic inquiry account for differences in information needs which are due to differences in the historical-cultural milieu? Is there a historical component to the definition of the scientific method or is it the same for all people at all times? (For a review of different concepts of the scientific method which emerged during the last 300 years, see Churchman 1971.) If the concept of scientific method changes with time (for which there is plenty of empirical evidence, cf. Churchman 1971; Kuhn 1970), then how can the decision for the one right method be based on scientifically validated knowledge? If scientism cannot answer this because it leads to an infinite regress (cf. McCarthy 1973), then we must conclude that it has nothing to contribute to the choice of its own methods. This means that the decision in favor of science is totally irrational (this is actually the conclusion which has been drawn in the orthodox philosophy of science, see review in McCarthy 1982, p. 49; on the role of rationality in research, see also White 1984 presented here). This leads to the paradoxical situation for the information scientist that (s)he is to advocate rational decision making by the application of the scientific method whereas the decision to apply the scientific method itself is irrational, i.e., cannot be justified by knowledge which conforms to the ideal of scientistic validity standards.

The example also points to the controversial problem of objective models of reality, i.e., are the information needs for Alexander the Great objectively defined by reality or are they constructed by socially influenced perceptions (e.g., Berger and Luckmann 1967)? Does terminology and language have any influence on the construction of reality (cf. Sapir-Whorf hypothesis; see literature review in Schaff 1973) or is language "neutral" (as nominalism suggests)? Is it possible to determine information systems requirements and supply information support without intervening in the process to be studied? If this is not possible, does this mean that the analyst must assume joint responsibility for the final outcome with the end-users? What are the further consequences of this, e.g., does it mean that the fiction of a "neutral" or value free scientific approach to information system development must be thrown overboard? And if information systems development is a value laden, interventionist process, what are the implications for participation?

As these questions do not have agreed upon answers in the modern literature, a more thorough analysis is needed.

Focus and Organization of this Paper

A thorough treatment of the limitations of scientism as the sole paradigm for information systems design is beyond the scope of a single paper. Therefore the purpose of this paper must be limited to the following: the second section is to expand on the definition of scientism and briefly point to alternative modes of inquiry. Also the strengths and weaknesses of scientism and some of its dysfunctions are introduced in the same context. The principle evidence for the thesis that scientism leads to a doubtful Science of IS is presented in the third section by relating to the Ruhnian concepts of paradigm crisis and anomalies. One set of anomalies, namely that scientism is unable to explain how technical systems can improve the sharing of meaning and knowledge for the purpose of ill-structured problem solving, is examined in greater detail in the third section. It confronts scientistic theories of data semantics with applicable research from other scholarly sources. The fourth section sets out some conclusions what could be done to address the scientistic bias in information systems mainstream research. Prominent among them is the observation that alternatives to scientistic research cannot blossom unless it receives some of the same kind of support that has been poured into orthodox research. As a whole, the principle purpose of this paper is to provoke discussion on the limits of the current orthodoxy by way of examples rather than to propose an alternative paradigm (see, however, Lyytinen and Klein 1984).

On Scientism: Its Alternatives and Dysfunctions

At the core of scientism is the notion that the so-called scientific method defines the only valid ideal of knowledge (e.g., Apel 1980; McCarthy 1978). More precisely, the following assumptions characterize the concept of the scientific method.

Scientific Method, Scientism and Alternative Traditions

The empirical-analytical method of science evolved from a synthesis between formal methods of reasoning and empiricist methods of data collection. Experimental and observational data collection methods provide the inputs without which formalized theory is empty and the methods of formalized reasoning provide the guidance without which data collection is blind. Modern formal sign languages must be taken to include all forms of symbolic models which allow the precise calculation of consequences from given preconditions. This includes not only mathematics and symbolic logic, but all forms of computer programming languages such as LISP, PROLOG, PSL, etc. (Newell and Simon 1972). From the scientistic perspective, the use of natural language is at best an imperfect, because imprecise substitute for theory which is not yet formalizable (cf. Carnap 1937).

The scientific method turns into scientistic orthodoxy when it entails a commitment to "one or more of the following tenets" (cf. Bleicher 1982, p. 14):

- The facts with which science deals are given independently of the researcher. Reality is not created through language and culture but exists independently and *a priori*.
- The empirical-analytical method is the only valid approach to improve human knowledge. What cannot be investigated by it, cannot be investigated scientifically at all and therefore must be banned from the domain of science as "un-researchable" and consequently is "unpublishable," "unfundable" and almost an "unspeakable."
- The empirical-analytical method must therefore be extended to all spheres of human knowledge including the domain of the cultural sciences and the use of knowledge in human decision making.
- Only results obtained by the application of the can(n)ons of the empirical-analytical method are a true form of knowledge.

The idea that scientism applies not only to the domain of the so-called exact sciences, but also to those of all other fields, in particular the study of human behavior, can be traced back to Hobbes (cf. McCarthy 1982, pp. 1-4). It has found its most extreme implementation in the practice of Management Science as manifested in most of the

TIMS publications and likewise outlets. A typical question encountered when questioning the universal status of scientism is "what is the alternative?" This question must be criticized for its ambiguous implications. "Alternative" cannot mean a replacement of scientific method by way of substitute, but the pursuit of other forms of scholarly inquiry in addition to those recognized by scientism. In that inclusive sense, at least three alternatives to the practice of scientistic research into social system design and the technical implications of social change exist:

(1) The phenomenological-interpretative tradition which leads to a subjectivist-relativistic perspective of information systems.
(2) The radical-structuralist (i.e., Marxist) view of information systems which leads to a normative-objectivist design concept of information systems.
(3) The critical social theory view of information systems which offers itself as a possible synthesis among selected elements of the scientistic, phenomenological and normative traditions of inquiry.

The basic assumptions of these three paradigms are extensively discussed in Burrell and Morgan (1979). It is not the purpose of this paper to examine how their sociological analysis must be modified as to apply fully to IS as a scientific discipline (cf. Klein and Lyytinen 1984a, 1984b) and consequently no more will be said here. Based on this and earlier work (cf. Lyytinen 1984), a survey of the critical social theory view of information systems development is presented in Lyytinen and Klein (1984). As far as the Marxist view of information systems development is concerned, we do not claim special expertise and prefer to remain silent. Some of the basic notions of relativism and its classical beginnings will be examined in the context of the next section.

The above implies a close connection of IS research with a general, theory of human behavior, in particular its interaction with the embedding social structure and cultural patterns. A common objection to this is that social system design is not a problem for IS. At most, it is admitted that human and social problems arise "at the interface." A thorough reply to this objection requires a discussion of the scientistic strategy of reification. This concept will be dealt with in the next section. For now the focus is on a better understanding of the general characteristics of scientism as a research strategy.

