# Should Informatics Be the Theoretical Paradigm of AIS? A Panel Discussion of AIS Researchers

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## ABSTRACT

Some have argued that the absence of a unifying theory has limited the contribution of Accounting Information Systems (AIS) to accounting research and practice. Hunton (2006) proposed the Science of Informatics as a unifying theory. Informatics is an interdisciplinary science that studies the representation, processing and communication of information in natural and artificial systems. The panel discussion, "Informatics: Should This Be the Next Theoretical Paradigm for AIS?", held at the 2007 AIS Educator Conference, explores this topic. Some panelists expressed concern about the effect on accounting software design and on publishing in top journals of adopting informatics as a theoretical foundation. Others suggested that informatics could provide legitimacy by linking AIS research to the mainstream accounting research. Some panelists believed that an informatics foundation would better position AIS research relative to accounting research and increase funding. Consensus opinion noted the value of more research into the contribution of informatics as a theoretical foundation for AIS. This paper briefly reviews the Science of Informatics, summarizes the panel discussion, and concludes with suggestions for integrating informatics into AIS education.

***Keywords***
Informatics, Accounting Informatics, Social Informatics, Business Informatics, Accounting Information Systems, AIS research

# INTRODUCTION

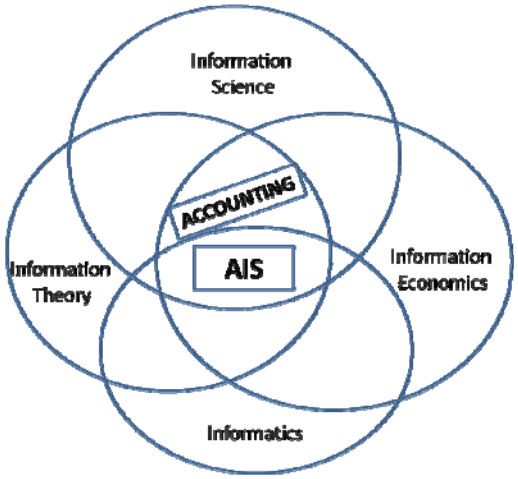
This document preserves, shares, and expands upon the Informatics Panel discussion held at the 2007 Accounting Information Systems (AIS) Educator Conference. The goal is to facilitate a dialogue about whether informatics science should be the theoretical foundation for AIS. The paper's structure is as follows. It begins by supporting a need for, and establishing the value of, informatics, and is followed by an informatics literature review summary. Next the panelists' remarks are detailed in the Panel Discussion. The panelists' suggestions for further inquiry into an informatics theoretical foundation for AIS are provided in the Conclusion section.

For almost two decades it has been suggested that AIS research topics lack theories (Sutton (1992, 8; Sutton and Arnold 2002, 9). The importance of a discipline's theoretical foundations has been universally recognized (19), and Demski et al. (2002, 158) argued that it is in fact "critical to the health of a discipline" (158). The 2006 AIS Educator Conference key note speaker Jim Hunton confirmed this by stating that AIS research is atheoretical (3). He also argued that AIS research is schizophrenic with too many different unconnected research topics (Ibid). Hunton (2006) further argued that AIS research is technologically driven rather than theoretically driven (3) and stated that the AIS academy has not established a science of AIS (2). He suggested clearly defining the philosophical, conceptual and theoretical foundation of AIS, and suggested informatics science as a potential theoretical foundation (17). He challenged the AIS academy to explore whether the science of AIS should have the informatics science as a theoretical foundation (19).

Both the accounting and IS disciplines struggle to define their authentic theoretical foundations. IS researchers and educators are concerned about the diversity of IS definitions and attempt to establish precise boundaries between it and other disciplines (Richardson and Robinson 2007, 261). IS research foundations are eclectic, preventing an overall cumulative IS research tradition. Although historically the accounting discipline has rested securely on information economics, mathematics, decision theory, and capital markets foundations, rapid technological advancements changed the accounting environment, reducing the accounting function to only one of many ERP system modules afloat in a financial and non-financial data ocean (Demski et al., 2002). Accounting became an IS sub-discipline, transforming the traditional accounting model into one that is AIS-based (Sutton and Arnold, 2002). With this new accounting model, one could argue that the traditional accounting academy is failing in its mission to recognize the importance of integrating AIS topics into mainstream accounting research and teaching. Thus the accounting academy is called upon to recognize AIS's legitimacy, a legitimacy that can be enhanced by a sound unifying theoretical foundation that supports mainstream accounting research as well as practice integration and influence.

