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Building Links Between IS Research and Professional Practice: Improving the Relevance and Impact of IS Research

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BUILDING LINKS BETWEEN IS RESEARCH AND PROFESSIONAL PRACTICE: IMPROVING THE RELEVANCE AND IMPACT OF IS RESEARCH

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Abstract

There has been a great deal of debate about the status of information systems (IS) as an academic discipline, its progress, and continued survival. Most of these critiques have been rather inward-looking, and have focused either on research methodology or the need to develop theoretical foundations. This paper argues that as an applied discipline, IS will not achieve legitimacy by the rigor of its methods or by its theoretical base, but by being practically useful. Its success will be measured by its contribution to the IS profession, and ultimately to society. We argue that to be effective, research must be both (1) relevant to the needs of practice and (2) disseminated and used by practitioners. We use medicine, a discipline which has a high level of integration between research and practice, as a model for radically changing IS research so that it can become more relevant and have a genuine impact in practice.

1. INTRODUCTION

1.1 Information Systems: An Applied Discipline

Information systems (IS) is the study of phenomena associated with planning, developing, implementing, maintaining, using, and managing information systems. The goal is to better understand these so that individuals, groups, organizations and society in general can use information systems more effectively and more efficiently (Weber 1997). As such, it is an *applied* rather than a *pure* discipline—it focuses on the application of information technology in practice rather than the technology itself. The study of the technology is the domain of computer science.

An applied discipline has two primary objectives, one theoretical and one practical (Phillips 1998):

- To increase knowledge (*theoretical*): to understand why things happen in a particular area of interest. For example, in IS, to understand why systems development projects succeed or fail.

- To improve practices (*practical*): there is an expectation that research will ultimately result in some useful social outcome. For example, in IS, to find more effective methods for developing information systems.

Applied disciplines often lack any distinct theoretical base of their own. Instead, they use theory from other disciplines (*reference disciplines*) and apply this to solve practical problems. For example, medicine uses theory from chemistry and biology and applies it to the problem of preventing and curing disease; engineering uses theory from physics and mathematics and applies it to build roads, buildings, and bridges.

There has been considerable debate in the literature about the status of IS as an academic discipline, its progress, and continued survival. Most of these critiques have focused on two major themes: (1) the methods that should be used in conducting IS research and (2) the need to develop theoretical foundations for IS.

1.2 The Research Methods Debate

There has been great concern with research methodology by IS researchers, almost to the point of obsession. There have been long running debates on the comparative merits of positivist vs interpretivist approaches, qualitative vs quantitative methods, and so on. IS research methodology has almost become a research area in its own right, and a number of major conferences have been held on this issue (e.g., Mingers and Stowell 1997; Mumford et al. 1985; Nissen et al. 1991). A number of taxonomies of research methods have been published, prescribing what methods should be used in particular situations (e.g., Galliers 1991; Hamilton and Ives 1982; Wynekoop and Russo 1997). The relative merit of different research methods has proved to be a highly emotive topic and particular techniques are energetically promoted by different researchers.

Such debates on research methods have occurred in many other applied disciplines and have largely proven to be a distraction. The truth is that all research methods may be appropriate in different situations depending on the research question being addressed. The real question is not whether the method is appropriate *per se*, but whether it is appropriate to answer the question being asked. Keen (1991) cites the use of different methods used by the great theorists in psychology: Pavlov and Skinner used laboratory experimentation, Piaget made detailed observations of child behavior, Erickson used biography, while Freud relied on interviews with patients.

1.3 The Paradigm Debate

Another issue, which has been hotly debated in the literature, is whether IS needs a distinct theoretical base of its own in order to progress as a scientific discipline (Banville and Landry 1989; Ein-Dor and Segev 1981; Galliers 1985; Hirschheim et al. 1996; Ivari 1986; Weber 1987; 1997). This is based on Kuhn's (1970) concept of scientific progress, which is characterized by the development of "paradigms" and subsequent testing of them. Weber (1987, 1997) argues that the lack of a unifying theory or paradigm is the major barrier to the progress of the field. He says that IS needs to develop a paradigm of its own to transcend the boundaries of an applied discipline and to enter the realm of a pure discipline. This, he says, is necessary to avoid the fragility of applied disciplines such as medicine, engineering, and architecture, which have their paradigmatic and theoretical bases located elsewhere.