Some General Characteristics of Scientism and Their Evaluation

The scientistic approach has both strengths and weaknesses as a research strategy in IS. It is important to reflect both in order to see the effects of scientism for the identity of IS as an academic discipline.

The Strengths of Scientism

Scientism values objectivity and rigor. To achieve both, it teaches respect for facts, i.e., to refrain from armchair speculation when relevant facts can be brought to bear on issues. In using facts to support inferences, it puts the emphasis on rigor, that is, on intersubjectivity, reliability and reproducibility. These criteria are closely related and are to assure that all trained observers at all times should be able to reach the same conclusions.

One beneficial effect of this for research in IS is that it leads to focus on the need for good tools and methods which could be a safeguard against the fallibility of the human mind in coping with the technical complexity of information systems development, insofar as scientism continues the Cartesian concern for method. In this regard, scientism has been most successful and substantial contributions have emerged. For example, the methods of structured programming and the continuing work on proving the correctness of programs mathematically must be viewed as possible research strategies to reduce subjectivity in information systems development. Another example is to apply software tools to the development of application systems or new software tools. The research on coping with the technical complexity of information systems development through integrated software development tools has, indeed, made significant inroads (e.g., Teichroew et al. 1980; Yamamoto 1981). Nevertheless, concise, comprehensive, yet comprehensible and accurate documentation does remain one important issue.

Supposedly, scientism also teaches a concern for clarity (Popper 1965, p. 28), but in practice this is sometimes less obvious. What is claimed as a strength, in fact turns into a weakness. For example. the precise meaning and limits of the applicability of mathematical models is not always made as transparent as it should be. Simulation models are inherently hard to document (Frijda 1967). The validity of complex software packages is even harder to establish, because their inferences cannot be checked by the axiomatic method of deductive proof and so forth.

Weaknesses of Scientism

The disadvantages of scientism are that rigor can frequently be only achieved at the expense of relevance and that the question "relevant to whom?" is not accessible to the rigorous methods espoused. This is because the "scientist," just as the non-scientistic scholar, must rely on community consensus that what (s)he is doing is relevant. Hence scientists, just as humanists, must rely on subjective interpretation to achieve "scholarly consensus." By the same token it would seem to be a matter of scholarly consensus whether one considers Heidegger's analysis of the conditions of "being" as a relevant analysis of the unresolved issues of the conditions of human life in modern society or not (cf. Steiner 1978). The fact that it takes years of training to read mathematical models or industry software documentation must be kept in mind when management scientists accuse social philosophers of unclear and vague language. After years of training in phenomenology, it is no less comprehensible than scientistic jargon.

Scientism also has problems with interpreting the meaning of its data collection enterprise, because the category of meaning is beyond natural science underpinnings—the many attempts to deal with "the meaning of meaning" by objective modeling not withstanding. As a result, scientism in social research tends to produce a "data monster" (cf. Churchman 1968, 1970). This aspect must be balanced with the spectre of uncontrolled armchair reflection. (There is plenty of room for poor research in all approaches, but should this influence the choice of proper method of inquiry?)

Of course, many data collected by scientistic methods are very useful and empirical researchers always stand ready to criticize not only the validity of their data, but also possible omissions in their model. The latter problem is known as "model specification error." But how then does scientific method discriminate between good and bad data? And how does it "prove" that the model is sufficiently complete for the purpose at hand? Basically it proceeds by falling back on scholarly modes of discourse, but restricts the agenda of critical discussion to issues which are legitimate from a scientistic perspective. At any time there is a current state of "scientific expert consensus" of what are the best models to use, what are good and bad data in a specific domain of inquiry and what are acceptable and unacceptable errors in data analysis methods and so forth (the true assumptions of statistical methods, such as no auto correlation or multi-collinearity, no sampling bias, etc., can hardly ever be met by real data in the socio-cultural sciences). The scientific expert consensus (which of course never is a consensus but a set of conflicting expert opinions) is comparable to the "scholarly consensus" about the relevance and usefulness of non-scientistic theories. Clearly neither is based on a totally objective criterion; this is substantiated by the historical analysis of the process of science in Kuhn (1970).

From this one must conclude that by relying on human consensus for the interpretation of data, scientistic research violates its own standards of objectivity and rigor. All of a sudden, reflection and speculation are allowed to enter. Why only at the end of a study? This makes it apparent that scientism fails to substantiate, even question, its own underlying assumptions. Maybe the most devastating accusation against scientism, therefore, is that it is by nature uncritical towards its own foundations and thereby opens itself to controversy and dogmatism. To make this self-evident, one can point to the following paradox: whereas scientism claims to be the only road to valid knowledge it can offer no observational evidence for substantiating this claim which could satisfy scientistic standards. Something must give way.

The danger of scientism when applied to the resolution of practical problems lies in a narrowing of problem perception to those aspects which are "researchable" by given scientistic methods. What is not researchable is by definition not publishable and therefore not fundable. By a conceptual sleight, all relevant practical problems on which good types of scientistic evidence cannot be brought to bear (but could at least be examined, say, from a phenomenological perspective) are defined to be illegitimate as far as science is concerned. This in fact biases the whole definition of information systems towards construing them as deterministic artifacts which must be scientifically "engineered."

Another danger is that the scientistic literature does not ask whether its espoused ideal of knowledge, i.e., that all trained observers at all times should be able to reach the same conclusions, is at all feasible or even desirable in the face of human and cultural differences. Bleicher (1982, p. 4) points out that science ignores to reflect on the usefulness of its output in relation to the socio-historical context which gave birth to the narrow concept of science in the first place: "left to its own device, the mindless expansion of science is even threatening the very survival of mankind" (Bleicher 1982, p. 4). Feyerabend (1978, p. 10) goes even further. He accuses scientists of a "self-serving 'rationalism"' by which they, as elitist groups, are now "using tax money to destroy the traditions of the taxpayers, to ruin their minds, rape their environment and quite generally to turn living human beings into well-trained slaves of their own barren visions of life."

Even though Feyerabend's critique of scientism is extreme, it is highly pertinent for information systems development. One reason for the failure of information systems is that their design has conflicted with the prevailing organizational culture and attitudes (some data for this can be found in Markus 1984 and Kumar 1984). This is precisely Feyerabend's point. Scientistic approaches impose one approach of organizational change, the rationalists', without informed consensus, whether those subjected to the scientistic design methods like it or not. The situation agrees with the historical analysis of the rise of scientism such as presented by Horkheimer and Adorno (1973, p. 303; also Lukacs 1971, p. 101). They point out that as science was pressed into service for commercial and military interests during the 19th century, it lost its progressive edge and turned into an "ideology of instrumental reason." This ideology then influences decision makers in key positions of the administrative bureaucracies which control the professional training of engineers, managers and information systems experts though hiring and funding criteria.