Hunton (2006) argues for utilizing informatics science as the unifying AIS research theoretical foundation. Hunton (2006, 11) identified the three accounting science pillars as: Information Science (the collection, classification, retrieval, and dissemination of information), Information Theory (the determination of information value to users) and Information Economics (the effect of information on economic decisions). Accounting information systems includes those three foundation areas plus the creative use of technology for innovation and transformation. Likewise, in a theoretical context, informatics is a well-developed "meta" discipline that looks at all systems that store, process and communicate information, including computer science, information science, psychology, and sociology (Hunton 2006, 12). Figure 1 illustrates how AIS's foundations should include not only the three accounting science pillars but also the interdisciplinary aspects of informatics.

**Figure 1**




ure 2: Accounting Informatics (Hunton, 2006)

Using informatics science to unify the traditional source disciplines with technical source disciplines may instigate a new golden AIS research era. Hopwood (2007) argues that a strong interdisciplinary orientation formed the last golden accounting research era. He notes that his and Ball and Brown's (1968) research utilized social psychology and organizational sociology insights and approaches as well as accounting. He notes "It has been and must continue to be a site (accounting research) for interdisciplinary inquiry." (Hopwood 2007, 1371). Informatics provides an appropriate interdisciplinary theoretical paradigm. Hunton (2006, 16) defined "Accounting Informatics" as "the science of accounting innovation and transformation through the creative use of technology". He proposed a "Generalized Framework for AIS Education" that would be grounded in informatics ontology, concepts, and theories, thereby leading to and supporting AIS learning objectives (21). Such a framework would provide "rigor, consistency, and depth to AIS education and research" (Hunton 2006, 21). The following section explores the history of informatics and its role in academia and business.

## BACKGROUND

The most current definition of informatics is from the *International Encyclopedia of Information and Library Sciences*:

> "Informatics is the science of information. It studies the representation, processing and communication of information in natural and artificial systems." (Feather and Sturges 2002, p. 238)

As such, it encompasses information science, (theory and research) and information practice (information technology and human decision making).

Although the term originally was most closely associated with computer science, its meaning has been expanded as its importance and applicability to various disciplines have been recognized. In addition, based on the historical evolution of the word informatics, its definition depends largely on the base country. To many Western Europeans the term means computer science or IS and has remained virtually unchanged from the 1960's. Alternately, in the Soviet Union, now Eastern Europe and Russia, as well as in the United States, informatics means the science of information and an examination of how scientific information, in general,

regardless of specific discipline, becomes knowledge. The term reflects information science broadened to include all information, the technology that processes, presents, and communicates it, as well how information technology (IT) interacts with the human at the individual, organizational and societal levels, who use this information to make decisions that ultimately impact society.

Informatics recognizes the "co-constitutive" (Kling 2000, 219) existence of technology, humans, and information. As Marshall McLuhan succinctly noted "We shape our tools and afterwards our tools shape us." (Martz and Cata 2007, 85). The broad lens of informatics provides a rebuttal to the criticism that the science of AIS is technology driven. Rather, informatics looks at the real world interactions of technologies, humans and information, providing the appropriate foundation through which the science of AIS can explain and predict real world phenomena. To further explicate informatics' inclusion of the social sciences and the reference disciplines of psychology, sociology, cognitive science and linguistics, "Social Informatics" became an expanded branch of the informatics paradigm. The formal definition of Social Informatics [SI] is "the interdisciplinary study of the design, uses and consequences of information technologies that takes into account their interaction with institutional and cultural contexts." (Kling 1999, 1). Thus SI gives insights into the most effective use of informatics in business at the micro level of human beings and at the broader organizational level as well as at the cultural and societal levels. Sawyer and Rosenbaum (2000, 94) have summarized these insights into seven key research findings as follows:

1. **The context of IS directly affects their meanings and roles**. Simply, context matters. The design of Information Communication Technology [ICT] is linked to social and organizational dynamics and these dynamics are contextual and thus influence their consequences for work, organizations, and other social relationships (Kling et al. 2005, 19). This means that an ICT is always linked to its environment of use (Orlikowski 1993; Kling and Scacchi 1982).