This paper argues that IS should stay firmly rooted as an applied discipline. There seems no sound reason why IS shouldn't use theory from other disciplines and apply it to solve practical problems in the same way that medicine uses theory from chemistry and biology to help cure disease. Surely this is just as legitimate as pursuing knowledge for knowledge's sake? In fact, Kuhn explicitly excludes applied disciplines from his discussions about the need for a paradigm for a discipline to progress:

> In the sciences (though not in fields like medicine, technology and law, of which the principal *raison d'être* is an external social need) the claim for a special place in the curriculum have usually been associated with a group's first reception of a single paradigm.

1.4 The Bigger Picture: Where IS Research Fits

Most of the debate about the status of IS as a discipline has been very inward looking, and ignores the fact that an applied discipline like IS exists within a much broader context—within the domain of IS practice and of society in general. The focus on research methodology and a unifying theory are both about achieving legitimacy as a "science" and respect from peers in other academic disciplines—within the walls of the university. It ignores the wider objective of IS, which is (or should be) to improve the effective planning, design, implementation and use of information systems in practice (Keen 1991).

This paper looks at the bigger picture: at the role of IS research in relation to the profession it supports and society in general. In particular, it focuses on how to break down barriers between research and practice, and how to improve the contribution of IS research to professional practice. In an applied discipline, practical credibility is at least as important as, if not more important than, academic respectability.

2. WHAT IS WRONG WITH IS RESEARCH

2.1 What Should Happen

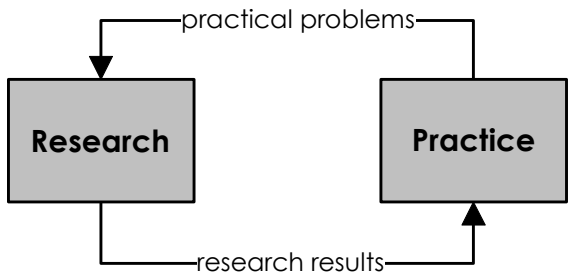

Figure 1. What Should Happen

In an applied discipline, research should be relevant to the needs of practice and research outputs should ultimately contribute to the development of improved practices (Avison et al. 1999). The way this should happen is illustrated in Figure 1. Two key flows of information which occur in this model:

- From practice to research: research activity should be driven by the needs of practice. This ensures that research is *relevant*.
- From research to practice: research results should be disseminated and applied in practice. This ensures that research leads to improvements in practice (*social outcome*).

2.2 What Does Happen

Currently, there is a major "disconnect" between research and practice in Information Systems (Figure 2). IS researchers and IS practitioners form independent communities, with little overlap or knowledge transfer between them. Both the generation of ideas and the dissemination and use of those ideas occurs largely within each community.

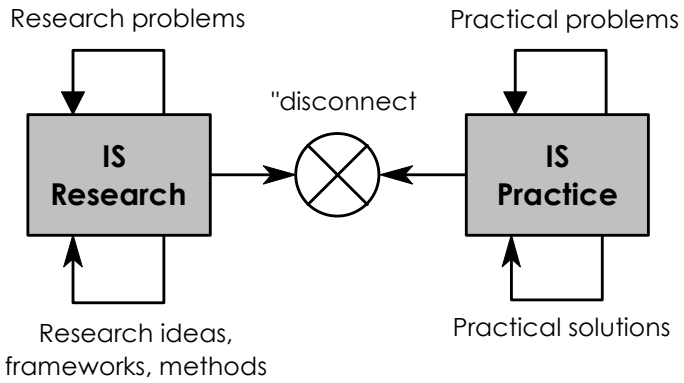

Figure 2. The Current Situation

* Research is not driven by practical needs but the interests of researchers and demand from publication outlets. As a result, it often has little relevance to practice.
* Practitioners tend not to read academic journals, so very few ideas or methods from the research community ever find their way into the practical domain.
* Practitioners rarely refer to scientific research to solve problems or make important decisions. Instead they rely on their own experience, peers, or advice from vendors or consultants.