Institutional Aspects of Scientism in IS Research

When scientistic evaluation criteria are practiced in the bureaucratic institutions of education and research, it produces a variety of biases which endanger the freedom of inquiry. In principle there are consequences here for the whole process of education (e.g., Skinnerian training vs. formation of mind and character), theory vs. practice of information systems, research and funding policies, and the management of research institutions. In order to be specific, the consequences for scientistic Ph.D. education are examined as a test case.

First of all, whenever there is a conflict between rigor and relevance, then Ph.D. students are encouraged to pursue the rigor. This is typical for the "scientist" who would rather look where the light is even when it is known that the important issues may lie elsewhere. The justification usually given for this is that it is important that Ph.D. students first learn the rigors of quantitative analysis; otherwise they might not appreciate the full scope and power of quantitative analysis. Maybe so. However, the long-term effect of this is that they never do anything else. If in the formative years of young scientists the attitude is shaped that philosophical inquiry into issues of social system design is "soft" and therefore second rate work, fundamental attitudes are shaped which prevent a consideration of the broader issues. Secondly, there is the problem of making a thesis "committee proof" if it is known that the official standards are scientistic. Finally, when the pressure is on to get past the first contract renewal, the obvious solution for most Assistant Professors is to carry on with the same. And as they progress along the career path to key positions, they come to believe in the truth of what they have been made to do. As a result, scientistic research standards become self-confirming in that only articles conforming to such standards are publishable (with some exceptions granted). One paradigm displaces all others not by informed scholarly debate, but by biasing the funding and publication selection process.

It could be argued in support of scientism that information systems are essentially technical systems and therefore it is wrong to argue that philosophical issues of social system design have much bearing on the crucial aspects of our discipline. Therefore scientism truly is the only right way to proceed. This sort of argument is another example of an appeal to reason which violates the very methods of inquiry which it is to uphold. This has already been discussed in an earlier subsection.

In summary, then, scientism leads to poverty in two ways. At the intellectual level, it narrows the perception of problems and displaces all other scholarly modes of inquiry by disavowing reflection. This leads to information systems which are conceived too narrowly and implemented without sufficient regard to how they affect the quality of the conditions of human existence. At the institutional level, scientism leads to an educational practice which trains specialists, who lack critical reflection of the limits of our knowledge. It also tends to lead to an impoverishment of the scope of research. It narrows research to consider only what is publishable in scientistically biased journals or fundable in terms of scientistic grant selection criteria. The next section substantiates the claim that scientism has impoverished IS research.

Paradigmatic Anomalies: The Symptoms of Scientistic Poverty

The principle evidence for the poverty of scientism is the existence of significant "problem anomalies," that is of serious research problems which cannot be resolved by following the methods of scientism. This definition is based on Kuhn (1970) and needs a brief explanation together with the notion of paradigm crisis. Following this, a classification and some examples of problem anomalies in the scientistic tradition are discussed.

Is There a Scientistic Paradigm Crisis in IS Research and Practice?

A research paradigm consists of the assumptions which are shared by the members of a scientific discipline. Typically, these assumptions are learned during post-graduate work and guide the research process. They form a framework which facilitates communication and agreement among the members of one discipline (cf. Kuhn 1970) about the nature of the objects of common interest (ontological assumptions, cf. Burrell and Morgan 1979) and about what constitutes good research to advance the field (epistemological assumptions, for instance those of expressed earlier). A paradigm also functions as a belief system which supports a particular line of inquiry (cf. Burrell and Morgan 1979; Shrivastava and Mitroff 1984). A crisis results if a paradigm produces more problems than it can solve. A paradigm crisis is similar to a policy crisis which is caused by a mistaken decision making frame of reference. The principle difference between a research paradigm and a frame of reference is that a paradigm guides the search for knowledge in research while a decision making frame of reference guides the search for information in organizational problem solving (cf. Shrivastava and Mitroff 1984).

Both paradigms and frames of references are used for orientation in a confusing world. If they are out of touch with the real problems, crisis symptoms result which tend to be ignored by the adherents of the current paradigm or frame of reference. (The number of intellectuals which claim that scientism has failed us on the level of national policy formation is growing. References to a "confidence crisis" of science can be found in many international newspapers. A historical example how a scientistic policy making frame of reference has failed us is the infamous economic depression of the thirties.) In IS, the many concerns raised in the current literature and by leading practitioners should be interpreted as symptoms for a widely felt crisis. Of course, whether one speaks of mere difficulties to be resolved by future research or a paradigm crisis is ultimately a question of faith. The following are four research areas in which scientistism causes a significant number of anomalies which warrant to speak of a crises of the scientistic paradigm:

- The construction of information systems as primarily technical artifacts. This leads to "misinformation systems," because it ignores the subjective and intersubjective dimensions of the creation of meaning and knowledge in a social action context.
- The definition of information as being drawn or derived from objective data by impersonal, formal procedures. This, together with the prior point, has important implications for the proper approach to information requirements analysis (cf. the next subsection). It leads to system mis-specification, defining the wrong requirements.
- The adherence to a bureaucratic machine model of organization as a viable and preferred form of rational cooperation and social control. One important aspect of this, also to be taken up in more detail below, is the proper approach to the specification of system goals. The machine model of systems rationalism causes alienation and leads to implementation failures.
- The interpretation of information systems development as an "engineering" process by which the professional designer acts upon an external world "from without." An alternative view of the role of the information systems developer is that of an internal participant who engages with others to improve the common socio-economic basis for cooperation from within. The "from without" approach leads to view good systems design as a question of technical expertise which precludes users from taking major responsibility for successful development. The lack of genuine user participation reinforces all of the above effects. In fact, there is reason to believe that the first three types of anomalies would largely disappear if the obstacles to information systems development "from within," by informed and voluntary participation, could be overcome.

The contention that these four areas are rife with anomalies is also supported by the observation that there is a total lack of agreement about them, yet all are fundamental to the constitution of IS as a scientific discipline. Radical disagreement among the members of one discipline about the core areas of their field is a crises symptom. In the literature, the conflict is most obvious with regard to the question of whether information systems should buttress the rationalist management control model of organization or free us from the stifling bondage of organizational controls and social conventions. The references to document this conflict alone go into the hundreds. The conflict is also obvious with regard to the question of whether information systems development is a matter of expert knowledge which has to applied from without or a matter of participation from within as for instance the socio-technical approach or critical social theory advocates (cf. Ives and Olson 1981; Land and Hirschheim 1983; Ciborra 1983; Davis 1983; Bostrom 1980; Kaiser and Bostrom 1982; Lyytinen and Klein 1984).