2. **IS are not value neutral: their use creates winners and losers.** Given the contextual nature of ICTs, they are often designed, implicitly or explicitly, to support social and organizational structures (Kling 1992). For example many large business firms introduced ERP systems to improve efficiency. However, deploying these systems has led to significant centralization in some firms as well as disruption (Davenport 1998; Markus et al. 2000). Technologies are also shaped by the everyday actions of those who routinely use them and the social settings within which they have been implemented (Orlikowski and Robey 1991, 151).

3. **IS use leads to multiple, and often paradoxical, effects.** The contextually-dependant nature of ICTs suggests that similar ICTs can have different outcomes in different situations. This also implies that ICT use can lead to both intended and unintended consequences (Tenner 1996). For example, a new ICT is introduced to one department to improve organizational effectiveness and efficiency. That department staff's work processes soon become enmeshed with the new ICT and they become dependent on the infrastructure to do its work, the intended effect. However, a lack of systematic maintenance and upgrading of this infrastructure leads to the ICT becoming unreliable. This lack of reliability means that, over time, the office is actually less capable of achieving its mission, an unintended effect.

4. **IS use has moral and ethical aspects that have social consequences.** The contextual nature of ICTs means that development and use raises moral and ethical issues (Nissenbaum 1994). This set of topics often reflects the most well known of the key Social/Organizational Informatics issues, such as the use of an ICT to

remove entire classes of workers.

5. **IS are configurable-they are actually collections of distinct components.** These components, many of which are nearly commodities, are assembled into unique collections for each organization. Any collection of ICT components is re-configurable (Brown 1998; Sawyer et al. 1997) permitting unique socio-technical networks (Kling et.al. 2005, 94).

6. **IS follow trajectories and these trajectories favor the status quo.** The configurational ability of ICTs is underlain by the trajectories of the components. A trajectory means that any definable component can be seen as an evolving series of products (or versions) (Quintas 1994) with a history and a future reflecting preexisting relationships of power and social life (the status quo) that are often maintained and strengthened. Given that ICTs are socio-technical entities, their evolution is as much social history as technical progress (Edwards 1994).

7. **IS co-evolve during design/development/use, before and after implementation.** The configurational ability of ICTs also underscores the socio-technical process of ICT design, development and use in every stage of an ICT's life. A system's use unfolds over time in a form of mutual adaptation between the ICT and the social system into which it has been placed (Leonard-Barton 1988). Evidence from empirical studies of actual work practices reveal that the people and groups that utilize ICTs reshape them in ways that their original designers did not anticipate (Kling et al. 2005). This ever-unfolding process, a "design in use", also implies the variations in social power that define much of the discourse of ICT developers and ICT users (Kling and Iacona 1984).

A more in-depth review of Social Informatics and how to bring it into the classroom can be found in Kling et al. (2005) and an in-depth overview of informatics in Feather and Sturges (2002).

In addition to the theoretical foundations of informatics discussed above, informatics also has many practical applications. Michael Dunn, dean of the School of Informatics at the University of Indiana, noted that the science of informatics is the integration of the art, science, and the human dimensions of information technology to provide solutions to **discipline-specific** problems (Dunn 2006). The ultimate objective of informatics is to aid decision makers in knowledge discovery that will benefit society. Informatics supports knowledge discovery and dissemination to assist the decision maker in a variety of academic disciplines and professional fields (Smith and Buerck 2007) because it aids in the development of optimal methods and means of collection, recording, storing, retrieving, analyzing, presenting, and disseminating scientific information (Mikhailov et al. 1967).

Informatics has been utilized extensively in the medical field where it addresses the cognitive, information processing, and communication tasks of medical practice, education, and research, including information science and the technology to support these tasks. (Greenes and Shortliffe 1990) Table 1 provides a listing of schools with Medical Informatics training programs as well as other disciplines that have incorporated informatics. The commonality among these disciplines is their concern with IT developed data and information that require human processing to create knowledge and wisdom. Perhaps the informatics application that is most applicable to AIS is Business Informatics (BI).

