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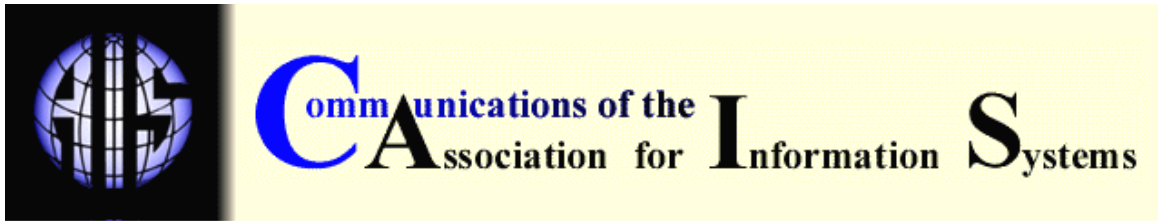
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THE IS CORE – X INFORMATION SYSTEMS RESEARCH AND PRACTICE: IT ARTIFACT OR A MULTIDISCIPLINARY SUBJECT?

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ABSTRACT

Much recent debate focuses on the nature of information systems as an academic endeavour and whether it constitutes a single, coherent subject discipline in its own right. This paper comments particularly on the recent paper by Benbasat and Zmud [2003] that proposes an IT artifact model to provide an integrative theme for IS research, and the response by Alter [2003] who presents an alternative paradigm that emphasizes the importance of systems. The approach taken here is to define the terminology of IS and put it into a management context which is implicit in most IS research but is often overlooked in the debates on the nature of academic IS research. It is proposed that a multidisciplinary approach to IS research is the most appropriate way of conceptualizing IS problems, academic research, and business practice, and that the integrating themes arise from the terms 'information' and 'systems' rather than from the technology. A multidisciplinary view of IS has different implications for identifying appropriate research problems, research design, publication and dissemination, and for the development of professional bodies than the IT artifact philosophy. It has some similarities to the systems model proposed by Alter and takes this concept further to stress that the IS research field can make a claim not only to systems but to much broader core disciplines in management because of the ubiquitous nature of not only IT, but also because of the central role that information plays in the co-ordination of economic activity in business enterprises. To support the argument, examples of historical IS research are outlined and the importance of earlier multidisciplinary research areas is described, particularly the antecedents of OR research practice in the UK. Finally some tentative ideas on future IS research and practice are outlined.

Keywords: IS core, IT artifact, multidisciplinary research, IS practice

INTRODUCTION

This paper is a comment on the position paper by Benbasat and Zmud [2003] regarding the identity crisis within the IS discipline and the response to it by Alter [2003] who proposes a

diametrically opposed viewpoint on how academics should conceptualize information systems. Although both sets of authors use the 'IS' term to frame their arguments, other terminology is or has been widely used to describe phenomena associated with the design and implementation of information technology based systems in organizations. For example, data processing, systems design, information technology, information systems, MIS and information management. However, this lack of agreed nomenclature is common in new and rapidly changing subject areas and, for the purposes of this debate, IS will be the predominant term used. A logical place to start is to define each of the terms 'information' and 'system' separately before considering their combined meaning.

Information is a concept that most managers feel fairly comfortable with until they are asked to define exactly what it is and then they tend to revert to defining it in terms of specific contexts such as a production management or marketing plan, or particular media such as newspapers, books, internet, radio and television, or something that leads them to take an action or response of some sort. System normally conveys some sort of technical arrangement of different parts that work together. The formal definitions of 'information' and 'system' are taken from the Oxford English dictionary.

Information: informing, telling; thing told, knowledge, items of knowledge, news.

Another way of thinking about information is from a communication perspective between a sender and a receiver of information. The communication of information from one person to another conveys something that the receiver did not already know, and implicit within this model, the information contains some meaning. This simple model is based on the seminal work by Shannon [1948]. Using the concept of entropy, he defined information in terms of uncertainty. The implication of this finding was that information can be defined as a mathematical entity. That is, it can be measured, transmitted through wires and its value to a recipient gauged. In telecommunications, the theory is used to determine the capacity of communication channels. In organizations, information to a manager is something that they didn't already know. If the receiver of a piece of information already knew that information, then no new information was conveyed. The precise amount of information conveyed is inversely proportional to the probability of receiving it. That is, the more likely it is to receive a particular piece of information, the less information is conveyed. Or the less likely it is to receive a character, the more information is received. In mathematics there is no distinction between the terms data and information and they both refer to levels of entropy. In digital systems this can be measured and represented by strings of 0s and 1s. In a management context data is the term used to refer to computer files, or databases, and information denotes that meaning is attached to a piece of data.