How is it possible that a paradigm can blind so many people, researchers and practitioners alike? If the principle thesis of this paper is correct, the widespread acceptance of scientism amounts to enormous group-think or mass self-deception. One principle mechanism by which this phenomenon can be explained is called reification (cf. Berger and Luckmann 1967). In the case of scientism, it leads to the widely shared definition of information systems in such a way that the problems which were referred to above do not appear as anomalies, but as lying outside the scientific domain of inquiry. The effects of reification can be demonstrated by confronting current theories in the above four conceptual domains with ideas about the same subject domain which stem from a time before the rise of scientism. In order to make this evident, an example needs to be discussed in some detail. For this, current views on system goals and information requirements determination are selected. Basically the following argument is to show how the reification of system goals leads to anomalies in information system implementation by causing alienation and increased user resistance.

Scientistic Reification of System Goals and Requirements

In the orthodox IS literature, data are defined as meaningful measurements and information as data which help to achieve organizational goals. The question of which information must be provided to change organizational goals is pushed aside. This is an example of reification by treating humanly defined goals as if they were functional requirements which are beyond human control. This conceptual trick works by first construing separate technical system goals and by then only admitting objective measurements which relate to these (and no other) goals as meaningful data. This produces system requirements which take on an objective appearance, but lack human support. By the staff specialists, this is then interpreted as lack of understanding of the methods by which the objective requirements were specified. Consequently, when the new system is introduced, negative impacts are not supported by users which naturally resent the intrusion brought upon them. The expert approach to system design breeds alienation and ultimately implementation failures.

Another way in which reification works is by claiming that there exist objective organizational needs which can be studied by scientistic methods to determine the objective requirements which information systems must meet. Along with this is implied that such study is a matter of expert opinion and that there is little choice in defining the roles which information systems must fill (cf. Habermas 1974 for an analysis of situational constraints and the technocratic model of decision making). A simple example for this type of reification is the choice of a football team—one cannot win if participants are chosen by the criterion of democratic participation. Of course, if the goals are fixed, then instrumental relationships take on the semblance of natural laws. Clearly, the separation of information systems goals from human purpose and the identification of data with measurable facts conceals the real nature of information systems as social communication systems. If viewed from this perspective, many objective instrumentalities reveal themselves as matters subject to social control (cf. Kling 1980). For instance, in the case of the football team, one might ask if it is more important to win in the big league or give everybody a fair chance to be a member of the team.

The General Concept of Reification

In its most basic sense, reification means that something is considered as a physically real entity when in fact it is not. More technically,

> reification is the apprehension of the products of human activity as if they were something other than human products—such as facts of nature, results of cosmic laws, or manifestations of divine will. Reification implies that man is capable of forgetting his own authorship of the human world, and, further, that the dialectic between man, the producer, and his products is lost to consciousness. (Berger and Luckmann 1967, p. 106).

The principle mechanism by which the scientistic approach removes the human authorship of system goals from consciousness is by elevating social laws (e.g., management policy), preprogrammed expectations and social conventions to a given reality which takes on the appearance of a natural universe into which everyone of us must fit. Human freedom and choice vanish from sight. Once data about this make believe world are mistaken for scientific evidence, certain problems which should be central to the research program in IS are by definition placed outside the boundaries of our discipline. With this trick, anomalies are avoided by defining them as irrelevant issues. In order to shed more light on the effectiveness of this strategy it is only necessary to return to some of the classical discussion of system goals. It raises important questions which the scientistic tradition cannot answer—and we would hypothesize—despite its claim to continuing progress (cf. McCarthy 1982, pp. 40-52) will never be able to answer unless it changes its current concept of the scientific method. As an example, let us take a moment of time to listen to some of Plato's views on social system design. What would Plato have to say if, after having written the *Republic*, if he were to read the typical kind of papers published, say, in *Management Science* (to avoid possible misunderstanding we feel obliged to emphasize that the only reason for mentioning this particular journal is that it contains many of the best papers which the scientistic tradition in IS has to offer).

Plato's Views on System Design

As examples for two crucial questions which the scientistic tradition of systems design fails to address, consider the treatment of (1) what should be the goals of systems design and (2) how can we learn the knowledge that we need to design good systems in Plato's *Republic*. We hasten to add that it is not from copying Plato's answer to these questions by which the analyst should learn but by reflecting upon the way in which these questions are asked, and from understanding the reasons why Plato's answer is unacceptable or unhelpful. It is of equal importance to understand why the answer given by the liberalized version of empiricism (e.g., the modern realist position as proposed by Popper 1968) is equally unacceptable. It is through insight into the reasons by which modern philosophical discussion has rejected Plato's "solution," not in the avoidance of these two questions altogether that we see true progress in knowledge. Therefore a rejection of

Plato's answer together with a rejection of Popperian realism could provide the basis for a new beginning for the discussion of goals and epistemology of information systems. It is proposed that a wide-spread understanding of the obstacles which we as humans face to obtain true and meaningful knowledge could go a far way to set warnings against the naive realist position in information requirements specification and this in turn could pave the way for a non-scientistic treatment of system goals. This is because Plato leads one to see that it is impossible to define a good system without having some knowledge of the good.

Plato on System Goals

The system goals which have received the most attention in the current information systems literature have to do with cost-effective, consistent, comprehensive, and complete specification of system requirements. The requirements in turn are related to improving profitability, competitiveness, quality of working life, user satisfaction and the like. From a Platonian perspective all of these are rather pedestrian subgoals and therefore cannot be used to define the characteristics of a good system. He disposes of the goals of commercial profits and user acceptance rather elegantly by sketching life in the "City of the Sows." In this city, everybody's physiological needs are well met. People are supposed to be happy because they can live a life of luxury and leisure.

However, through the mouth of Glaucon (one of the discussants in the discourse about the design of a "good" system of city management), Plato points out that what distinguishes the human life are desires which go beyond the need for bread, shelter and the like. That which truly makes human life ultimately worthwhile are the desires for knowledge, justice, beauty and challenge (Plato uses the word "courage") which are not at the heart of designing a luxurious horn of plenty. The desirability of such a purely materialistic objective is questioned by putting the following words in the mouth of Glaucon: "If you were to provide for a city of sows, Socrates, on what else would you fatten them than this?" (Plato, 372d, p. 49). Therefore, later in the *Republic* it is argued that, above all, the system designer must be concerned with social harmony, strength (ability to survive in a hostile environment), wisdom and above all, justice. A long discussion of the interaction of these goals can be found and justice is identified as the one goal without which the others mean little. What good is knowledge if it is not leading to the just and good life for all? However, Plato points out that justice is impossible without concern for knowledge and wisdom. Hence those that are supposed to run the system must be carefully selected and trained—the management of the system is a question of the qualification and only those who qualify are supposed to rule.