**Table 1: Informatics Programs**

| Universities With Medical Informatics Training Programs | Universities With Business Informatics Programs | Other Disciplines Incorporating Informatics |
|---|---|---|
| Harvard University | University of Reading (UK) | Bioinformatics (computational biology) |
| Tufts University | Middlesex University (UK) | Business informatics |
| MIT | Dublin City University (Ireland) | Chemical informatics |
| Yale University | Northern Kentucky University (US) | Cognitive informatics |
| Columbia University | University of Canberra (Australia) | Dental informatics |
| Pittsburgh University | University of South Africa (UNISA) | Environmental informatics |
| Duke University | Jonkoping International Business School (Sweden) | Health informatics |
| University of North Carolina at Chapel Hill | University of Twente (Netherlands) | Library informatics |
| University of Utah | Utrecht University (Netherlands) | Mobile informatics |
| University of Minnesota | Djurakij Pundit University (Thailand) | Molecular informatics |
| University of Missouri | Virtual Global University | Museum informatics |
| Rice University | | Nursing informatics |
| Stanford University | | Protein informatics |
| | | Science informatics (e-science) |
| | | Security informatics |

BI focuses on business IS with the objective of supporting business functions (Helfert and Duncan 2005). (See Table 1 for a partial listing of universities offering degrees in BI). BI is defined as a discipline combining IT/informatics with management concepts by looking at the 'co-constitutive' relationship of business and the technology it uses (Martz and Cata 2007). As such, BI focuses on the relationship between humans, business functions, information and communication systems and technology (Helfert and Duncan 2005). One example of this application that is of special relevance to the AIS community is in the design of databases that are machine readable beyond word searches to more complex information – such as finding arguments that support a particular decision (Ibid) like eXtensible Mark-up Language (XML).

Based on Hunton's (2006) call for the exploration of informatics as a starting point for developing a framework for AIS education and research, a panel of AIS researchers and educators was convened to present various perspectives on the topic. As has been noted:

> "… fundamental changes in the way we think of accounting often occur as a result of lively discussions of foundational issues, usually based on new developments in a basic discipline. For example, classical economic thinking helped shape Paton (1962 [1922]) and Canning's (1929) original accounting treatises in the early twentieth century. The modern information-economic thinking contributes to fundamental accounting breakthroughs in, say, Ball and Brown (1968) and Demski and Feltham (1976). Continuing such discussions is also a good first step to avoid what Demski (2001) called 'intertemporal sameness' in accounting research and teaching." (Demski et al. 2002, 159)

The next section provides a summary of "this lively discussion" of the views of four AIS researchers on topics regarding the role of informatics in AIS research and teaching, and is followed by concluding comments and suggestions for future research.

# PANEL DISCUSSION

## Topic 1. Based on your perspective and background, what do you think could be accomplished by the Science of AIS adapting informatics as a new paradigm?

Roberta Barra began by stating that informatics could transform AIS as we know it. The computerized AIS that we now have are nothing more than the codified elements of the manual accounting systems which have been in place from the beginning of the double entry manual accounting system. These have been designed and built without research that would provide evidence as to whether this is the best way to design a computerized AIS. Integrating the science of informatics into AIS research may result in different methods of capturing, storing, and communicating accounting information requiring a completely fundamental redesign of accounting software that would be very different from today's AIS software. Informatics-driven AIS software designs might not include journals and ledgers. With the possibility of such dramatically redesigned AIS software, the possibility of great resistance by practitioners to these informatics-driven results also arises.

Dan Stone asserted that the discipline of AIS faces a legitimacy crisis as demonstrated by the fact that what AIS professors research and teach does not seem to be well integrated with the research and teaching of the rest of the AAA academy. Therefore, the science of informatics may be instrumental in legitimizing the discipline of AIS as a science and integrating it into the larger accounting academy. The legitimizing would occur because the science of informatics is multi-dimensional and inter-disciplinary. By positioning the discipline of AIS under informatics, AIS researchers would have a framework for how their scholarship integrates with the broader accounting academic community. Therefore, the discipline of AIS urgently needs to be exploring the potential linkages it has with the pure science of informatics in general and Social Informatics in particular.

Skip White countered that, on the other hand, the disciplines of accounting and AIS suffer in the eyes of the overall academic community as being very practitioner-oriented. It is questionable as to whether adopting an actual science like informatics as an AIS theoretical foundation will ever have an effect on the practitioner community. As an example, even after over 25 years of REA research that might provide an informatics ontology, such research still has not found general acceptance in either the academic or practitioner community.

## Topic 2. What would be the benefits and drawbacks of informatics as a foundation for the Science of AIS?

Roberta Barra offered the suggestion that one possible drawback is that the conservative accounting academy might be very resistant to research containing the new word "informatics." As a result, research using a theoretical foundation based on mathematical, statistical and database models as well as computer information

technology may continue to be difficult to publish in top journals like *The Accounting Review* and the *Journal of Accounting Research*. Therefore the research will still be limited to traditional AIS research outlets like Management Information Systems (MIS) journals or the *Journal of Information Systems*.

