MALAYSIAN ACCOUNTING REVIEW

Volume 8 No. 1
July 2009

ACCOUNTING INFORMATION SYSTEM: EDUCATION AND RESEARCH AGENDA

Noor Azizi Ismail
College of Business
Universiti Utara Malaysia, Malaysia

Abstract

Revolution of information technology has changed many aspects of accounting practices, which resulted in greater demand for accountants with sufficient information technology (IT) knowledge and skills. Importantly, these changes have provided new and exciting research opportunities for accounting information system (AIS) researchers. This paper aims to address issues relating to both AIS education and research. It also attempts to provide guidance to AIS curriculum design and direction for AIS research. In terms of AIS education, this paper reveals that accounting programmes worldwide have not sufficiently integrated IT knowledge and skills into the curriculum, thus resulting in the inability to produce graduates that meet the current needs of businesses. In terms of research, the paper starts with a discussion on issues relating to definition, scope and category of AIS research. In general, while IT revolution has offered various research opportunities, AIS research has provided very limited contribution to accounting or information system research and practice. Towards this purpose, this paper provides several suggestions to researchers. First, AIS researchers need to view AIS in a broader perspective where the impact of technology on all areas of accounting, auditing, and taxation should be considered within the realm of AIS interest. Second, AIS researchers have to specialise in at least one other accounting area such as financial reporting, managerial accounting, audit or taxation, in addition to AIS domain, to produce high-quality research results. Finally, it is hoped that discussions brought forward by this paper would initiate and encourage debate among accounting professionals and academics and, in particular AIS lecturers, in order to strengthen current AIS curriculum to produce high-quality AIS research that can have a notable impact on the accounting profession and business practice.

Keywords: *accounting information system, accounting education, accountant, research.*

Introduction

Information technology (IT) has revolutionised business practices and played a vital part of business strategies (Elliot, 1992; Brecht and Martin, 1996). Advancement in IT has increased the ability of organizations to make good business decisions based on the large amount of information their enterprise produces (Dillon and Kruck, 2004). Hence, investment in sophisticated IT is now considered fundamental for firms of all sizes to support, sustain and grow the business (Ismail and King, 2007). According to Elliot (2002), accounting is one of the important business areas facing unprecedented challenges due to the rapid development of IT. Many aspects of accounting practice have been changed fundamentally by advances in IT, including financial reporting, managerial accounting, auditing and taxation (Scapen and Jazayeri, 2003; Chayed and Best, 2005).

More than a decade ago, many accounting professionals and academics argued that the sophistication and complication of IT have changed the nature of accounting information system (AIS) (Walker and Denna, 1997), hence, the role of accountants (Brecht and Martin, 1996). Mauldin and Ruchala (1999), for example, claimed that advancements in IT enables users to view modern AIS in a much broader perspective and with added emphasis on the economies of business operations and strategic management. Therefore, the emergence of this knowledge-based economy and rapid technological changes will, no doubt, have significant impacts on the future role of accounting professionals (Elliot, 2002; Dillon and Kruck, 2004).

Greenstein-Prosch and McKee (2004) argued that rapid technological change, the globalisation effects facilitated by the changes, and the recent large-scale business failure such as Enron, Parmalat, and MCI-WorldCom have significant implications for both accounting professionals, and academic accountants. Furthermore, the integrated nature of Enterprise Resource Planning Systems (ERPS) widely adopted by medium and large organisations have not only changed the traditional role of management accountants (Caglio, 2003) but has substantial impact on the internal controls of the adopting companies (Sayana, 2004).

The widespread use of IT in organizations has expanded the role of accountants in the analysis and design, evaluation and use of information systems (Chayed and Best, 2005). For example, auditors need to embed technology in everything they do during the audit process (Janvrin, Bierstaker Lowe, 2008), similar to the practices of their clients (Winograd, Gerson, and Berlin, 2000). Therefore, accounting professionals, especially auditors, have to integrate new and sophisticated technology into their practices to stay relevant (Janvrin et al., 2008).

The above discussions suggest that much needs to be done to equip future accountants with sufficient IT knowledge and skills. While many researches have been conducted over the last two decades, Hunton (2002) argued that many AIS researchers are not clear with the direction of AIS researches, thus contributing little to the knowledge of AIS. Furthermore, very little is known about IT integration in accounting curriculum (Chayed and Best, 2005) especially those in the developing economies (Riccio and Gramacho

Sakata, 2002). Hunton (2002) called for accounting professionals and academic accountants to work together to educate and prepare future accountants in a complex and rapidly changing environment. Ignoring these changes is like pushing the accounting profession to the sidelines (Ismail, 2003).