System: complex whole, set of connected things or parts, organized body of material or immaterial things.

System therefore means interconnectedness of some sort or other and a degree of organization. Related to systems it is worth noting the definition of systems design as the "organization of data for electronic processing, or of data-processing equipment". This definition is a reminder of how fast some of the basic terminology changed over time.

Working from these definitions, 'information system' can be broadly conceived of as a set of inter-related elements concerned with information. The boundary of IS therefore depends on what is meant by the 'system', that is, what elements constitute the system. To move from the abstract to something that is more tangible it is necessary to place information system in a specific context. Both sets of authors implicitly assume that they are referring to *management* information systems. It is understandable that it is almost not worth bothering to mention the management context explicitly. However there are other types of information systems that do not fall neatly within the boundaries of management information systems yet still might be of tangential interest to the IS community, for example engineering information systems concerned with the control of

large-scale manufacturing and distribution processes such as a coal-fired power station or a dark manufacturing site that employs advanced robotics, and entertainment information systems where some of the technological innovations (particularly in mobile devices) overlap with management applications and uses. Notwithstanding these other types of information systems, it is clear that the focus of the IS subject debate is on management information systems and it is no coincidence that MISQ, the best known academic journal in the field, takes its name from this term.

II. THE IDENTITY OF MANAGEMENT INFORMATION SYSTEMS

Most subject disciplines can be defined quite succinctly by a broad, yet unambiguous definition. Within a broad definition different branches of study start to emerge. For example, physics can be defined as the study of matter. Specific branches of study include such areas as nuclear physics, optical physics, and quantum physics. In the social sciences, Doyle [2002] defined the marketing concept as “the task of seeking to provide customers with superior value”. Similarly, Daft defined organizations as “social entities that are goal-directed, deliberately structured activity systems within an identifiable boundary”. Within these definitions of marketing and organizations, it is possible to identify specialist areas of study; for example, in marketing the specialist areas include consumer marketing, brand management, globalization, and network marketing. Similarly in organization behavior, the topics culture, organization design, communication, leadership, and industrial relations all have their own specialists and theories that exist within the broader subject of organization behaviour. The subjects of organization theory and marketing have a reasonably clear boundary which ensures a fairly high level of cohesiveness of academic research and for marketing practitioners, there is also a separate, identifiable group of marketing managers. Benbasat and Zmud make the assumption that the IS subject is, or should be, a similarly single, cohesive discipline with its own traditions, methods, and theories that together would make it a core discipline. In this case diversity at the level of moving freely between ‘core’ subject disciplines such as organization theory, strategy, computer science and marketing is problematic and can be construed as a weakness. The alternative model is that the IS subject is inherently multidisciplinary and that its strengths lie in the ability of IS researchers to tackle real problems in organizations, draw on a diverse theory base, and contribute not only to IS journals that act as a focus for their work, but also publish and make theoretical contributions to the ‘core’ disciplines such as marketing, strategy, and organization science. In this case, diversity is a strength, and the IS discipline is defined more by the types of problems that its researchers and consultants address, rather than by some pre-determined definition of subject boundaries defined by a theoretical construct.

Once it is agreed that management is the context to the subject of information systems, then we can start to explain the extensive overlap of IS with other fields of study, and the apparent lack of identity and cohesiveness of the subject. If management is defined at a high level as the co-ordination of economic activity, then the importance of information systems that exploit technology (hardware, software, networks) to collect, collate, manipulate, organize, store, and transmit information is obvious. In fact to co-ordinate activities of any kind, including economic activity, requires the communication of information so that it can be shared among the different elements of the management system (for example individual managers, the automatic movement of data between products and machines, groups of workers, organizations and markets). Management and information technology are so bound up and interwoven with one another that it is difficult to separate them in practical situations.