In the remainder of this section, we analyze *why* this "disconnect" exists.

2.3 The Dangers of Excessive Rigor

One effect of the preoccupation with research methodology is that methodological rigor is often seen as the primary (or only) measure of the quality of IS research. For example, the IS literature is full of articles describing laboratory experiments using undergraduate students. While rigorous in methodological terms, it may be argued that such studies provide little knowledge of practical value (Galliers 1994). Laboratory experiments are in fact a poor substitute for testing ideas in organizational contexts using real practitioners. However, it is much more difficult to do "rigorous" research in a practical setting.

Another problem is that the question of *what* to research often becomes subordinate to the question of *how* to research (Galliers 1994; Keen 1991; Weber 1997). This results in research that, although highly rigorous, addresses research questions that are trivial or irrelevant. It encourages researchers to focus on problems that *can* be researched (using "rigorous" methods) rather than those that *should* be researched.

Excessive rigor also acts as a barrier to communication with the intended recipients of research results: practitioners. Articles in many of leading IS journals have reached such a level of rigor, they have become almost impenetrable to practitioners. This is seen by some people as a sign of progress of the field, based on the assumption that if research can be understood by non-specialists that it is somehow "unscientific." This is based on Kuhn's (1970) notion of the maturity of a discipline:

> Both in mathematics and astronomy, research reports had ceased already in antiquity to be intelligible to a generally educated audience. In dynamics, research became similarly esoteric in the latter Middle Ages, and it recaptured general intelligibility only briefly during the early seventeenth century when a new paradigm replaced the one that had guided medieval research.

Again, this is a misunderstanding of the difference between pure and applied disciplines. Pure disciplines don't need to be understandable to anyone but other researchers because there is no external social need and, therefore, no external audience.

2.4 Who is the Audience for IS Research?

In an applied discipline, researchers are the *producers* of research knowledge while practitioners are the *consumers* of this knowledge. Banville and Landry (1989) define IS as a "fragmented adhocracy." By this they mean that IS consists of a number of distinct *research communities* with no centralized control. Research communities are defined by the subject matter of interest or the preferred research methods and tend to be organized around key conferences and journals. Research communities are very powerful, because they control both the *supply* and *demand* of IS research. The key to getting published in IS, and hence academic survival, is to find a "research community" that is interested in your work.

In such an environment, the real audience for IS research becomes other researchers on journal editorial review boards and conference program committees (which rarely include practitioners). These people dictate the "demand" for IS research—what is considered important or high quality research and, therefore, what gets published. In addition, the readership of most of the leading IS journals and conferences is almost exclusively academics. This means that IS research is written by academics, reviewed by academics, and read by other academics. As Keen succinctly puts it: "IS research is in danger of talking about itself to itself."

The concept of "research communities" has created an artificial and highly efficient market for IS research knowledge, in which, unfortunately, the producers and the consumers are the same people.

2.5 Relevance to the Needs of Practice

Currently, research priorities in the IS field seem to be driven more by the interests of researchers rather than by the needs of practice or society. Hirschheim et al. (1996) see this as a good thing, in that it encourages diversity and promotes academic freedom. However, in an applied discipline, it also reflects a lack of social accountability. For example, there would be a public outcry if medical researchers spent their time researching health problems that interested them while ignoring the major health problems in society. As Chalmers (1999) says: "In research, as well as the need to be published and promoted, there is something else which needs to be considered—the public interest."