Dan Stone noted that on the other hand, using the science of informatics as a theoretical foundation for AIS research helps legitimize AIS research, by linking that research to efforts to identify the foundations of accounting scholarship (e.g., Demski et al. 2002). The science of informatics was greatly expanded beyond its previously narrow computer science/database/technological vision by the work of Rob Kling (e.g., Kling 1993) who is largely responsible for founding "Social Informatics", thereby broadening informatics' theoretical foundation (Berleur et al. 2006; Kling et al. 2005). Dan Stone explained that Social Informatics brought principles of library science and aspects of sociology and social psychology to the foundations of informatics. Therefore, despite the formidable challenges ahead, AIS research could likely benefit greatly by embracing the science of informatics as a potential theoretical foundation.

## Topic 3. If you support exploration of informatics as a framework for the Science of AIS, what is the next step?

Roberta Barra suggested that a good first step is a literature review paper, with the next step the establishment of some potential research agendas. Examples could include software and database issues as well as others suggested by AIS researchers interested in exploring informatics. AIS researchers should look at the published research in this area to learn the research methodologies being used as well as what has already been accomplished.

Dan Stone optimistically noted that a successful body of AIS informatics research has the potential of initiating a paradigm shift which may include the IS section of the AAA becoming the informatics section of the AAA, the *Journal of Information Systems* becoming the *Journal of Accounting Informatics*, and AIS professors becoming Accounting Informatics Systems professors. Dan Stone asserted that the issue of identity is important. "The choice of a name for a discipline is more important than one might think, sometimes contributing substantially to the developing identity of the discipline" (Dahlbom 1996, 30) That is, specifically who are we, as AIS scholars? I have often been asked by mainstream financial accounting colleagues, sometimes jokingly, sometimes seriously, "really, what IS accounting information systems?" The implicit question is whether we have any professional or academic legitimacy or credibility. And if we do, what is the source of that legitimacy? An informatics identity would impart clarity to the broader academic community about the type of research conducted by AIS professors. Thus instead of being on the periphery of accounting; AIS becomes central to the function of the discipline and the accounting academic community. Roberta Barra suggested that to further clarify the issue of identity, the broader term of Business Informatics resolves the issue of the much debated labels of AIS vs MIS, and provides a more expansive arena for research, appropriately reflecting the broader and more expansive information systems being built and used today.

Skip White reminded the group that the traditional discipline of accounting in some sense has ignored the social aspects of fitting into the business world. The broader definition of social or business informatics avoids restricting it to the science of accounting.

Greg Krippel noted that this is further justified by recognizing that advances in business software, namely, ERPs, now make it possible to collect vast amounts of non-financial data. Secondly, informatics may facilitate connecting this non-financial data to financial data, making it more relevant and reliable, and thus possibly improving the decision making usefulness of the linked data. For example,

> "A piece of data, you can be lucky to give it away, Mr. Bruce McIndoe, chief executive of iJET Intelligent Risk Systems of Annapolis, explained. Analyzed Information is 10 times more valuable than raw information [sic data]. Analyzed information linked to business objectives is even 100 times more valuable" (Bruce McIndoe quoted by Leiva 2006, 2).

If the profession of accounting can learn to integrate the non-financial (or other business data) and financial data, thus providing critical decision useful information for achieving business objectives they could become the information czars of the business world. The science of informatics applied to the business discipline, i.e., Business Informatics might provide the way.

Dan Stone suggested that additional benefits may be forthcoming as universities devote more resources for AIS research. Top universities already invest substantial sums of resources dedicated to creating centers of informatics. Furthermore, asserted Skip White, the REA model's theoretical informatics ontology above the accounting model (which can be expanded to include XBRL) provides a starting point toward developing a Science of AIS.

## CONCLUSION AND CALL FOR FUTURE RESEARCH

This panel discussion initiates an examination of whether AIS educators and researchers should embrace the foundational discipline of informatics. As can be seen in this panel discussion, the question as to whether the science of informatics could serve as a theoretical foundation for AIS research still needs a definitive answer. However, the panelists did agree that AIS research should have a sound theoretical foundation (e.g., Demski et al., 2002). A theoretical foundation grounded in a sound scientific discipline will not only provide AIS research with clarity and consensus as to its definition and purpose but also provide perceived legitimacy to the rest of the academic community. This clarity and consensus provides value to AIS educators by supporting a more cohesive and solid curricula similar to that enjoyed by other accounting areas such as Auditing and Intermediate Accounting (Bain et al. 2002).