Although researchers talk about IT as a separate element for analytical purposes in research models it is difficult to separate the IT from the management context, especially if information is included as a core part of IT. For example, a complex Oracle or SAP software package can be described purely in terms of its technology but their significance to managers is that they contain the design of business processes, including roles, information flows, workflow, and organization structures. Business process definitions contained in the enterprise systems span all of an

organization's activities. Therefore, the significance of SAP and Oracle enterprise systems to a manager lies in terms of their influence on how business processes are designed, implemented, and then continue to evolve with changes to parameters in the software, new software releases, people changes, structural changes, and strategy changes. The software is intrinsically linked to elements of the business such as individual roles and departmental structures, accounting practices, and workflow. In this case it seems perfectly legitimate for an IS researcher to focus on the business process design, information structures, information flows and associated organizational change because these issues are arguably the nub of the implementation problem that faces managers.

Alter points out that the sheer ubiquitous nature of IT makes it different to other forms of technology. It is also the fact that information technology is concerned with *information* and when put in a management context the management activity relies fundamentally on the co-ordination of economic activity through the communication and sharing of *information*. When the information technology is placed in the context of an organization with people, processes, structures, purposes, strategies, and culture, the only meaningful way of understanding the complex set of phenomena that arises is to investigate the information system from a multidisciplinary perspective. For large-scale information systems projects, such as a Customer Relationship Management (CRM) system or a database marketing system, it is almost taken as granted that to be successful the company must deploy a multidisciplinary group of individuals, a steering group, to manage the implementation process. This reality is also reflected in the IT vendors who similarly offer a diverse range of skills for such projects.

III. THE IT ARTIFACT MODEL VERSUS THE MULTIDISCIPLINARY MODEL

The IT artifact concept proposed by Benbasat and Zmud [2003] attempts to define the whole field of study by defining a clear boundary between 'pure' IS research and non-IS research. It places the IT artifact at the centre of the model in order to specifically limit the IS field of study to issues and phenomena that are directly related to an IT artifact. By placing the IT artifact at the centre Benbasat and Zmud emphasise the technological component of IS research over the alternative concepts of 'information' and 'system'. They also seek to reduce the diversity of the IS research field. The rationale of the IT artifact argument is that IS requires a set of core properties that distinguishes it in some way from other subject disciplines, and that without a set of core properties the diversity in the IS field (that is exemplified by its participants from a diverse range of subject disciplines, the wide array of topics studied, and the methodological and theoretical diversity) is problematic. The notion of an IT artifact is proposed as a solution to the claimed problem of diversity in IS research. The definition of the IT artifact though is rather confusing and can be interpreted in a number of different ways. However the central idea is that the information technology artifact should be the central phenomenon of research interest, and other variables should only be included in the study if they are directly related to the IT artifact in some manner. They go on to develop the idea of research design errors. Errors of exclusion are research designs that exclude key variables from the study, errors of inclusion are research designs that include variables that are only tenuously or indirectly linked to the IT artifact.

Limiting the scope of IS research to first order effects of the IT artifact may be appealing from a 'pure IS' core discipline perspective but it may miss the point of the research in the first place, namely to solve a particular problem in an organization where IT is an element in that problem. Most management IS problems concern how information technology is inter-related with other aspects of the organization, whether this be business processes, information modelling, strategy, production management, or whatever.

The IT artifact argument appears to present a clear delineation of the IS discipline subject boundaries, but there are substantive problems connected with its theoretical underpinnings, the evidence cited to validate the existence of the IS identity crisis, and the practical application of the

IT artifact. It makes the assumption that the information systems subject is a core discipline rather than being inherently multidisciplinary. Why should there be a core set of IS theories at all? All the major information systems issues that CIOs and IT directors face do not fall neatly within a technologically defined area. For example the alignment of business and information systems strategies, the implementation of electronic commerce strategies, enterprise computing, achieving competitive advantage from the innovative use of IT, cost control and justifying investment in information systems in terms of economic, strategy and organizational benefits are typical issues that arise in surveys of senior managers. None of these issues would be better served by the application of an IT artifact model by academic researchers. IS researchers investigating IS phenomena often take a particular type of IS problem (for example ERP implementation, user participation and systems design, electronic commerce strategy) and then apply appropriate techniques, models and theories from computer science, psychology, economics, strategy or some other fields and attempt to contribute to our understanding of the phenomenon of interest. This problem-centred approach to information systems is not didactic about the particular position of IT in a research model, or where the methods and concepts were originally conceived. The very nature of most information systems problems mean that to adopt an IT artifact only approach would severely limit the scope and value of the research contribution in an organizational context.