In reviewing this vision of the responsibilities of the system designer, one cannot help but be struck both by the grandiose vision and the naivete of Plato. Clearly the rule of the wise leads to a bureaucratic and authoritarian nightmare (e.g., cf. Popper 1966). It has long been abandoned as a desirable system of government. Hence insofar it would be mistaken to look back to Plato for solutions. But should we not have the courage to revitalize Plato's concern for justice and wisdom in the construction of new development methodologies? Surely this could lead to a new perspective on the implementation issue. If systems are designed with justice in mind, it seems that resistance will be minimized.

Therefore, the first comment that Plato could have for us could possibly read something like this: "If information systems are to assume a central role in your society, how do you propose to use them in way which will improve social harmony and justice? And if you say that social justice is not the business of the system designer, how can you know then that computers will be an improvement at all?" (Plato actually writes: "Won't you say that the greatest evil-doing against one's own city is injustice?" "Of course." 434c, p. 113).

Plato's Critique of Objective Requirements Determination: The Cave Example

f justice and fairness is the ultimate goal of systems design (as would also seem to follow from Rawls 1971), then the question is how can we obtain the knowledge which we need to design and operate a just system? One important issue which relates to this concerns the proper approach to information systems requirements analysis. What would Plato think of the proposition that the system requirements can be defined by "modeling entities and attributes of the objects in the real worlds?" (cf. references stated later in the subsection on realism in IS development).

One of the prominent passages in the *Republic* is the cave example. Transposed to our context, it suggests that users, analysts and management are chained to a block in a cave such that they can only see the distorted shadows on the wall. The objects of reality are hidden from them. The shades of reality which they see are cast by a big and unsteady flame behind their backs. Their vision is confined such that they can only see a section of the cave wall in front of them, but not the real objects carried behind them that cause the shadows on the rocky surface. The real objects are the metaphor for the objective system requirements. The cave can be compared to the organizational context and the chains and the block to the accepted managerial policy assumptions. In this metaphor the different parties (or system stakeholders) may see different shapes of the same thing as it dances across the rocky background of the cave before them. They can argue who sees the "true" shape and management may decide the right way to see—yet clearly they will know little about the true underlying reality and what things are really like. If this metaphor is judged to capture the situation within which we all have to work as humans, then the mirror metaphor of modeling reality (or picture theory of meaning) must be immediately retired. It is easy to show that "modeling reality" underlies much of the current work in information systems modeling (see references in the subsection on realism in IS development later in this paper) and that the concept of "modeling the real world" in turn is based on Tarski's correspondence theory of truth (cf. Popper 1965). If this orthodoxy is questioned, there are important consequences for (a) user participation and project management, e.g., project team composition (cf. Kaiser and Bostrom 1982), (b) the nature of the tools we need to improve our knowledge of underlying or hidden system requirements, (c) the scope of information systems development, e.g., is the mandate of information systems development really to be limited to technical change which leaves the existing framework of managerial policy assumptions unchanged. The anomalies which this produces in practice are, for example, pointed out in Martin (1983).

And if not, how can we "free" (emancipate) ourselves from the self-imposed contingencies by an appropriate approach to organizational requirements analysis?

These considerations can be summed up by putting a second question into the mouth of Plato: "You tell your students that they must carefully study the objects moving in front of them and compare them with the ways in which they appear to different people who reside in different places and hence see them from another angle. Your analysts might also study how the objects change and derive complex mathematical transition models which accurately predict how the observed shadows change over time. Yet if the analysts, like the cave dwellers, are the prisoners of their own perceptions, how can they ever know that what they measure has anything to do with the true characteristics of the good system about which they want to know?"

Discussion: From Plato to the Modern Theories of Data Semantics

Popper (1965, pp. 10, 28) points out that the pessimistic cave story of Plato is essentially the correct view of epistemology. Yet in a complete turnaround, the very same Popper (1965, p. 223) proposes an optimistic realist epistemology for approximating reality through a serious of conjectures and refutations to achieve ever greater "verisimilitude" of our knowledge (for critical analysis of this, see McCarthy 1982, pp. 40-52). In the following it will be shown that the Popperian view is also the established paradigm in information requirements analysis data modeling. A closer look at these issues will show that the realist theory of data modeling is untenable.

On Relativism in Information Systems Development

Plato's cave example leads to a relativistic outlook on information systems development. No objective requirements definition exists, because even when we are allowed to wander around in the "organizational cave" in search of an exit to the outside environment, we can never be sure to have left the social cave system. We may just have entered another cave, in a much larger system and our chains may be less visible, because we have not yet become aware of the new social programming of our brains. There may by a succession of caves and ultimately they may intertwine such as in a complex labyrinth which is constantly changing. Things always look different, but there is not any better or worse. The relativistic position has been well summarized by Feyerabend:

> Being a tradition is neither good nor bad, it simply is. The same applies to all traditions—they are neither good nor bad, they simply are. They become good and bad (rational/irrational; pious/impious; advanced/primitive; humanitarian/vicious; etc.) only when looked at from the point of view of some other tradition. (Feyerabend 1978, p. 8)

The implications of such a viewpoint for information systems research are very poorly understood. One implication miight be that all that the analyst can hope for is that through information systems he can help people to spend less effort in figuring out whatever it is that they see by imposing whatever meanings on the shades on the wall which suit them. An information system might also stimulate the earthly cave dwellers to see more interesting things which otherwise would have escaped them. But ultimately it is all a matter of subjective experience and acceptability. There is no objective right or wrong information, because it is all in the eye of the beholder. If the "receiving structure" in Langefors work is emphasized, it leads to relativism because its particular idiosyncrasies determine which information is conveyed by data. From reading Nurminen (1982a, 1982b), Boland (1979), Boland and Day (1982), and Boland and Pondy (1983), the impression was gleaned that this research pursues such a relativistic view of the nature of information systems.

The obvious alternative to relativism is realism. Its central tenet holds that there is one objective reality and by modeling it we can control it to our advantage. There are reasons to believe that this also leads into a blind alley. An informal indication of this was given in the introductory example of Alexander the Great. As realism appears to be the current orthodoxy in information systems design, it appears important to review some of the literature on it and the reasons why it must be rejected.