In general, the research and practical agendas in information systems are very different (Galliers 1994). One reason for this is the review process for academic research: editorial boards and program committees tend to select papers based on their methodological or theoretical rigor rather than their relevance to practice. Weber (1997) argues that the development of a unifying paradigm would define the problems to be addressed by the discipline as well as the research methods to be used. We argue that this is inappropriate in an applied discipline, and that the problems to be addressed by IS research should be determined by the needs of practice and society rather than driven by theory.

2.6 Is More Research Necessarily Better?

In IS research, there has been a preoccupation with the volume of research output. The "publish or perish" syndrome means that academics are rewarded based on the number of publications they produce. This has resulted in an exponential increase in the number of journals, conferences, and publications in the field. A recent study identified over 233 journals in the MIS field (Hardgrave and Walstrom 1997).

The growth in the IS literature has been hailed as a sign of progress of the field (Hirschheim et al. 1996). Now while this may be good for academic promotion and the publishing industry, it is questionable whether the increase in volume of research published has had any real impact on practice. In fact, the volume of research actually becomes a barrier to communication with practitioners by creating a situation of *information overload*. The average IS practitioner would not have time to read all the journal articles in their area of interest even if they devoted all their time to it.

2.7 Dissemination of Research Results

Research knowledge is not intrinsically valuable; it only becomes valuable if it is used in practice. This is well recognized in the medical field (Phillips 1998): "Ultimately, it is not the research results that are important, but the appropriate application and use of that information in a clinical context."

Unfortunately, in IS research, publishing is often seen as an end in itself (or a means of getting promoted), rather than a means for getting ideas disseminated and used in practice. A number of studies have been carried out on citation patterns in IS research, which is one measure of the usage of research outputs (e.g., Culnan and Swanson 1986; Ives and Hamilton 1982). However, this measures how much articles are read by other researchers, not by practitioners. We argue that the value of research knowledge is a function of its use by practitioners, not by other researchers.

Because practitioners tend not to read academic journals or attend academic conferences, it makes it very difficult for IS research results to filter into practice. Some people argue that research results find their way into practice through teaching. However this is a very slow and inefficient way to transfer information, and there are many "voltage drops" along the way. First, the latest IS research takes a long time to filter into textbooks and university courses. Second, students forget much of what they learn after the final examination. Finally, graduates usually go into practice at quite a junior level and are not in a position to influence practices.

2.8 Lack of Knowledge Transfer

A more fundamental reason for the disconnect between research and practice is the lack of knowledge transfer between IS research and professional communities. While they deal with the same subject matter, practitioners and researchers mix in their own circles, with very little communication between them.

There is very little *informal transfer of knowledge* between the two groups because they form separate communities with little cross-membership. It is comparatively rare in IS for academics to also be practitioners, and the IS research discipline actively discourages this. It is difficult for academics to continue to practice and play an active role in their profession because of the requirements to publish. There are no rewards for people to maintain their practical skills.

There is also very little *formal transfer of knowledge* between the two communities because each has their own conferences and journals. Practitioners rarely publish in academic journals or conferences, because they cannot meet the standards of "rigor" required to get through the review process. Academics tend not to publish in practitioner conferences or journals, because they are not refereed and, therefore, don't "count" in the publication game. As a result, the best ideas from IS research don't get disseminated in practice and vice versa. It also means that to get ideas across to both groups requires publishing two separate papers.

3. THE MEDICAL MODEL

3.1 Medicine: A Disciplinary Role Model for IS?

The parlous state of affairs in terms of the relationship between IS research and practice suggests the need for radical change rather than just fine tuning. While the need to be more relevant to practice is often mentioned in editorial policies and conference themes, good intentions of this kind are unlikely to achieve anything on their own. For genuine improvements to occur, we need to fundamentally change the model on which IS research currently operates.

The IS discipline is very immature and has only existed since the 1960s. A natural starting point in bridging the gap that exists between IS research and practice is to look at how other, more mature applied disciplines have addressed this issue. We choose medicine as a referent discipline for the following reasons:

- Like IS, medicine is an applied discipline. Its *raison d'être* is an external social need: to find ways of preventing, detecting and curing disease.