This paper aims to highlight issues relating to AIS research and education. More specifically, the paper discusses how the revolution in IT has changed many aspects of accounting practice and education, and as a result, offers new and exciting challenges and research opportunities to accounting professionals and academic accountants. In addition to shedding lights into the direction of AIS research, this paper also provides guidance on the design of AIS curriculum.

This paper is organized as follows: the first section of the paper provides an overview of the history of AIS, followed by a description of issues facing AIS education. Issues such as the scope and categories of AIS research are then discussed. The paper ends with a brief conclusion on AIS education and research agenda.

History of Accounting Information System

This section discusses the history of AIS. First, it highlights the role of accountants in the early years of computerization and the emergence of AIS courses. Then, it discusses how accountants lost controls of organizational information systems which led to the emergence of information systems discipline. The section ends with brief discussions on the revolution of IT, its impact on accounting profession and AIS, and the emphasis on accountants with IT knowledge and skills.

In the early years of computerization, AIS was almost always the first to be automated. Among the popular accounting modules were general ledger, accounts receivable, accounts payable, and payroll. According to McMickle (1989), only accountants have the knowledge and privilege to use IT-related devices and systems in 1950s and 1960s. During that time, AIS courses were offered in most universities in the United States and became a vital component of most accounting degree programmes (Sutton, 2004a). A body of information system specialists also emerged within most accounting departments.

The trend, however, started to change in the 1970s. As accountants were busy with the technical accounting issues, such as the format of financial statements, they started to hire technical assistants, known at that time as "machine accountants" to operate the technology (McMickle, 1989). This group of machine accountants then gradually began to distance themselves from the accounting profession. They were eventually given full responsibilities to develop and maintain organizational AIS. This new trend witnessed the emergence of the field of information system as a sub-discipline of accounting.

Information technology was later used to experiment with providing other useful information outside the traditional scope of accounting, which had significant implications on the architecture of the financial accounting system. Unfortunately, accounting

65

professionals had further distanced themselves from this new demand. The result was that AIS courses were being dropped from the accounting curriculum in most universities in the United States during 1970s (McMickle, 1989). At most universities in the United States, the information system discipline was separated from accounting departments and became stand-alone departments that often found more common ground when interacting with colleagues in computer science, engineering, or information sciences than with colleagues in accounting (Sutton, 2004a). During this period, the gap between accounting and IT deepened both professionally and academically.

During 1980s and 1990s, the creation of the concept of resources-events-agents (REA) and the advancement in database technology saw the emergence of a new accounting model (Walker and Denna, 1997). The REA, which is based on economic changes rather than debits and credits as in traditional accounting model, enables AIS to capture data beyond the historical- and financial-related accounting boundary (Mauldin and Ruchala, 1999). Following this, organizations began to rethink the way they used IT to provide information and support decision-making. This meant the way to develop applications that gather detailed business data and apply rules that govern the execution of business activities in real-time. Information system was then developed across a much broader array of tasks in non-accounting divisions of organizations. Following this, the information system domain began to mature and become a strong, independent discipline in its own right.

While business practices and accounting procedures have developed and matured a great deal over the past centuries, the revolution of IT has disrupted the peaceful existence of accounting profession by radically transforming the manner in which business is conducted. Since the turn of the century, accounting profession is argued to have passed its prime and, in its traditional state, is experiencing a decline (Hunton, 2002). The accounting profession began to realise that technological development has resulted in them losing control over information and information system. As Williams (2000) noted, the people driving organizations are no longer the accountants; rather they are the information system people. While the statement is still arguable, the increased availability and sophistication of IT have certainly increased pressure on the accounting profession to do things differently.

The related impact on accounting has been a growing market in AIS with a high demand for lecturers with AIS knowledge and skills and for students who have an education that blends both accounting and IT knowledge and skills (Arnold and Sutton, 2001). Therefore, accounting programmes need to incorporate sufficient IT knowledge and skills into the curriculum to meet the current demand of business world. More importantly, accounting professionals and academic accountants began to recognise the profound impact that IT was having on the processing of accounting information in major organisations (Suton, 2004a). This new trend offers greater opportunities for accounting professionals and academic accountants to develop new ways of looking at the roles of accounting in the information age.