Realism in Information Systems Development

It is a truism that information systems are useless unless they will facilitate the exchange of meanings and knowledge among people who together are engaged in some enterprise or project. This is what we mean by communication. But the scientistic approaches to social system design cannot explain how through technical system engineering an improvement in communication can be brought about. Any attempt to do so leads beyond the conceptual framework of scientism. Two possibilities for a scientistically acceptable theory of communication have been offered. One can refer to them also as theories of data semantics because they are to explain how users interpret the meaning of data for drawing possible action implications from them. The providing of data which support action is the central domain of information systems development. The two scientistic theories of data semantics are the denotational correspondence theories of meaning and the behavioristic stimulus theories. Both types of theories are inadequate for the following reasons.

Denotational Theories of Meaning in Data Modeling

The basic notion of denotational semantics is that the meaning of a datum (or any symbol) is given by the class of objects to which it refers. Hence correct meaning is a matter of "denotational correspondence" between what is said and the actual or "real" state of affairs. This sort of realist position has been thoroughly analyzed by Kutchera (1975). It has also been advocated in some artificial intelligence models and already been found unsatisfactory as a basis for future work (see Winograd 1980). A recent affirmation of naive realism can be found in all information systems development methodologies represented in Olle et al. (1982) and the ISO report on conceptual schema terminology (cf. van Griethuysen 1982, pp. l-2). The principal philosophical support for the realist position has come from Popper's popularization of Tarski's correspondence theory of truth (cf. Popper 1965, Chapter 10). It contains Tarski's famous example: "The sentence 'snow is white' is true if, and only if, snow is white" (Tarsky 1944, p. 15). The quotes around "snow is white" are to convey that it is a sentence in the object language and the correspondence to facts is expressed in a meta-language by which it is possible to talk about the relationship between linguistic messages and the actual state of affairs. More strictly speaking, the quote transforms the sentence in a name for itself (a literal in programming terms). True and false are predicates which apply only to statements in the object language, actual states simply are (it sounds odd to say: the actual state of the world is true—how can it possibly be false?).

The problem with realist theories of meaning is that contrary to the Popperian analysis, they are totally unable to show in what way a sentence can correspond to a state of affairs. As Wittgenstein himself critically noted when he later abandoned his "Tractatus Logico-Philosophicus":

> The difficulty faced in my theory of logical picturing was that of finding a connection between the marks on the paper and a state of affairs there in the world. I always said truth is a relationship between a sentence (Satz) and a state of affairs (Sachverhalt), but was never able to make out such a relationship. (Rutchera 1975, p. 57)

The reason for this problem with the realist position is that it ignores the social process by which predicates are created through social interaction and their meanings are anchored in the context of social action (cf. Berger and Luckmann 1967; McCarthy 1982, pp. 299-307; Kutchera 1975 pp. 119-129). Tarski's (1944) definition of truth does not help, because it only shows that the correspondence notion can be maintained without leading to logical contradictions. It says nothing about how to establish the correspondence, i.e., how to "make out the relationship" between what is said and what is actually the case. For this, the context of social action is needed as a mediator. This is confirmed by casual observation of instances of social action in which the meanings are not fixed by an unproblematic convention, such as in new legislation where new distinctions must be drawn, court cases where the question of what exactly did happen is highly controversial, definition of new policy, etc.

The realist position of meaning is also incapable of explaining how the same sentence can be used to convey an instruction, a suggestion, a request, a warning, a prediction, an assertion, a belief, etc. Clearly the meaning of these different forms of speech are not the same. For example, a simple sentence such as "you will go" can mean an order, a question, a suggestion, a prediction, depending on the social context in which it is utttered. In a business context, a budget is such a semantically multimorphous set of statements. For some it is a prediction which, with the benefit of hindsight, will have been true or false, for others a set of instructions which must be obeyed whether or not it is true, etc. The meaning of the budget document depends on the context of discourse in which the word budget is used (cf. Flores and Ludlow 1981). The realist theory of meaning cannot cope with this because it does not recognize that meaning is not so much a matter of correspondence of which there can only be one if there is only one reality, but of intentionality of which there can be as many as different human interests.

Behaviorist Theory of Meaning

The second possibility by which scientism has proposed to describe the meaning of information is in terms of the predispositions to respond in a certain way to symbolic stimuli. Information are (sense) data which help with purposeful action or which make a difference in action, etc. The basic idea is that the behavior difference and its relationship to a predefined goal can be objectively measured. A first theoretical outline for such a behavioristic theory of meaning was proposed by Morris (1946). Its most notable representative is Skinner (1957). Later it was introduced to Management Science and from there to information systems by the widely quoted article from Ackoff (1971) and it is still the position in implementation research (e.g., Bariff and Ginzberg 1982), cognitive style research (Dickson et al. 1977) and information economics (Kleijnen 1980).

The following is a very brief summary of the problems of the behavioristic theory of meaning presented by Chomsky (1959) and Rutchera (1975). First, a behavioristic theory of meaning cannot account for language acquisition which is the ultimate medium for the communication of human meanings. Instead it proposes that language is inherited in the same way as animal signalling systems. The view that there is only a gradual difference between human language and animal communication was fashionable for a while, but is now discredited (for the reasons see Pateman 1980). The behavioristic inheritance theory of language acquisition cannot account for the creation of new meanings in poetry, science, policy formulation, etc. There is clearly no equivalent in the animal kingdom. Secondly, there are many linguistic communications which lead to no observable behavior. Thirdly, behaviorism also must ignore the complexities which arise from the observation that people can change their linguistic behavior at will by conventions and agreements which in principle are quite different from conditional reinforcements. Fourthly, the criterion that meaning has been communicated if a specific linguistic stimulus evokes a goal oriented response is simply too broad. If it is accepted, then even training an ape must count as meaningful communication. With regard to information systems, it leads one to construe them as organizational reinforcement machines or "Skinner boxes" for operant conditioning. This is not only unsuitable for knowledge support, it is also ethically unacceptable by any standard. For instance, if the Kantian ethical principle is applied, that the same maxims should be applied the question arises "who conditions the designers?" Thus the conditioning theory is seen to to create an infinite regress. It also violates the Jeffersonian ideal of participatory democracy, the tenets of Rawls' (1971) theory of justice (because rational people would not allow to give up their liberty rights for the sake of being conditioned) and so forth.

Summary: Beyond the Realist Position of Scientism

This section has presented some of the reasons why the scientistic approach to information systems development leads into unresolvable issues. They indicate that an adequate theory for the meaning of data is impossible on the basis of realism (correspondence between data and reality) or behaviorism (information is data that leads to objective goal achievement). Such positions may be useful as simplifications under special circumstances, but only if all using them are fully aware of the "simplification terrible" which they are applying. This currently is not the case. Furthermore, it is difficult to see how information systems development approaches based on scientism could overcome the difficulties, because they treat meaning as something that can be physically measured as an objectively given fact, not as something that is socially created and continues to evolve depending on changing human interpretations (cf. Winograd 1980; Langefors 1977a, 1977b; Nurminen 1982a). Thereby scientistic information systems development approaches fail to deal with the connection between the meaning of data, human intentionality and conflict of interest. This is a sign of scientistic poverty because it leads to "misinformation," that is confusing and misleading output specifications, and erronous use of information systems. This has also been documented in Boland (1979). Of course, scientism can drop its objectivistic hypothesis. But this would have drastic consequences for the definition of what is "good research" and mean to create a new paradigm.

