

Chapter 1

FOUNDATIONS AND FRAMEWORKS FOR AIS RESEARCH

Steve G. Sutton

University of Connecticut/University of Melbourne

Vicky Arnold

University of Connecticut

INTRODUCTION

The greatest challenge in undertaking any project related to exploring the boundaries and frontiers of accounting information systems (AIS) research is the inherent difficulty in defining AIS as a discipline. Several researchers have attempted to put forth definitions in the past (McCarthy 1990; Sutton 1992; Murthy and Wiggins 1999; Sutton 2000a; Arnold and Sutton 2001), but other researchers within the discipline have questioned each attempt. Much of the debate revolves around the breadth of a given definition with criticisms ranging from the “too narrow” to the “too broad.” This will be the first issue addressed in this chapter—and therefore, this monograph.

Defining AIS research is broached first as a necessary precursor to any meaningful discussion of extant AIS research, the criticisms of the extant research, and the future frontiers. These latter three topics, however, are the topics that will be of greatest interest and importance to new AIS researchers. These new researchers are the primary targets for this monograph—whether they are researchers from other accounting or information systems (IS) disciplines or they are researchers in-training as doctoral students.

Accounting is rapidly becoming an IS discipline and the traditional research training provided in accounting doctoral programs leaves the vast majority of accounting faculty ill-prepared for completing AIS research studies that are capable of moving the research domain forward. Three major factors contribute to this phenomenon: (1) the seminal AIS research is rarely published in traditional accounting journals, (2) most of the seminal AIS research is relatively recent in comparison to other accounting domains, and (3) the faculty teaching the majority of doctoral seminars in accounting have little training in and/or knowledge of AIS research. To counter these inhibitors for new and re-tooling scholars, this monograph is designed with the intent of providing (1) a review of the seminal research in AIS, (2) an overview of state-of-the-art AIS research, and (3) perspectives on and synthesis of the primary research streams in AIS by leading scholars in each of these streams. As such, this monograph should aid in cutting the cycle time required for AIS researchers at all levels to review a research stream of interest and attain a foundation-level understanding of the key research and frontiers of development in that stream.

In order to provide a level of cohesion to these various authors’ efforts, this first chapter considers the frameworks that have been proposed for providing order and categorization to the extant AIS research and puts forth an explanation for the framework ultimately adopted in this monograph. To achieve this objective, the remainder of this chapter is divided into six sections. The

first section addresses the issue first raised here—defining AIS research. The second section addresses the various types of research that feed the body of literature in AIS and puts forth a simple three-category framework for presenting the extant AIS research. Sections three through five discuss the strengths and concerns about each type of research (design science and ontological, behavioral study of the impact of technology, and emerging technologies/issues in AIS). The sixth and final section synthesizes the discussion in this chapter and briefly reviews the state of AIS research.

DEFINING THE BOUNDARIES OF AIS RESEARCH

The earliest definition, in terms of a proposition for boundaries of AIS research, is probably McCarthy's (1990, vi) editorial position where he identifies "the distinguishing feature of an AIS is its involvement in transaction processing for accountability purposes in an organization." Sutton (1992) takes a much broader view of AIS from a research perspective. He argues that AIS might be usefully perceived as a subset of management information systems (MIS) from a teaching standpoint, but from a research perspective, identifying an area of IS that is not of import to AIS research is difficult. Similarly, Sutton (1992) argues that AIS research also reaches deep into accounting research, being influenced by a broad array of accounting research, including (1) how information technology (IT) can be used to support accounting/auditing, (2) the implications of IT to the quality of accounting and/or auditing information, and (3) the evolution of control and auditability of accounting systems in an IT-based environment. Sutton's (1992) perspective is not necessarily that different from McCarthy's (1990) elaborated views on the acceptable reaches of AIS research, but Sutton does avoid any type of AIS definition that might be limiting.