Accounting Information System: Education Perspective

The previous section discusses the history of AIS and the impact of IT on accounting profession. This section highlights the importance of integrating IT into the accounting curriculum, followed by results of prior studies. It then discusses issues in AIS education and ends with recommendations to accounting educators.

Elliot (1992) made the point that "information technology changes everything". He emphasized that the survival of accounting profession rests with its ability to integrate new and sophisticated IT into the accounting practices. Recognising the importance of IT to the accounting profession, the International Federation of Accountants (IFAC) issued an International Education Guideline IEG11 named "Information Technology in the Accounting Curriculum" in December 1995. The guideline was revised several times due to the rapidly changing IT and business environments. The IEG11 has recently been re-titled as Practice Statement 2.1 "Information Technology for Professional Accountants" (IFAC, 2006).

Practice Statement 2.1 outlined a modest set of IT requirements for professional accountants. Included in the guideline are lists of general IT education requirements, user role requirements, and designer, manager and evaluator requirements. The argument is that, professional accountants, in addition to extensively using various types of IT, also play important managerial, advisory and evaluative roles in connection with the adoption, deployment and use of various technologies by organisations of all types and sizes.

Despite the importance of IT to the accounting profession, Boritz (1999) argued that academic accountants worldwide are not moving aggressively enough to develop sufficient pre-qualification competencies at the tertiary level. The results of several recent studies provide mix supports for the argument. For example, Murthy and Groomer (1996) reported that advanced topics such as databases and modelling received very little coverage in AIS curriculum across the United States. Based on the results of a content analysis, Bain, Blankley and Smith (2002) concluded that the core content of AIS courses in the United States comprises of an introduction to information system, transaction processing, and internal controls. Dillon and Kruck (2004) reported that a limited number of colleges and universities in the United States offer AIS programmes at the undergraduate level. Those that offer the programmes are located in major metropolitan areas with an average of nine courses in the AIS curriculum. Chayed and Best (2005) reported that AIS coordinators in Australia lack awareness of the guidance provided by IFAC. Chandra, Cheh and Kim (2006) explored the use of IT in management accounting courses and concluded that accounting students are not being taught the necessary skills required by the business world. More recently, Badua (2008) reported an increase in topical diversity of AIS course topics offered and the choices of software in AIS courses in the United States.

Despite calls from professional accounting bodies such as IFAC to integrate sufficient IT knowledge and skills in accounting curriculum, results from prior studies indicate that the issue of integration remains a big concern among accounting professionals and educators. One obvious problem to the issue, according to Boritz (1999), is that IT is not considered

a core knowledge area like financial accounting, management accounting, auditing and taxation. Boritz (1999) suggested that an initial step to integrate IT into the accounting curriculum is by formally defining IT to be part of the core programme. However, accounting programmes cannot simply add additional IT-related courses to the current curriculum without sacrificing existing elements. This raises the following fundamental yet significant questions: How many IT-related courses are needed to adequately prepare accounting graduates with IT knowledge and skills? And what courses should be dropped to make room for these courses? The main issue is that a majority of individuals; either accounting professionals or academic accountants in each area of expertise are reluctant to reduce, and in many cases, eager to increase the syllabus to accommodate recent business developments.

In Malaysia, the Malaysian Institute of Accountants (MIA) and Ministry of Higher Education together with the local institutions of higher learning have established "Hala Tuju 2 Program Perakaunan" report in 2006 (Jabatan Pengajian Tinggi, 2006). The objective of the report is to ensure that accounting programmes offered by local universities are in line with the global developments within the profession. One of the important points agreed by the committee is for all public universities to have a minimum of three AIS courses in the structure of an accounting programme. These courses include an introduction to IT, AIS, and system analysis and design.

Ismail, Tayib and Salim (2005) raised another important issue which is related to the significant shortage of trained academic accountants with both accounting and IT interests and skills to make significant improvements in the accounting curriculum. In Malaysia, the responsibility to integrate IT into the accounting curriculum often rests on the shoulders of a small group of junior AIS lecturers (Ismail, 2003). Therefore, the efforts to integrate IT into other areas of accounting such as financial accounting, management accounting, auditing, and taxation remain an issue among local universities.

The growth and strengthening of AIS as a discipline is not always viewed positively by other groups of accounting professionals and academic accountants (Sutton, 2004a). The common argument is that accountants should only concentrate on the "information" (I) part, which they are best at, and leaving the "technological" (T) aspect of the "information technology" to the IT or information system professionals. Many also fear that blending accounting education with IT knowledge would eventually produce "half-baked, half-cake" accounting graduates.