- Of all the professions, medicine has probably achieved the highest level of integration between research and practice. Research is driven by population health needs and research results are actively disseminated and used in practice (Figure 3.

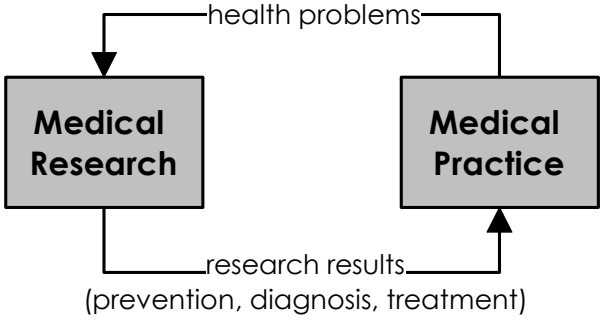

Figure 3. The Relationship Between Medical Research and Practice

Medicine is a discipline with both academic respectability and practical credibility. For this reason, it provides an ideal disciplinary "role model" for IS. The key elements of the medical model are discussed in the remainder of this section.

3.2 Joint Academic/Clinical Appointments

One reason why medicine has so successfully closed the loop between research and practice is that academics and practitioners form part of the *same community* rather than separate communities. It is comparatively rare for medical academics to be "pure" researchers, and it is generally considered undesirable. Most medical academics are also leading practitioners in their field. In fact, they must demonstrate they are leaders in their field of practice in order to get senior academic positions. For example, to be a professor of obstetrics, you must be able to demonstrate that you can deliver babies successfully and run an obstetrics unit in a major hospital, not just write papers about it. In contrast, many IS academics have never even practice in their area of expertise.

The medical academic model encourages (and even requires) academics to continue practicing. Medical academics must perform a minimum level of clinical practice in order to retain accreditation and get promoted. Most academics in the medical field spend about half their time in clinical practice and half their time researching and teaching. In the IS discipline, such behavior is actively discouraged. For IS academics, time spent in professional practice reduces time available for research and, therefore, represents an opportunity cost in the "publication game." IS academics typically get no credit from their institutions for spending time in professional practice and keeping up their practical skills. In many cases, it is even seen as a negative and evidence that they are more interested in making money than pursuing research.

3.3 Research Review Process

In medicine, there is virtually no distinction between academic and practitioner journals or conferences. The key medical journals are widely read by both academics and practitioners alike. Academics write for practitioners, because:

(1) They are practitioners as well, so have a vested interest in doing research that is practically useful, since they can use it in their private practice.

(2) Leading practitioners are on the editorial boards of the leading journals.

Equal emphasis is given in selection of submitted papers to the quality of the research (i.e., rigor) and its interest and use to practitioners (relevance). Medical journals also emphasize the need for research to be understandable to practitioners. There are strict limits on the length of articles, a requirement to be relevant to current issues, and articles must be written in a readable way, with a minimum of statistical or mathematical content—if necessary, such material is included in an appendix.

3.4 Evidence Based Medicine

For medical research to improve health outcomes, research results need to be disseminated and implemented in practice. However medical research findings are slow to change medical opinion and practice (Phillips 1998). One of the major barriers to implementation of research findings is the volume and geometric growth of the medical literature. It is not humanly possible to keep up with all the advances in all areas of medical research (Jordens et al. 1998). It is estimated that the average medical practitioner would have to read 19 articles per day to keep up with the latest developments in their field. Faced with information

overload, doctors often fall back on global judgements based on experience rather than thorough analysis of the relevant medical literature (Weed 1997).

Recognition of these problems led to the discipline of *evidence based medicine* (EBM). The aim of EBM is to bring research and practice closer together and to reduce the time lag between the development of clinically proven treatments and their use in everyday medical practice. EBM is a structured process in which all available research evidence is synthesized to support medical decision making (Sackett et al. 1997). The structures, methods, and tools to support EBM have evolved over almost three decades, and it represents a mature and effective solution to the problem of linking research and practice.