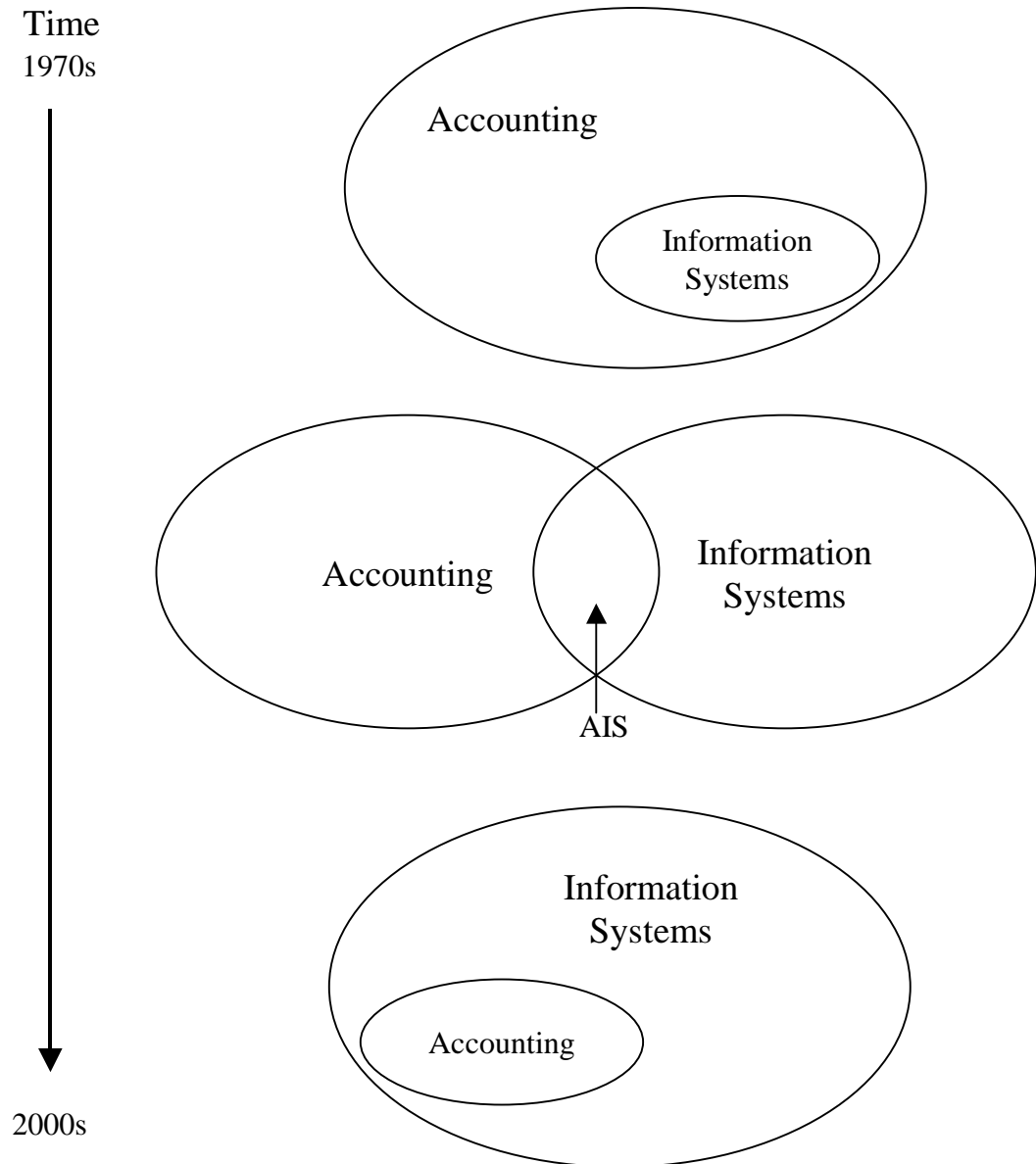
Murthy and Wiggins' (1999, 3) editorial defines AIS as the logical intersection of the broad fields of accounting and MIS. They note that both accounting and MIS are focused on information. The foci differ though as accounting is more focused on the information itself and MIS on the systems that produce information. The connection between the two comes from computer-based systems that produce information. Murthy and Wiggins (1999) do indicate, however, that AIS research can expand beyond just the explicit intersection into both the accounting and MIS domains—a position very similar to that taken by Sutton (1992).