Being "information-oriented" professionals, accountants need not only have a good understanding of business information requirements but also information system processing capabilities in order to create and sustain competitive advantage of the organisation they work with. As Brecth and Martin (1996) noted, the accounting profession needs to expand their reporting functions beyond the scope of traditional AIS. Accountants need the knowledge and ability to analyse not only financial but also non-financial information, using appropriate technology, and convert those results into predictive tools. This is noteworthy considering what Kaplan (2006), a well established academic accountant, has previously written, "…more than two-thirds of the activities of all

accountants, financial analysts and financial managers in the vast majority of firms are essentially worthless in terms of creating or sustaining competitive advantage". Thus, a new generation of accountants, in addition to the already strong accounting and business backgrounds, also require adequate IT knowledge and skills to add value to any organisation.

To properly address this issue, one needs to understand that the aim of integrating IT into the accounting curriculum is not to produce "technically minded boffins" who have personal love affairs with the computer. The goal is to produce "hybrid accountants", whom are capable of evaluating IT issues such as strategic alignment, value delivery, resource management, performance measurement, and risk management in some depth and thereby, bridging the "information-technology gap" for themselves. It is important to understand that these knowledge and skills development approaches only need to focus on key topics, their business objectives and their business impacts. Appendix A and B present a summary of Practice Statement 2.1, "Information Technology for Professional Accountants" (IFAC, 2006) for guidance.

Finally, concerted efforts from all relevant parties are necessary to fully integrate the IT knowledge and skills into the existing accounting curriculum. Accounting regulatory body, professional body, practitioners and educators must adopt an appropriate vision for the future and take leadership roles in their areas, assess the current state of affairs, help to develop a plan to address the problems and obstacles, and a monitoring programme to encourage progress.

Accounting Information System: Research Perspective

The previous section discusses issues in accounting education. This section proceeds with discussions on issues in AIS research. First, it discusses the definition, followed by the scope and category of AIS resarch. The section ends with a brief discussion on the gap in AIS research.

Definition of Accounting Information System

Arnold and Sutton (2002) noted that the greatest challenge in undertaking any project related to exploring the boundaries and frontiers of AIS research is the inherent difficulty in defining AIS as a discipline. While several researchers have attempted to define AIS in the past, 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" (Arnold and Sutton, 2002, p. 3). Nevertheless, they argued that defining AIS research is a prerequisite to any meaningful discussion of extant and future of AIS research.

McCarthy (1990) offers what is probably the earliest definition in terms of a proposition for boundaries of AIS. He noted that "the distinguishing feature of an accounting information system is its involvement in transaction processing for accountability purposes

69

in an organization" (p. vi). Sutton (1992), on the other hand, takes a much broader view of AIS . He argued that while AIS might be usefully perceived as a subset of management information system (MIS) from a teaching standpoint, identifying an area of information system that is not of importance to AIS research is difficult. Sutton (1992) further noted that prior AIS research were influenced by a broad array of accounting research, including (1) how IT can be used to support accounting/auditing, (2) the implications of IT to the quality of accounting/auditing information, and (3) the evolution of control and auditability of AIS in an IT - based environment.

Murthy and Wiggins (1999, p. 3) defined AIS "as the logical intersection of the broad fields of accounting and management information system" (p. 3), where the connection between the two disciplines comes from computer-based information system that produces information. While both accounting and MIS are focused on information, Murthy and Wiggins (1999) argued that accounting is more focused on information itself and MIS on the systems that produce information. To avoid AIS definition that might be limiting, Murthy and Wiggins (1999), similar to Sutton (1992), also proposed that AIS research expand beyond just the explicit intersection into both accounting and MIS domains.

Quite recently, Hunton (2002) adopts a similar view as McCarthy (1990) where he defined accounting as "a specialized information system aimed at recognizing, measuring, recording, processing, and reporting economic events affecting business entities" (p. 60). The difference between accounting and information system disciplines centres on the economic implications of business events. Hunton (2002) further noted that while both disciplines investigate similar intra-enterprise issues, the information system discipline is most concerned with the technical aspects of incorporating IT into organisations, whereas the accounting discipline is most interested in leveraging IT to improve business performance while simultaneously maintaining effective internal controls.