The panel perhaps generated more questions than answers. The panelists suggested that adapting informatics as a new paradigm could result in a total redesign of accounting software as the information collection and dissemination process moves beyond the manual double-entry mechanics and uses technology to support business decisions in new and innovative ways. They decided that it could provide AIS researchers with much needed acceptance, but were uncertain as to its benefit to AIS practitioners. In addition, the panelists identified several drawbacks. For example, there could be great resistance to the new word informatics because it represents such a new term to the academy. Accordingly, there is concern about whether informatics-based AIS research would be publishable in *The Accounting Review* and *Journal of Accounting Research.* As noted by Hopwood (2007), those who venture into new interdisciplinary areas by going against the status quo will find "the dissemination and publication of the new knowledge more difficult" (p. 1367). Hopwood (2007) cites

the example of the most widely cited research article in accounting research, Ball and Brown (1968), where their use of the interdisciplinary insights and approaches of social psychology and organizational sociology as well as accounting was rejected by *The Accounting Review* by reason that it was not accounting. Hopwood (2007) argues that…"increasingly accounting research is being seen as too cautious and conservative, too rigid, and insufficiently attuned to grapple with the new and to embrace novel insights and bodies of knowledge (1370)." While the panelists agreed that change would be difficult, informatics-based AIS research could be linked to well-established and accepted theoretical accounting research such as that of Demski and Fellingham (1976), without excluding extant AIS theoretical research.

Panel members concurred on the value of dialogue regarding the potential contributions of informatics to AIS. As a result of this panel discussion, it was agreed that the question of whether the science of informatics could be used as a possible theoretical foundation for AIS research should be further pursued by the academy. Hopwood (2007) argues that the current accounting academy is missing the dynamic for change and transformation that existed in the early Chicago days of great accounting research advances (1370). Hunton (2006) calls for such dynamic change and transformation as well as a willingness to embrace the novel insights and bodies of knowledge that informatics might bring us.

Could the informatics paradigm be consistent with definitions of what constitutes AIS research? Murthy and Wiggins (1999) define mainstream AIS research as research involving some aspect of information as it is captured, processed, or generated by a computer-based system as well as research into systems issues as they impact the information produced. As Mikhailov (1967) noted: "Informatics consists in developing optimal methods and means of collection, recording, storage, retrieval, analytical-synthetic processing, presenting, and dissemination of scientific information….leading to economic and societal benefits" (74). Based on these statements, we suggest that the informatics paradigm is consistent with the definition of what constitutes AIS research.

Could informatics be the unifying research paradigm uniting the three areas of AIS research as identified by Sutton and Arnold (2002)? These three areas are AIS design science research, the AIS social science research area--impact of IT on individuals, organizations, and society, and the AIS emerging issues and technologies research area. The social science research area provides a research frame that is more appropriate for establishing theories and testing those theories as they relate to the impact of IT on individuals, organizations, and society (Sutton and Arnold 2002). All three of these broad areas are included in the informatics paradigm. The informatics paradigm is comprised of the interdisciplinary combination of the technical sub-disciplines of mathematics, statistics, computer science and emerging information technology as well as the behavioral social sciences of psychology, sociology, and organizational behavior. We suggest that indeed informatics could be a research paradigm that could unify most if not all previous AIS research areas, including XBRL research.

## Informatics and AIS Practice

Now that we have discussed what the informatics paradigm might do for AIS theory, we can make some conjectures about what the application of informatics might do for the practice of AIS. Given the combination of sophisticated ERPs with (almost) unlimited storage capabilities and exponentially increasing processing capacity, the number one challenge facing AIS and its users, now and for the foreseeable future, is information overload. These new systems are collecting both financial information and non-financial information. The number one objective of informatics is to transform mountains of data into decision useful information. "Informatics is technologies that can derive knowledge from immense data sets and help humans cope with

'information overload.'"(Greiper and Sauter, 2005, p. 6). The successful application of informatics theory to the disciplines of medicine and law, i.e., Medical Informatics and Legal Informatics, has created new knowledge from a deluge of data.