Arnold and Sutton (2001) take an even broader view of AIS research. They argue that in the evolution of IS, accounting, and AIS, a steady shifting of dominance has occurred. Figure 1-1 is extracted from that article for use here in more clearly articulating this alternative view. As denoted in Figure 1-1, in the early years of computerization the first automated systems were almost always the accounting systems (i.e., payroll, accounts receivable, accounts payable, general ledger, etc.). Thus, the field of IS arose as a sub-discipline of accounting. As systems were developed across a much broader array of tasks in nonaccounting divisions of organizations, the IS domain began to mature and become a strong, independent discipline in its own right. This mid-1980s to 1990s perspective (see Figure 1-1) drives definitions such as that put forth in Murthy and Wiggins (1999).

Since the turn of the century, a decline in the strength of accounting has often been noted. Indeed, accounting appears to have passed its prime and, in its traditional state, is experiencing decline. As Williams (2000) notes, the people driving organizations today are no longer the accountants; rather, they are the IS people. The related impact on accounting has been a burgeoning market in AIS with high demand for faculty with AIS skills and for students who have an education that blends accounting and IS skills. As depicted in Figure 1-1, accounting today is becoming AIS—a growing sub-discipline in the domain of IS.

The prediction put forth by Arnold and Sutton (2001) is that, over time, AIS and its sister disciplines such as Marketing IS will continue to mature and ultimately displace the separate domain of MIS. Inherent in this vision, however, is the displacement of the traditional accounting model with a new or transformed model that is essentially AIS-based. Such a transformation brings with it a paradigm shift. Accounting academics and practitioners must adopt a new vision—one that recognizes that accounting is an IS discipline. For accounting scholars there is the need to learn to

FIGURE 1-1
Evolution of Accounting Information Systems



Source: Arnold and Sutton (2001).

research accounting as an information systems discipline. Thus, virtually all accounting research must address the implications of IT in order to maintain (or regain) relevance. All of this research potentially falls under the domain of AIS research. With full recognition of the inherent bias, Arnold and Sutton's (2001) broad-based vision drives the boundaries of AIS applied in developing this monograph.

CATEGORIZING AIS RESEARCH

The merging of accounting into AIS provides both opportunity and risk for the AIS domain. Researchers in traditional accounting domains have the potential to bring added strength to AIS research through strong traditions in theory-based work, rigorous statistical methods, and strong analytical skills. A blending of traditional accounting research with AIS research could lead to a stronger domain with higher relevance. McCarthy (1987, 30) states the benefit-risk trade-off very well, "I am not advocating that the methods of financial accounting research be adopted in AIS (their problems with relevance and overly scholastic thinking are maladies I would certainly not wish on any discipline), but I am envious of their understood traditions of excellence and rigor." Thus, for researchers in other disciplines to simply port their topics and methodologies over to AIS may potentially do more harm than good. Rather, bringing these skills to the AIS research arena and blending them with the rich literature and methodologies that are evolving in AIS represents a potential giant step forward.

Clearly, AIS research is not without its own weaknesses. AIS is a young discipline that has arguably only just begun to mature over the last few years. Until recent years, the core of researchers working in the area has been limited. Accordingly, much of the AIS research produced in relatively recent years still suffers from various maladies. As David, Dunn, McCarthy, and Poston (1999) note, AIS research should always evolve first from an understanding of the domain, not from availability of technology. Much of the early AIS research was of poor quality because researchers applied new technologies to problems they had not fully analyzed; as a result, the academic contribution of such projects was limited (McCarthy et al. 1992; Sutton 1992).

Sutton (1992, 8) identifies three major areas of weakness in much of the early AIS research: (1) an almost total absence of theory, (2) a focus on descriptive studies of practice, and (3) a limited analysis of data yielding little insight into meaningful relationships. Slowly, the AIS research domain is shaking many of these problems as the discipline matures.