Arnold and Sutton (2002) take an even broader view of AIS research. They argued that in the evolution of accounting, information system, and AIS, a steady shifting of dominance has occurred. According to them, while information system discipline has initially emerged as a sub-discipline of accounting, it has subsequently grown into a mature and independent discipline in its own right. On the other hand, accounting today is becoming more AIS, a growing sub-discipline in the domain of information system. Following this, Arnold and Sutton (2002) suggested that accounting scholars need to learn to research accounting as an information system discipline. They argued that all accounting research must address the implications of IT in order to maintain relevance and effectiveness, and ultimately, all this research potentially falls under the domains of AIS research.

Scope of Accounting Information System Research

From the research perspective, AIS is still a young discipline that has just begun to mature over the last decade (Hunton, 2002). Until recent years, the core of researchers working in the area has been limited and often subjected to certain weaknesses. Sutton (1992) identified three major weaknesses in the early works of AIS research. Most of early researches lack theoretical basis, focus on descriptive studies of accounting practice,

and have limited analysis thus yielding little insight into meaningful relationships. These researches tend to repeat old MIS research studies in the accounting domain but with minimal contribution to the overall information system research and to the evolution of AIS research (Sutton, 1996).

Following Sutton's (1996) argument, Hunton (2002) suggested that AIS researchers should blend traditional accounting research with information system research. The reason is that traditional accounting research, via its strong traditions in theory-based work, rigorous statistical methods, and strong analytical skills could lead to a stronger domain that is of higher relevance to the AIS theory and practice. More recently, Sutton (2004b), in his commentary about the role of and need for theory in AIS research, emphasised that AIS research must be well-grounded.

Arnold and Sutton (2002) raised another important issue which is related to the publication of AIS research. They argued that the seminal AIS research is rarely published in traditional accounting journals. Many AIS researchers have published their works in reputable information system journals such as *MIS Quarterly, Information Systems Research, and Journal of Management Information Systems. The main reason is the lack of AIS publication outlets. Two journals dedicated to AIS research are International Journal of Accounting Information Systems (IJAIS) (formerly known as Advances in Accounting Information Systems (AiAIS)) and Journal of Emerging Technologies in Accounting.*

Over the last two decades, AIS researches have covered a wide range of diverse topics and methodologies. Hutchinson et al. (2004) categorized articles that have been published in AiAIS and IJAIS from 1992 to 2003 into several research topics and issues. This paper adds to Hutchinson et al.'s (2004) study by reviewing articles published in IJAIS from 2004 to June 2009. Table 1 presents the topics and issues addressed and the percentage of articles published in each category.

The results in Table 1 show that the trend of AIS researches has changed from a general to more recent IT issues. For example, topics relating to organization and management of information system, and judgment and decision making dominate AIS research during the period from 1992 to 2003. However, from 2004 to June 2009, AIS researches focus more on topics relating to internal control and auditing, general AIS frameworks, and the Internet. This is in tandem with recent technological advancement which emphasizes on the security aspects of enterprise systems and the move towards digital and continuous systems.

Sutton (2005) in his editorial comments about the role of AIS research in guiding practice, argued that the opportunities to provide guidance and impact practice are greater in the area of AIS than any other area of accounting or information system research. He proposed three research areas that should be of interest to AIS researchers. First is the development of eXtensible Business Reporting Language (XBRL) and its potential impact on the financial markets and audit process. The second important research area that relates to the issue of continuous reporting such as XBRL is the efficacy of auditors in auditing continuous audit data. Third is the impact of enterprise systems technology such as ERPS on the control structures, user responsibilities, accounting information processing,

71

Table 1: Articles Published in AiAIS and IJAIS by Research Topics (1992-2009)

Topics	Issues	1992-2003*		2004-June 2009	
		No.	Percent	No.	Percent
Organization and Management of an Information System	Issues related to the various stages of the systems development life cycle. Examples include top management involvement in planning, the use of chargeback systems, and evaluating system effectiveness.	27	27%	6	11%
Internal Control and Auditing	Issues related to the design and evaluation of internal controls in information systems, or to the use of various types of audit tools and techniques to provide assurance about information system.	9	9%	12	23%
Judgment and Decision Making	Issues concerning the use of systems and the effects of such use on individual or group decision making.	25	25%	5	10%
Databases	Issues concerning the design and use of databases.	5	5%	2	4%
Expert Systems, Artificial Intelligence, and Decision Aids	Articles that focus on the design of expert systems or other artificial intelligence techniques.	10	10%	2	4%
General Accounting Information System Frameworks	Articles that develop frameworks to address broad accounting information system issues, such as the development of a research paradigm.	15	15%	11	21%
The Accounting and Consulting Profession	Articles that examine career-related issues in accounting and consulting.	0	0%	0	0%
Educational Issues	Articles that address curriculum design issues, describe instructional materials, or present syllabi for specific courses.	8	8%	2	4%
Internet	Issues concerning the use of Internet for business and reporting purposes.	0	0%	10	19%
Others	Other recent technology issues such as outsourcing.	0	0%	2	4%
Total		99	100%	52	100%