The major methodological tool of EBM is the *systematic review* (Chalmers 1993; Cochrane 1972; Sackett et al. 1997). Systematic reviews begin with an exhaustive search for published and unpublished research studies addressing a particular health issue (e.g., treatment of asthma). The next step is to critically evaluate the studies to identify which are of sufficient quality to contribute to decision making. The final step is to pool the results of the studies to arrive at a quantitative estimate of the effectiveness of the treatment(s).

The Cochrane Collaboration is an international not-for-profit organization that prepares, maintains, and disseminates systematic reviews of the effects of health care interventions. It consists of about 50 international Collaborative Review Groups, which include researchers, health care practitioners, and consumers. Reviewers employ standard methods to assemble, appraise, and synthesize data from published research studies (Chalmers 1993). Reviews are also regularly updated to take account of new research developments.

Synthesizing the research evidence is only the starting point for using research to improve practice. Equally important is the *dissemination* and *use* of this information (Jordens et al. 1998). To make a practical difference, systematic reviews must be readily available to clinicians in the workplace and must be actively used and implemented in clinical practice. Moody and Shanks (2000) describe a system that uses the Internet to provide on-line access to the latest medical research at the point of care. This enables medical practitioners to make more informed decisions based on the latest medical evidence. This can make the difference between life and death, an accurate or erroneous diagnosis, early intervention or a prolonged and costly stay in hospital.

4. A COLLABORATIVE MODEL FOR INFORMATION SYSTEMS RESEARCH

This section proposes a model for improving links between research and practice based on the medical model described in the previous section.

4.1 Joint University-Industry Appointments

The practice of knowledge management has shown that sharing of knowledge is largely a people issue (Sveiby 1997). Informal transfers of knowledge are often more important than formal transfers. No matter how much we talk about bringing IS research and practice together, ultimately it will never happen while they exist as separate communities.

One reason why medicine has so successfully closed the loop between research and practice is that they form part of the same community, or more correctly, medical academics are a *subset* of the practitioner community. Almost all medical academics are also active practitioners, while only a small proportion of IS academics are also active practitioners. In order to bring the IS research and practice communities closer together, we need to increase the overlap between them.

An obvious way to do this, following the medical example, is to create joint university/industry positions. Expert practitioners should be appointed to half-time university posts. They should be free to continue to practice but should take an active role in teaching and research activities. Salaries for such appointments would need to be competitive to attract leading practitioners. As in medicine, the objective should be to attract people who are leaders in their field of expertise and play senior roles in the IT industry rather than "average" practitioners. While it is common practice to appoint expert practitioners as "fellows" or "associates" in IS departments, these are generally honorary positions, which are unpaid, and the recipients typically do not play any active role in the department.

Such appointments will open up channels for direct *knowledge transfer* between research and practice (as opposed to indirect transfers through teaching) and will provide improved opportunities for researchers to conduct research in organizational settings, using real practitioners. It will also increase awareness by IS researchers of the needs of practice, and help to improve the relevance of research and teaching programs.

Most IS departments have problems attracting quality staff, partly because of the shortage of IT skills in practice and also because of the high salaries paid in the IT industry. Medicine has similar problems in attracting top practitioners to take up academic positions (in fact, medical salaries tend to be even higher than IT salaries), but has overcome it through the mechanism of joint appointments. Importantly, they do it by enabling (and encouraging) people to *continue* practicing, rather than forcing them to make a choice between research and practice.

4.2 Dissemination of Research

In order for IS research to have an impact on practice, research results need to be disseminated and used in practice. This means "retailing" research findings to practitioners rather than just circulating them within research communities, which currently happens. IS practice is currently highly anecdotal and experience based. Practitioners rarely refer to scientific evidence to solve practical problems or make important decisions but instead rely on their own experience, their peers, or advice from vendors or consultants.