In the early 1990s, a different problem evolved to limit the contribution of AIS research. Doctoral training in AIS was often done by the default approach of studying in MIS departments (Sutton 1996). Unable to get the training in accounting departments, most AIS-oriented doctoral students pursued supporting-area study in MIS. The result was that young AIS researchers expended significant energy rehashing old MIS research studies in the accounting domain. The studies provided minimal contribution to the overall IS research domain and minimal contribution to the evolution of AIS research. This left the question hanging—does immersing one's self in MIS training prepare a young researcher to make a contribution in the AIS domain?

The answer is probably that some training in IS is desirable; however, absent an understanding of the AIS literature, the skills attained are likely to have less impact than what might otherwise be possible. The perceived solution has been an emphasis on presenting synthesis and perspectives on AIS research with particular focus on frameworks. These frameworks tend to take a rather narrow view of the AIS research domain. For instance, Sutton and Arnold (1995) focus on providing some order and perspective on research opportunities in behavioral AIS research. David, Dunn, McCarthy, and Poston (1999) take a broader perspective in trying to integrate all AIS research through their research pyramid, but ultimately focus more on design science perspectives. Nonetheless, the David, Dunn, McCarthy, and Poston (1999) framework is particularly useful for the novice AIS researcher in that it presents a frame for viewing the potential contribution of a study. Also, the framework provides a vehicle for deriving an initial domain of general interest that the researcher might wish to pursue.

That leads back to the purpose of this monograph—to provide a framework and discussion of the extant research in a cohesive format that enables the developing researcher to understand the AIS research domain and to identify areas of opportunity for contribution. The monograph format

provides the luxury of having enough pages devoted to it (as opposed to a single journal article) to take advantage of the opportunity to overview a full breadth of AIS research with a reasonably complete analysis of the research in each area. This leaves one major concern—what is the scope of AIS research and how should it be divided for logical presentation?

The reference to the Sutton and Arnold (1995) and the David, Dunn, McCarthy, and Poston (1999) papers as examples of past efforts were also highlighted because they provide perspectives on the two dominant, and perhaps competing, methodological foci in AIS research. The behavioral research framework is representative of the evolution of more traditional accounting research and fits into the realm of what might be termed *natural science* or at least the *social science* equivalent thereof. The *design science* perspective has roots embedded more deeply in the domains of computer science and engineering. As such, this latter area is relatively foreign to most accounting (and business) researchers. This is the area that is probably at most risk as the inevitable migration of traditional accounting researchers into the AIS research domain begins to swell. Yet, *design science* represents the earliest foundation for quality AIS research.

The extinction of *design science* research would yield a significant risk to the rate of epistemological growth in AIS. *Design science* research, in short, is the development of improvements in (1) systems concepts, (2) models, (3) design and development techniques, and/or (4) systems implementation and validation. These improvements are subsequently coupled with the *proof of concept*, which is a demonstrative *instantiation* of the proposed advancement. An *instantiation* is an operationalization of proposed concepts, models, or techniques. Given the significant impact that *design science* research has had on the evolution of AIS research, both in terms of its growth and increased rigor, the initial segment of this monograph will focus on *design science*.

While *design science* research provides the ability to demonstrate the feasibility of proposed concepts, models, and techniques, it does not provide a good foundation for understanding the impact of such evolutionary advancements. The more traditional techniques applied by *natural scientists* or *social scientists* provide 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. The breadth and diversity of such research is difficult to classify as the extant literature has drawn from such sister disciplines as psychology, sociology, and philosophy—really going beyond just behavioral research methodologies. Rather than attempt to put an artificial categorization on this section of the monograph, this second section of the monograph is simply classified as *the impact of information technology on individuals, organizations, and society*.

These two lenses for viewing the extant research are reasonable for classifying past and current research. Where they fail, perhaps, is in dealing with the frontiers of AIS research. While these frontiers could be analyzed from both *design science* and *social science* perspectives, presentation seems more efficient if topics are presented and then discussed simultaneously from both perspectives. This final section of the monograph is categorized as *emerging issues and technologies*. These chapters relate to emerging topics that can benefit from the efforts of researchers applying all available methodologies. While various researchers might argue a preference for one set of methodologies over another, as Dalal (2001) suggests in analyzing the contemporary discourse in IS research over relevance, a dualism of research approaches should not necessarily be considered a weakness, but quite probably is a strength of the domain's research. We concur with this view that diversity breeds strength and fosters epistemological growth.