The principal alternative to the realist or behaviorist theories of meaning is an intentional theory of meaning. Its basic proposition is that meaning is a matter of human intent which is conveyed by the way in which phrases are used (cf. Austin 1975). There is no objective meaning, but rather it is a question of cultural calibration, what phrases mean in different usage patterns. This view goes back to the later Wittgenstein. An introduction into this can be found in Pitkin (1972, Chapters I to VII) and some of the implications of the modern literature on the use theories of meaning for information requirements are discussed in Goldkuhl and Lyytinen (1982, 1983) and Lyytinen (1983a, 1983b). The question of how these views on data semantics fit with a Critical Social Theory view of information systems development and what implications there are, e.g. for participatory approaches or semantic data normalization are pursued in Lyytinen and Klein (1984) and Lyytinen (undated).

Conclusions

It is now time to step back from details and briefly reflect upon the principal thesis of this paper and its consequences. A number of dangers have been cited to support the claim that the usual concept of scientific method is too narrow a base for IS as a science. It is recognized that this thesis will meet with skepticism. But interesting conclusions can be drawn from false premises. It is therefore of interest to ask where the previous arguments would lead us even if the jury reaches the verdict that the case against scientism is unproven.

The Diagnosis

The conclusion which emerges is that there exists a vicious circle by which the prevailing scientistic outlook of the current research and teaching orthodoxy in academia conditions the frame of reference of the next generation, which in turn implant their unreflected beliefs in the professional attitudes of knowledge workers. The scientistic establishment biases the training of our present knowledge work—which assume the position which Plato wanted to see reserved for his guardians and philosopher-kings. As the scientistically trained experts rise through the institutional ranks and gain positions of influence in society, they translate into practice what they have come to believe through years of indoctrination and socialization. Problems are ascribed to the limits of current knowledge, but not to the limits of the scientific method by which practical problems are approached. Ultimately, when in very senior positions, the unresolved issues of scientistic practice are verbalized in the form of political demands made on research to be more practical and useful, but the criteria for judging this are not reflected. The judgments by which research priorities are set remain either caught in the tunnel vision of vested group interests or the subliminal filters of scientistic standards and precepts. Under scientism, science, rather than being the critical conscience and teacher of practice, becomes its myopic servant.

The Challenge of Therapy

The question to which this leads us is how the vicious circle can possibly be broken. We see two avenues which must be pursued concurrently. On the one hand, the concept of the nature of research and with it the concept of academic education must be considerably broadened by providing a multi-paradigm background. We see this as one principle possibility to revitalize the result of Kant's philosophy that there can be no science without epistemological reflection of the existential constitution of the those who practice science. Secondly, vehicles must be found to translate the insights gained from this into improved practice of informations systems design and use. This is the challenge put before us. Some tentative ideas how to approach it follow.

In Academia

In the academic world, at least two sets of actions can be pursued to stem a continuing orthodoxy, one in the realms of research and academic curricula, the other in the realms of research institutions and academic community. As our own interests primarily lie in research, the implications for redefining research and teaching priorities are taken up at greater length.

Given that the final verdict on research methodology is not in and non-philosophers are at best qualified to serve in the role jurors, the authors believe that the conclusion cannot be that scientism must stop altogether (cf. Feyerabend 1970). This conclusion is also supported by the earlier observation that each paradigm imposes its own particular form of bias and that each paradigm takes on ideological functions if it is backed by institutional powers. Hence we believe that a climate must be created in which different research paradigms can flourish and cross-fertilize each other. The time has come to provide the means such that the neglected paradigms can be developed with greater force so that one can see where they could lead us. Ignoring for the moment the institutional difficulties with this, the following reflects upon the academic responsibilities which this imposes on the adherents of all traditions—scientistic or otherwise:

(1) **Standards of scholarship.** Each of the different lines of scholarship would have to be more explicit about its epistemological and ontological assumptions and critically discuss its own standards of excellence. Clearly it is in the interest of no paradigm that a tide of trivial papers fill expensive journal space. The criteria for judging this must be brought from the intimacy of an old boy network to the light of widest possible debate.

(2) **Breadth vs. depth in education.** Regardless of which tradition one favors in one's own research, all academics must take steps to effectively communicate different approaches to information systems development. This should be a basic oath of allegiance for academic citizenship. To live up to it, one needs to consider some of the differences between professional and doctoral education with the overall view that differences in educational content must be reduced. To put it polemically: why should Ph.D. students have a monopoly to truth?

A very visible starting point for the reform of doctoral education is the organization of national or at least regional doctoral seminars. (One possible model is provided by the type of national doctoral seminar which the authors just attended in Finland.) A similar role is performed in the U.S. by the annual doctoral consortium which is held in connection with the Conference on Information Systems (known as CIS). Its contents need to be documented and publicly debated. Also the limitation of participation to handful "by invitation only" in a country with so many information systems programs as in the U.S. is unsatisfactory.

In professional education, there must be more than just a cursory critical examination of the epistemological basis upon which the validity of preferred tools and methods rests. The same applies to the ethical-moral position which legitimizes preferred tools and methods as "good" and which is to guide their application. As an example, consider the values underlying structured analysis and design versus those underlying the STS approaches: which of these can be said to truly represent the general interest, etc. This is discussed in some research literature (e.g., Klein 1981), but for practical purposes this is of little use unless it is reflected in widely used textbooks.

The broader implications of the concept of multi-paradigm thinking for breaking habitual response learning have been realized by more than one critique (e.g., Illich 1970; Gartner 1973; Feyerabend 1975, p. 163; Pappert 1980). In Information Systems we need to discuss the detailed implications of this debate for curriculum reform in the appropriate bodies which will gain the ear of all educators and their sponsors around the country. We do not see this in the three IS curriculum proposals which have been publicized. For instance, should readings from specific classical authors be made a prerequisite for certain courses, do certain modern linguistic or hermeneutic concepts belong in a good introduction to information systems theory, what really is the role of projects and cases beyond providing a maneuvering ground for the unquestioning application of the current state of the art, should there be more intellectualism in existing teaching programs and how can this be achieved, etc. If we are not mistaken, such questions currently are either never asked or decided by appeal to convention rather than by informed debate.