*Source: Hutchinson, White and Daigle (2004)

and role and decision-making patterns of management accountants. More recently, Lee and Moody (2008) highlighted several recent researches conducted by AIS researchers which include the impact of outsourcing on stock prices; the alignment between business strategy and IT strategy; the impact of ERPS implementation on stock prices; the cultural implications of ERPS implementation; and privacy protection in data mining.

Category of Accounting Information System Research

The previous section addresses issues relating to the scope and trends of AIS research. This section which discusses the category of AIS research would add understanding and direction of future AIS research.

Arnold and Sutton (2002), based on the works of David et al. (n.d.), March and Smith (1995), Sutton and Arnold (1995) and David, Gerard and McCarthy (1999), divided AIS research into two categories, i.e. social science (natural/behavioural) research and design science research. According to Arnold and Sutton (2002), social science research framework is a representative of the evolution of more traditional accounting research. Researchers in this domain conduct experimental and field research, evaluating theories, testing hypothesis, and performing statistical analysis. Design science perspective, on the other hand, has roots embedded deeply in the domains of computer science and engineering. The design science research activities emphasise on information system construction and software engineering.

Similar to the information system discipline, AIS research has often been caught in the middle of these two sciences. However, as March and Smith (1995) noted, both design science and natural science activities are needed to advance AIS research. Regardless of whether the research is a design science or social science perspective, the issue of primary importance is the motivation for pursuing a particular research project (David et al., n.d.). The question of which category to focus will depend on the academic background of the AIS researcher.

Design science, which represents the earliest foundation for quality AIS research, refers to the development of improvements in system concepts, models, design and development techniques, and system implementation and validation (David et al., 1999). Some domains in accounting research that have been enriched by this methodology include database accounting system, expert system, and object-oriented system. Examples of design science research in accounting domain includes: relational design of traditional accounting constructs (Everest and Weber, 1977); REA model (McCarthy, 1982; Dunn and McCarthy, 1997); and accounting database design (Chen, O'Leary and McLeod,1995).

Arnold and Sutton (2002), however, warned AIS researchers about the risk of design-type research. They argued that design science researchers are often infatuated with a technology rather than focused on the underlying concepts or theories related to design, development, or application of the technology. Arnold and Sutton (2002, p. 8) further noted that "…simply building a system does not advance research - rather the question that follows relates to the concept of which proof was being sought". According to David et al. (n.d.), "…making only minor design changes or implementing the same elements with a new tool, are development activities rather than research" (p. 10). Further, this perspective does not provide a good foundation for understanding the impact of IT evolutionary advancements.

73

The more traditional techniques applied by social scientists, in contrast to design science research, 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, mostly in decision-making contexts (March and Smith, 1995; Sutton and Arnold, 1995). Poston and Grabski (2000) found underlying theories used in AIS researches were borrowed from microeconomic, macroeconomic, statistical, organisational behaviour, organisational strategy, social psychology, cognitive psychology, and computer sciences disciplines. The theories among others, include: contingency theory; organizational information processing theory; technology diffusion theory; knowledge-based theory; task-technology fit theory; technology acceptance model; unified theory of acceptance and use of technology; real options theory; transaction cost economics; and agency theory; resource-based view of the firm.

However, similar to the design-type research, behavioural-type research is also subjected to criticisms. Since the extant literature of behavioural AIS research was also drawn from other disciplines such as psychology, sociology, and philosophy, the major criticism for this type of research has been whether it really is AIS research. Others have questioned as to whether they are more likely audit, managerial, or tax research. According to Arnold and Sutton (2002), the answer primarily comes down to how one defines AIS research. They argued that "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 accounting information system interest, then virtually all of this research are considered within the scope of accounting information system" (p. 9).