DESIGN SCIENCE RESEARCH IN AIS

Design science research, as noted earlier, is somewhat of a foreign concept to most traditional accounting researchers. Such research focuses on the creation of technology-oriented things that

serve human purposes (March and Smith 1995). The value of such research is embedded in the ability to enhance utility through technological advancement. The advances come in the form of improvements in such areas as systems concepts, models, design and development techniques, and systems implementation and validation. From outside observers, such research is often viewed as simply the building of systems. In actuality, the building of systems should be purely for the benefit of demonstrating that the improvement in systems concepts, models, design and development techniques, and/or systems implementation and validation are indeed implementable, achievable, and feasible. Thus, building the system is generally viewed as a *proof of concept*—the demonstrative implementation of a proposed improvement. As such, *design scientists* create knowledge and engage in meaningful research activities.

As with all types of research, there has been broad criticism leveled at design science research. As is typical in criticisms of a research domain, these criticisms are generally focused at the weaker studies of the domain or the misapplication or classification of research under the umbrella of *design science research in AIS*. The risk with *design science* is that a researcher is infatuated with a technology rather than focused on the underlying concepts or theories related to design, development, or application of the technology. Simply building a system does not advance research—rather the question that follows relates to the *concept* of which *proof* was being sought. The studies that have focused solely on building a system are the ones that have received the bulk of criticism related to *design science research in AIS* (McCarthy et al. 1992; Sutton 1992).

So how does one determine if a given study is good *design science research*? Sutton (2000a) suggests that any research frame is appropriate if it adds to the perspective and knowledge of the subject matter. Weber (1987) suggests that one should also consider the time horizon for which the study will have an impact—the longer the time horizon in the future for which the discovery will have an impact, the greater the value of the research. McCarthy et al (1992) and David, Dunn, McCarthy, and Poston (1999, Chapter 3) provide three criteria that can be used as further benchmarks:

1. Given the current state of the field, is the research truly novel?
2. Is the problem addressed difficult or easy (i.e., the difficult ones generally provide greater impact)?
3. Has there already been a *proof of concept* or of feasibility in other research (i.e., a second demonstration has minimal value)?

THE IMPACT OF IT ON INDIVIDUALS, ORGANIZATIONS, AND SOCIETY

As noted earlier, the other major body of AIS research (and probably the fastest growing) is the study of the impact of IT on individuals, organizations, and society. The evolution to these areas is a somewhat natural progression based on the behavioral research training that many AIS faculty receive during their Ph.D. program. Similar to other areas of accounting, the preponderance of this research focuses on individuals and the use of technology—mostly in decision-making contexts. The research in this area would probably be best classified as psychology-based accounting research in that the theoretical underpinnings are generally embedded in psychology theory and the methodologies applied are also generally consistent with those applied by psychology-oriented researchers (see Stone 1998).

The study of the impact of IT on organizations and society has received less attention, to date, than the individual-oriented arena. The biggest exception here is in the area of ethics, where the preponderance of AIS research has been at the organization and society level—although even here the studies also encompass the impact on and responses of individuals affected. The organization- and society-based research has adopted a broader range of methodologies. For instance, various

branches of both sociology and philosophy have been explored and applied within this research domain.

The major criticism of the psychology-based research has been whether it is really AIS research. Some parts seem to fit more closely with AIS (e.g., studies of presentation formats) while others are questioned as to whether they are more likely audit, managerial, or tax research (e.g., studies of the impact of decision aids on users). Similarly, others have questioned whether the research into organization- and society-based AIS research really fits within the AIS domain. The answer primarily comes down to how one defines AIS research. If the focus is limited to the development of systems for processing transactions to maintain accountability, then much of this research may fit outside the scope. However, if a broader view is taken where the impact of technology on all areas of accounting, auditing, and taxation is considered within the realm of interest, then it would be hard not to consider virtually all of this research as being applicable. Given the definition of AIS put forth earlier in this chapter, all of these areas of research are considered within the scope of AIS, as the domain is laid out in the following chapters.