A multidisciplinary approach to IS recognizes that information systems both influence and are influenced by other variables such as strategy, structure, roles and style of the organization in which they are deployed. An important implication of this approach is that the IS field is inherently diverse. Diversity is reflected in the different backgrounds of IS researchers, the diffuse location of the IS literature, the varied organization of IS research in Universities, and the varied management approaches to IS in organizations. An early example of this diversity would be the research by Huber [1990] who based his theoretical model primarily on organization theory, and published the (IS) research findings in a general management journal. Similarly Osterman [1986] focused on the displacement effect of computers and published the findings in an industrial relations journal. Similarly, Johnston and Vitale [1988] employed methods and frameworks from strategy and economics to analyze inter-organizational systems and competitive advantage. In all of these papers IT is an element in the research problem and prompted the authors to re-examine extant thinking but they focused on particular business, economic or organizational problems and questions that were of relevance and interest to academic researchers and practising managers.

Taking the multidisciplinary approach to its logical conclusion, one would expect IS research to make theoretical contributions to the core disciplines such as marketing, organization theory, and economics from which it draws many of its theories and research methods. This approach reflects the fundamental role of information in organizations and the impact of information technology on *all* aspects of management practice over the past forty years. Many of the strategic innovations in business have centred on the pivotal role of exploiting IT in areas such as database marketing, supply chain management, B2B electronic markets and hierarchies, information-based product innovations, globalization of markets, and consumer research. In fact information technology played such a central role in the formation of contemporary marketing practice that marketing theory can be re-cast in information handling terms so that it explains practice more effectively than historical marketing models that did not take the enabling effects of information technology fully into account, (for example see Holland and Naude, forthcoming).

Of course there are historical antecedents to multidisciplinary research in Universities notably the subject of Operational Research .

“Operational research (OR) and information systems are two other, albeit related, areas of multi-disciplinary studies. The earliest OR studies took place during the Second World War. A group of scientists, ‘back-room boys’, from a great variety of disciplines came together to problem-solve and improve the Allied war effort. They addressed such problems such as the optimal size of convoys, camouflage

'patterns', and disinformation dissemination. They improved operations and so were called operational analysts or researchers. After the war, many industries and government organisations established similar multi-disciplinary groups to improve the workings of their systems. If you look at the earliest writings of these analysts, there was a pride that they drew their disparate backgrounds into the basis for highly effective teams of problem solvers". French [2003]

These loosely structured groups were formed to solve a range of problems that could be broadly classified as operational systems but when Universities tried to capture the success of OR researchers, the OR groups came under pressure from University authorities to establish more cohesive structures and form departments. French [2003] argues that because these departments existed within faculties, the choice of faculty biased the type of research that was conducted so that each OR group had a particular bent towards mathematics, business, engineering, or computer science. Similar pressures are being applied to the IS community today.

Returning to the apparent need for a core discipline, the evidence cited by Benbasat and Zmud to support the idea that the IS discipline is in an identify crisis is taken from only two academic journals over two years which is far too short a time period to make any meaningful inferences on academic research trends. A sample of this sort is not representative of even narrowly defined IS research and certainly does not capture the diversity and richness of IS research published over the past forty years in a wide range of academic and business journals, books, consultancy reports, and more recently in on-line resources. They also do not mention academic management journals or business journals targeted at practicing managers such as *Business Week* or professional journals based around the membership of the IEEE.

From a practical perspective it is difficult to see how the IT artifact could be applied in practice. Is the definition plausible to academics and business managers? Most IS researchers and CIOs could agree on what constitutes IT in terms of products and services from the IT industry. But couching the definition in terms of tasks embedded in structures and contexts detracts from its explanatory and practical value. Benbasat and Zmud argue that the "hardware/software design of the IT artifact encapsulates the structures, routines, norms, and values implicit in the rich contexts within which the artifact is embedded". Alter describes the IT artifact as a questionable concept because of inconsistencies within the model and practical difficulties of applying it in real situations. Depending on how you interpret the definition, it is either so simple as to be trivial and does not add anything to well known frameworks that relate IT to the strategy and structure of the enterprise, or it is so complicated and limiting that it appears to exclude core IT systems such as wireless applications, PDAs, IT infrastructure, and enterprise systems that are different to the established context and structures in which they are being implemented. The artificial examples of a budget planning system and a gardening club internet presence do not add to the credibility of the IT artifact and there is certainly scope for describing the IT artifact concepts with reference to real examples of business practice and published academic research.