The Internet opens up enormous possibilities for making IS research more directly accessible to practitioners. The system described by Moody and Shanks (2000) uses the Internet to provide on-line access to the latest medical research to support clinical decision making. An excellent use of IS research funds would be to build a similar system to support *evidence based IS practice*. Such a system would provide on-line access to IS research knowledge to support decision making in practice. It could also include on-line discussion groups to connect researchers and practitioners and enable direct knowledge transfer between them. This would help to improve the impact of IS research and to reduce the time lag between the development of new research knowledge and its application in practice.

4.3 Systematic Reviews: Toward Evidence Based Practice?

As discussed earlier, the geometric growth of the IS literature has resulted in information overload for practitioners. There are so many papers published in different IS journals and conferences, no practitioner could keep up with all the relevant research in their area of expertise. Part of the problem is the sheer number of studies that have been published in a particular topic area; another problem is the conflicting findings from different studies. It is, therefore, little wonder that practitioners fall back on anecdotal evidence, experience, and advice from vendors and consultants to make decisions.

Following the medical model, a possible solution to this problem would be to conduct *systematic reviews* of IS research, just as the Cochrane Collaboration does in the medical field. In this way, research findings could be synthesized and made available in a form suitable to support decision making in practice. The methodology used for synthesizing medical research could be adapted to the IS field. Collaborative groups involving both practitioners and researchers would be needed to conduct such reviews, to ensure that studies are reviewed for theoretical and methodological rigor as well as practical relevance and applicability. Reviews would also need to be regularly updated to take account of the latest research developments.

4.4 Research Review Process

As discussed earlier, the research review process dictates the demand for IS research. One way to improve the relevance of IS research would be to ensure that editorial boards and program committees have *equal representation from academics and practitioners.* The concept of "quality" in IS research would also need to be redefined. As discussed earlier, rigor (methodological and theoretical) has become synonymous with research quality. However, this is just one aspect of research quality. Relevance (whether the research addresses a practical need), practical utility (whether the research results can be applied in practice), and understandability are also important.

We propose the following criteria for evaluating the quality of research:

1. Relevance: Is this an important research question? Does it address a practical need?

2. Theoretical soundness: Has appropriate theory been used to support the research findings?

3. Methodological rigor: Is this an appropriate research method to answer the research question? Is the research design methodologically sound?

4. Utility (practical significance): Can the results of this research be used to help improve practice?

5. Contribution to knowledge (theoretical significance): Has the research increased our understanding of information systems?

6. Understandability: Can it be understood by the average practitioner?

Criteria 1, 4, and 6 can only be evaluated by practitioners.

5. CONCLUSION

5.1 The Fundamental Problem in IS Research

In this paper, we have argued that the fundamental problem that needs to be solved in IS research is not a methodological problem nor a theoretical problem, but a knowledge transfer problem. There is a major "disconnect" between research and practice that needs to be urgently addressed. This paper argues that IS will not achieve respectability by having a universal theory or by the rigor of its methods, but by being practically useful. Ultimately, its success will be measured by its contribution to practice and to society. The research community needs to address the issues that are confronting organizations and to ensure that research results are disseminated and used in practice.

5.2 Medicine as a Model for IS Research

We argue that there is an urgent need to form closer links between IS research and practice and to improve the knowledge transfer between the two groups. This paper has proposed some strategies for achieving this based on medicine, a discipline that has achieved a high level of integration between research and practice. It has taken medicine many centuries to build such close links between research and practice, and it is unrealistic to expect that we can achieve such a level of integration in the short term. However, we can make much faster progress toward this goal if we learn from more mature disciplines. The medical model has evolved over a long period of time and appears to have worked very successfully.

5.3 The End for Pure Research?

If we move to a model where research is closely tied to the needs of practice, there is, of course, a danger that research will become narrowly focused and opportunistic and fail to address long term theoretical issues, which are fundamental in any discipline. The issue of the balance between pure and applied research is a problem in any discipline, medicine included (Larkins and Anderson 1998), and funding bodies and universities need to be aware of this. However, at this point in time, the pendulum has swung too far toward pure research—the pursuit of knowledge for its own sake—and the balance needs to be urgently redressed.

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