EMERGING ISSUES AND TECHNOLOGIES

The final segment of the monograph will focus on emerging issues and technologies. For the most part, each of these domains is relatively early in its life cycle, with each experiencing tremendous growth and each being vastly under-researched. Yet, these domains are perhaps the best opportunity for researchers to take a leadership position and generate research that guides practice development rather than follows and describes practice. Admittedly, significant risk exists in researching an area that is still developing. First, the technology may evolve before the researcher completes the life cycle of the project, thus reducing the applicability and meaningfulness of the study before it is published in the public domain. Second, researchers have a tendency as noted before to focus on and design the study around the technology, without first properly grounding the study.

While these research areas have been separated from the primary dichotomy for AIS research, these studies invariably will draw from the methodologies and philosophies of either *design science* or *natural science/social science*. Accordingly, the standards for quality research accepted within each of these research domains must still hold. The burden still rests on the *design science* researcher to develop solid models or concepts prior to executing the *proof of concept*. For the *natural scientist/social scientist*, the burden is still there to conduct studies that are solidly grounded in theory or designed to produce theory applicable to the study. Absent the rigor of these methodologies, the research will lack the foundation to be seriously considered by practice and fail to produce research outputs of interest to future researchers.

CONCLUDING THOUGHTS ON THE STATE OF AIS RESEARCH

In this introductory chapter, the focus has been on the general approaches to categorizing AIS research by research methods and state of development. The criticisms of the various domains have also been briefly addressed. At this point, some final comments on the general contribution of AIS research seem appropriate.

In general, the research community perceives that AIS research has provided only very limited contribution to accounting/IS research and practice. Yet, the opportunity is greater than ever before for AIS researchers to contribute substantive research that advances both research and practice. As the practice community begins to transform itself into a technology-driven information systems profession, little is known about the factors impacting IS and business process-oriented audits, IS assurance, e-business success, quality of continuous financial reporting, and data warehouse applications, among other issues. As the academic community begins to research these areas, equally little is known about theories for interpreting these new phenomena.

Given the opportunities for research that abound, how does an individual researcher know if they have a good research question and research project? In selecting a research program and initiating new projects, McCarthy (1987, 31) suggests the use of Dijkstra's (1982, 329–339) *Three Golden Rules for Successful Scientific Research*:

1. Raise your quality standards as high as you can live with, avoid wasting your time on routine problems, and always try to work as closely as possible at the boundary of your abilities. Do this because it is the only way of discovering how that boundary should be moved forward....
2. We like all our work to be socially relevant and scientifically sound. If we can find a topic satisfying both desires, we are lucky; if the two targets are in conflict with each other, let the requirements of scientific soundness prevail....
3. Never tackle a problem of which you can be pretty sure that (now or in the future) it will be tackled by others who are, in relation to the problem, at least as competent and well-equipped as you....

The challenge is not only in selecting and conducting a study, but also in presenting the story. Stone (1998) notes that the impact of behavioral research is often lost because it is written in a fairly dry and noninteresting manner. The onus is on the researcher to develop a better story that conveys the implications of the research in a form that is both understandable and interesting to the researcher.

Finally, academics and scholars have a responsibility to provide research leadership that also guides practice (Sutton 2000b). With the challenges of working in a contemporary environment where practice is evolving rapidly, this evolution may necessitate that the researcher consider alternative research methods. In many cases, substantive theory may not be available to guide research efforts; the researcher may need to first consider using methods appropriate to the development of theory. However, the other risk is that the researcher may not be familiar with theories in various related domains (e.g., management, marketing, psychology, sociology) that may help to guide the development of a given research study.

Throughout the remaining chapters in this monograph, various authors will provide detail on the theories and extant research applicable to specific AIS domains. Admittedly, a monograph is a snapshot in time and the field will have evolved before this monograph is even in print. Nonetheless, the reviews in these chapters will provide a substantial foundation in a broad range of domains for those interested AIS research.