Conclusion

The objectives of this paper are two fold. First, it aims to address issues relating to AIS research and education. Second, it attemtps to provide direction of AIS research, and to provide guidance on the design of AIS curriculum. To achieve these objectives, the paper first highlights the history of AIS, and then discusses the past, present and future roles of accountants. The paper also discusses how the revolution in IT has changed many aspects of accounting practice and its increasing demand for accounting with good IT knowledge and skills. Following that, international accounting body like IFAC has called for a change in the curriculum of accounting programme. Results from prior studies, however, indicate that accounting programmes worldwide has yet to sufficiently integrate IT knowledge and skills into the curriculum. In terms of research, the paper addresses issues relating to the definition, scope and also categories of AIS research. While the revolution in IT has offered new and exciting challenges and research opportunities, AIS research has provided very limited contribution to accounting or information system research and practice. Most early AIS researches are claimed to be descriptive in nature and lack theoretical basis. To increase the variety and quality of AIS research, prominent scholars have called for AIS researchers to view AIS in a broader perspective where the impact of technology on all areas of accounting, auditing, and taxation is considered within the realm of AIS interest. AIS researchers also need to specialise in at least one other area of accounting such as financial reporting, managerial accounting, audit or

taxation, in addition to AIS domain, and to collaborate with other accounting researchers, where possible, in order to produce high-quality research results that can have notable impact on the accounting profession and business practice. In this so called "global networked economy" where the practice community begins to transform itself into a technology-driven information system profession, little is known about factors impacting information system and business process-oriented audits, information system assurance, e-business success, enterprise information system, 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.

References

Arnold, T. and Sutton, S.G. (2001). The Future of Behavioural Accounting (Information Systems) Research, *Advances in Accounting Behavioural Research*, 4: 141-154.

Arnold, V. and Sutton, S.G. (2002). *Researching Accounting as an Information Systems Discipline*, Information Systems Section of the American Accounting Association.

Badua, F. (2008). Pedagogy and the PC: Trends in the AIS Curriculum, *Journal of Education for Business*, 83, 5: 259-264.

Bain, C., Blankley, A. and Smith, L. (2002). An Examination of Topical Coverage for the First AIS Course, *Journal of Information Systems*, 16, 2: 143-164.

Boritz, J.E. (1999). *The Accounting Curriculum and IT*, International Federation of Accountants.

Brecht, H.D. and Martin, M.P. (1996). Accounting Information Systems: The Challenge of Extending their Scope to Business and Information Strategy, *Accounting Horizons*, 10, 4: 16-22.

Caglio, A. (2003). Enterprise Resource Planning Systems and Accountants: Towards Hybridization? *European Accounting Review*, 12, 1: 23-153.

Chandra, A., Cheh, J.J. and Kim, I.W. (2006). Do We Teach Enough IT Skills in Management Accounting Courses? *Management Accounting Quarterly*, 8, 1: 49-54.

Chayed, L. and Best, P.J. (2005). The Accounting Information Systems Curriculum: Compliance with IFAC Requirements, *Proceeding of International Conference on Innovation in Accounting Teaching and Learning*, Hobart.

Chen, N., O'Leary, D. and McLeod, D. (1995). Schema Evolution for Object-Based Accounting Database Systems, *Expert Systems with Applications*, 9, 4: 491-502.

75

David, J.S., Gerard, G.J. and McCarthy, W.E. (n.d.). (2007). *Design Science: Building the Future of AIS*, Retrieved June 11, 2007, from http://www.msu.edu/user/mccarth4/

David, J.S., Dunn, C.L., McCarthy, W.E. and Poston, R.S. (1999). The Research Pyramid: A Framework for Accounting Information Systems Research, *Journal of Information Systems*, 13, 1: 7-30.

Dillon, T.W. and Kruck, S.E. (2004). The Emergence of Accounting Information Systems Programs, *Management Accounting Quarterly*, 5, 3: 29-36.

Dunn, C.L. and McCarthy, W.E. (1997). The REA Accounting Model: Intellectual Heritage and Prospects for Progress, *Journal of Information Systems*, 11, 1: 31-51.

Elliot, R.K. (1992). The Third Wave Breaks on the Shores of Accounting, *Accounting Horizons*, 6, 2: 61-85.

Elliot, R.K. (2002). Twenty-first Century Assurance, *Auditing: Journal Pract Theory*, 17, supplement.

Everest, G.C. and Weber, R. (1977). A Relational Approach to Accounting Models, *The Accounting Review*, 340-359.

Greenstein-Prosch, M. and McKee, T.E. (2004). Assurance Practitioners and Educators Self Perceived IT Knowledge Level: An Empirical Assessment, *International Journal of Accounting Information Systems*. 5: 213-243.