(3) **Intellectual revival of the textbook.** The implications of the above for introductory and advanced texts in information systems which spread the new ideas are com-

pletely unrealized. Publishers and authors which understand the new *Zeitgeist* must work together to design the next generation of textbooks which eliminate all dogmatisms of scientistic reification. One concept which we have adapted for this purpose is to structure all texts "dialectically." Unfortunately, a proposal to bring together different research traditions into a reader of research papers for advanced graduates has been turned down as having not enough market. This sort of "chicken-egg" situation must be addressed.

(4) **Specialized non-scientistic workshops.** Specialized workshops of non-scientistic research methods must instigated; non-scientistic approaches simply are underdeveloped and will remain so unless they cross-fertilize each other. At the moment it is too difficult to learn from each other. Much of the knowledge we have to communicate is "tacit" or "personal." It can be communicated through interaction or not at all (cf. Polanyi 1962).

(5) **Arena for integration and discussion of broader issues.** We need more meetings like this one which provides a broad and open agenda to address topics to formally address the kind of questions which in more structured meetings are at best raised informally over the coffee table. Intellectual griping in public should be encouraged by all means. Some of the CIS panel discussions have begun to assume such a role.

On a broader front, not much of the above can happen very easily unless certain institutional changes are made. It is not possible to have many flowers blossom unless all receive a fair share of attention and nourishment. In this context, it is all too easy to call for additional funds so that those wishing to stay with established ways can carry on with business as usual. This is what could be done without calling for additional monies:

(a) **Stimulating more pluralism.** All journals which currently publish information systems articles can issue special calls for non-scientistic research papers and revise their editorial staff to review them. Initially, priority could be given to papers which address the problem of lacking quality criteria as referred to under the standards of scholarship above. This is a research issue and not one decided by closed editorial meetings. In this context, we would also like to note that some of the best work in our field goes unpublished and some of the lasting contributions of the 1960s would in all likelihood be unpublishable under a truly blind review. This clearly shows that the balance between the "three types of errors" (erroneously rejecting a good paper) is off. Along similar lines, we have seen some manuscripts that were watered down by the editorial refereeing process rather than raised in conceptual challenge.

(b) **Speeding up the delivery system.** Another problem associated with the review process is that it is simply not worth the effort, time and waiting period(s) involved in submitting if the principal goal is to reach ones colleagues with novel ideas rather than to have something to show to the tenure committee. Maybe a refereed journal for quick and dirty papers needs to be founded.

(c) (**Redistributing resources.** The existing funds must be redistributed among different schools of thought. In part this could be achieved by reversing the burden of proof when it comes to justifying the approach chosen in funding applications.

(d) **Reversing the burden of proof.** If it is true that the prevailing orthodoxy is seen in the stage of producing diminishing returns, then a logical consequence is to put the burden of proof on those wishing to continue with it and not on those wishing to deviate from it. This would seem to apply in different contexts, i.e., not only to grant proposals but to all other types of academic decisions: course and curriculum design, publications refereeing, committee structures and procedures, etc.

In Practice

Finally there is the all important question of what can be done to improve the practice of information systems development and use. The first prerequisite is better communication between industry people (who supposedly know the problems) and researchers (who supposedly are prepared to investigate them). But this form of cooperation requires significant attitude changes.

(1) **Toward a broader notion of what is practical.** First the notion of practice needs to be broadened to include the reconsideration of ends and not just the choice of means to achieve given ends. Knowledge becomes practical if it serves human interests and thereby becomes "a cause determining the will" (Kant 1964, p. 128). Therefore practical implications involve a deep concern with the "what" and "how" of human action. Scientism emphasizes how to do things and refuses to help people to decide on the ultimate ends of their actions. In brief: the HOW preempts the WHAT. This could be rectified by an even concern for three types of practical rules (cf. Kant 1964, p. 82): rules of skill, rules of prudence and categorical rules which are concerned with the question how to choose goals. Scientism emphasizes rules of skill, but leaves the choice of goals to the domain of irrational politics.

(2) **Concern for practical research is a two-way street.** Researchers can be practical by pointing to the practical implications of their work. In addition, there appear to be three ways in which the practice of information systems can be changed to help break the vicious cycle of scientism. First, industry leaders must live up to the implications of the Jeffersonian ideal in their domains of influence. Jefferson's dictum that the powers of society are best put in the hands of the people themselves would seem to have important implications for the practice of systems design. And "if we think them not enlightened enough to exercise their control with wholesome discretion, the remedy is not to take it from them but to inform their discretion" (quoted from "A Nation at Risk," *Communications of the ACM,* July 1983, p. 469). If industry leaders cannot explain how their approach to system design differs from that practiced in totalitarian societies (e.g., by being able to demonstrate how they design systems with the people for the people and by the people), then the Western world is in trouble.

Secondly, industry should try to apply results from the many research projects, current and reaching back to the 1970s, which document rules of prudence and rules of skill for managing information systems development and use "from within" rather than scientistically "from without" or at least come very close to it. Some of the earlier work is Bostrom and Heinen (1977), Mumford and Weir (1979), Lowe (1979), and the PORGI project, e.g., Oppelland and Kolf (1980). Some of the more recent work is Hirschheim and Land (1983), Ciborra (1983), Lyytinen and Lehtinen (1983), Kaiser and Bostrom (1983), Mitroff (1983), Nissen (1983), Nurminen (1982a, 1982b), the PIOCO model, e.g., Simila and Nuutinen (1983), Markus (1984), and many others. None of this work can come to fruition unless industry opens their doors to all types of research and is willing to give the new and untried a chance. Industry, too, might somewhat shift the burden of proof as was suggested above under reversing the burden of proof.

Finally, to be practical, academics need equipment, "teachable" documentation and technical assistance not only for research, but also to strive for technically up-to-date, yet humane education. To point to governments for providing funds to buy the necessary resources at market rates is "passing the buck." Yet without this type of support we are pushed into the proverbial ivory tower. Unless industry is willing to face the resource implications of its demands for more relevant education, it will face a continuing lack of broadly educated, critically thinking, yet technically competent system participants. Once we have better system participants, better systems will be designed "from within."

"Technutopia"?

Can we conclude with some guarded optimism? Surely, it shows the current vitality of IS as an academic discipline that it is impossible to come up with a complete list of the most promising work. If this work is successfully merged with the new types of theorizing which is based on phenomenology and ethnomethodology (cf. Bleicher 1982; Morgan 1983), Information Systems as an academic discipline could very well become the *avant-garde* in search of a "humanist technutopia." In this, the Greek "topos" stands for place and "u" for the Greek adverb "eu" (well); hence technutopia is a place where technology is used well.

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