Likewise, an Accounting or Business Informatics application could improve the decision usefulness of the information provided by relating non-financial data to financial data thereby allowing management to more effectively and efficiently achieve the objectives of profitability and solvency. The human race creates more than five exabytes of new information ($10^{18}$ bytes) each and every year world wide- enough to fill 37,000 new Libraries of Congress and even more than all the words ever spoken or printed; the annual equivalent of a 30 foot stack of books for every man, woman and child on the planet (Greiper and Sauter, 2005, p. 4), yet it will soon be technologically possible for an average person to access virtually all recorded information (Feather and Struges 2005). This information will not be confined to just text but will also include audio and video as well. By 2025, it is predicted that we will have, in our pockets and on our desktops, computers with the raw computing power of the human brain, as well as computers linked to each other by a telepathic communication network (Ibid). How much of this information will be relevant to AIS and how should it be analyzed? The main benefit to practitioners will be the ability to organize this deluge of information to produce quality knowledge for decision makers.

How will informatics affect accounting software? One of the major principles of informatics supported by empirical findings is that people and groups that (ICT) software also them reshape the software. Thus, accounting software will be evolving dynamically in contrast to its current static structure. Informatics also maintains that these ICT, including accounting software, will have intended and unintended consequences. The informatics discipline can provide theoretical foundations for how AIS researchers and practitioners can work together to address AIS's challenges.

## Informatics and AIS Education

How could the adoption of the informatics paradigm impact AIS education? We offer some possible suggestions with the goal of providing the best information to decision makers to achieve the business objectives of profitability and solvency. For example, the IS concepts section of our AIS course needs to be greatly expanded to include an introduction to the basic concepts of informatics (the theory of information), Social Informatics and Business/Accounting Informatics. Thus much more of the course content must be devoted to AIS theory or "Accounting Informatics". More specifically, we speculate that the following five subjects are worth exploring from the theoretical perspective of axioms and theorems; 1) numerical and symbolic computation, 2) algorithms and data structures; 3) databases, knowledge management and information retrieval; 4) human-computer interaction; and finally 5) graphics and visualization. A more complete description of these suggested subjects is as follows: The numeric and symbolic computation subject area is concerned with the efficient solution of equations using either symbolic or numeric techniques (Feather and Sturges 2002) The algorithms and data structures subject area is concerned with the development of efficient methods for solving specific problems and how data is organized. The subject area of databases, knowledge management, and information retrieval is primarily concerned with storing and accessing large amounts of highly structured data in an efficient and flexible manner. The human-computer interaction subject area is mainly concerned (at least initially) with efficient transfer of information between persons and computers, in addition to the implications of group work and the effects of the organizational environment (i.e., Social Informatics) (Ibid).

These five subjects could again be addressed in the IS and Design section of the typical AIS course, but

from an abstraction and design view point. More specifically, the abstraction view is concerned with data collection and modeling, and the interpretation of results and the design view involves requirements analysis, design rationale and implementation, methodologies, testing and analysis (Ibid). The database management section of the typical AIS course would focus more on database, knowledge management and information retrieval subjects as well as the human-computer interaction. The graphics and visualization subjects comprise part of the design view of implementation within a business information system. All of these topics include the need to address security, integrity and privacy issues (Ibid) and thus are part of the internal control section of the typical AIS course. The application of the informatics concepts in these five subjects as well as the transactions processing systems section of the AIS course would be used to justify the current AIS or provide for theoretically-based improvements. In either case including informatics concepts in every major section of the AIS course should not only present a unifying theme throughout the course but should also provide a solid foundational understanding of the true nature of AIS.

In summary, Accounting Informatics is defined as: research on, development of, and use of technological, sociological, and organizational tools and approaches for optimizing the dynamic acquisitions, storage, visualization, integration, indexing, retrieval, querying, analysis, synthesis, sharing and dissemination by means of production of ad hoc and formalized accounting reports to provide decision-useful information. Accounting Informatics is technologies that can derive business knowledge from immense economic data sets, including financial and non-financial but business relevant data, enabling business decision makers to do more than just cope with the continuous and exponentially growing "flood of business information" but to efficiently and effectively harness this information force and turn it into knowledge power that will drive the business to unprecedented levels of asset growth, profitability and cash flows (Arundel 2007; U.S Geological Society website, Mikhailov et al. 1967)

In conclusion, this paper has offered AIS educators and researchers the opportunity to begin exploring the use of informatics as a fresh and broader lens through which to view AIS challenges and opportunities.

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