Another danger is that the IT artifact concept unnecessarily limits the scope of IS research to what could be termed applied computer science, which is unlikely to have a sustainable future as either an academic subject discipline, or provide the basis for a meaningful professional organization for IS managers. Of particular relevance here is the recent paper by Carr [2003] whose provocative argument is that IT doesn't matter anymore because it is ubiquitous and commoditized. Apart from missing the point that IT has not reached any kind of maturity and is fundamentally different to earlier technologies such as railways because it deals with information, it also misses the management context of information systems and how they create new possibilities related to the design and management of marketing, production, finance, and strategy processes in such a fundamental way that to understand how business is changing, it is necessary to consider business and IS changes in tandem. If IS researchers focus exclusively on the IT artifact and those phenomena directly related to it, over time, an IS subject defined as a

core discipline could become largely irrelevant and be vulnerable to the type of comment that Carr [2003] raises regarding the business use of IT.

IV. DISCUSSION

The IS research community is still in the early phases of development, which reflects the relative newness of the IT industry. In terms of vibrancy and growth, IS research is widely published in every conceivable medium. There is a strong cadre of IS-focused journals in the US, Europe, and Asia. IS research is also published extensively in prestigious management journals where its role in shaping and enabling new forms of organization, work patterns, industrial structures, and global business models is widely documented. The IT industry is also extremely successful and continues to demand skilled IS professionals ranging from technical staff through to more business-focused managers. The IT industry and their customers require skilled people to manage the design, manufacture, and implementation of novel technologies in organizational settings. Although the multidisciplinary approach does not offer a neat solution to the organization of IS, including where IS research and teaching should be placed in Universities, it is a more accurate model of how IS research and practice are actually carried out. IS is not a subject that is in crisis. IS faculty are based in business schools, technical departments, media and communications institutes, and social science faculties. This is to be expected if the IS problems facing industry require a multidisciplinary approach. The IT artifact does not strike a resonance with what is happening in the IT industry, major users of IT systems, or the academic community.

The work system concept described by Alter [2003] is part of a long tradition in the IS and business research communities of developing and applying frameworks and models that incorporate elements from the general management literature in order to explicitly convey the inter-dependence between information technology, people, business processes, organization structures, business strategies, and industrial structures. A casual inspection of some of the most influential IS theories will see that most of them are at the boundary of different 'core' subject areas. For example Mumford's pioneering work on systems design (socio-technical design), Nolan's stage theory of information systems evolution (evolutionary theory), Codd's theory of relational databases (mathematical logic), Malone's electronic markets theory (transaction cost economics) and the MIT study of IT in the 90s program (strategy and organization theory). Similarly, work on IT and competitive advantage draws heavily on the strategy literature. The contribution of many IS theories relies on their synthesis of ideas, concepts and frameworks from different subjects and research paradigms. Case studies such as Schwab.com by Mendelson and Dewan [2003] illustrate the effective synthesis of ideas from marketing, strategy, and IT.

One of the challenges facing IS researchers is to contribute to both best practice, and make theoretical contributions to core disciplines as well as their own IS journals. The diversity of the IS research community is its strength and multidisciplinary research should not be sacrificed to achieve theoretical neatness that would hardly be recognized, let alone valued, by IS practitioners and would undermine the position of IS researchers in Universities.

Editor's Note: This article is the tenth in the series titled *The IS Core*. At the time of publication, the papers in this CAIS series included Articles 31 through 41 and the editorial in Article 42. These articles were motivated by Benbasat and Zmud [2003] in the MIS Quarterly and by Article 30 [Alter 2003] in this journal. The article was received on September 12, 2003 and was published on November 24, 2003.

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The IS Core-X: Information Systems Research and Practice: IT Artifact or a Multidisciplinary Subject? by C.P. Holland

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