Jabatan Pengajian Tinggi (2006). *Hala Tuju 2: Laporan Penilaian Semula Program Perakaunan Institusi Pengajian Tinggi Awam Malaysia 2006*, Jabatan Pengajian Tinggi, Kementerian Pengajian Tinggi.

Janvrin, D., Bierstaker, J. and Lowe, D.J. (2008). An Examination of Audit Information Technology Use and Perceived Importance, *Accounting Horizons*, 22, 1: 1-21.

Hutchinson, P.D., White, C.G. and Daigle, R.J. (2004). Advances in Accounting Information Systems and International Journal of Accounting Information Systems: First Ten Volumes (1992-2003), *International Journal of Accounting Information Systems*, 5: 341-365.

Hunton, J.E. (2002). Blending Information and Communication Technology with Accounting Research, *Accounting Horizons*, 16, 1: 55-67.

International Federation of Accountants. (1995). *International Education Guideline 11: Information Technology in the Accounting Curriculum*, IFAC Education Committee.

International Federation of Accountants (2006). *Proposed International Education Practice Statement 2.1: Information Technology for Professional Accountants*, International Accounting Education Standards Board.

Ismail, N.A. (2003). IT and Accounting Education: Issues and Challenges, *Akauntan Nasional*, 16, 1: 33-35.

Ismail, N.A., Tayib, M. and Salim, B. (2005). IT Integration in Accounting Education: Are We Ready? *Accountants Today*, 18, 7: 36-39.

Ismail, N.A. and King, M. (2007). Factors Influencing the Alignment of Accounting Information Systems in Small and Medium Sized Malaysian Manufacturing Firms, *Journal of Information Systems and Small Business*, 1, 1/2: 1-19.

Kaplan, R. S. (2006). The Competitive Advantage of Management Accounting, *Journal of Management Accounting Research*, 18: 127-135.

Lee, C.B. and Moody, J. (2008). Highlights of Accounting Systems Research, *Journal of Accountancy*, December, 86-88.

March, S.T. and Smith, G.F. (1995). Design and Natural Science Research on Information Technology, *Decision Support Systems*, 15, 4: 251-266.

Mauldin, E.G. and Ruchala, L.V. (1999). Towards a Meta-Theory of Accounting Information Systems, *Accounting, Organizations and Society*, 24: 317-331.

McCarthy, W.E. (1982). The REA Accounting Model: A Generalised Framework for Accounting Systems in a Shared Data Environment, *The Accounting Review*, 57: 554-578.

McCarthy, W.E. (1990). The Journal of Information Systems Editorial Guidelines, *Journal of Information Systems*, 4, 2: iv-x.

McMickle, P.L. (1989). Accounting Systems: Past, Present and Future, *The Accounting Systems Journal*, 1, 1: 1-3.

Murthy, U. and Groomer, S. (1996). An Empirical Analysis of the Accounting Information Systems Course, *Journal of Information Systems*, 10, 2: 103-127.

Murthy, U.S. and Wiggins, Jr. C.E. (1999). A Perspective on Accounting Information System Research, *Journal of Information Systems*, 13, 1: 3-6.

Poston, R.S. and Grabski, S.V. (2000). Accounting Information System Research: Is It Another QWERTY?, *International Journal of Accounting Information Systems*, 1: 9-53.

Riccio, E.L. and Gramacho Sakata, C. (2002). Information Systems and Technology in Accounting Education: A Web-Based Study Comparing Portuguese and Brazilian Universities Accounting Curricula, *Proceeding of European Conference of Accounting Information Systems*, Copanhagen.

Sayana, S.A. (2004). Auditing Security and Privacy in ERP Applications, 4, Retrieved March 13, 2008, from http://www.isaca.org/Content/NavigationMenu/Students_and_Educators/IT_Audit_Basics/IT_Audit_Basics_Auditing_Security_and_Privacy_in_ERP_Applications.htm

Scapens, R.W. and Jazayeri, M. (2003). ERP Systems and Management Accounting Change: Opportunities or Impacts? A Research Note, *European Accounting Review*, 12, 1: 201-233.

Sutton, S.G. (1992). Can We Research a Field We Cannot Define? Toward an Understanding of the AIS Discipline, *Advances in Accounting Information Systems*, 1: 1-13.

Sutton, S.G. (1996). Have We Lost the Accounting in AIS? The Need for Leadership in a Technology Driven Accounting and Audit Environment, *Advances in Accounting Information Systems*, 4: 1-10.

Sutton, S.G. and Arnold, V. (1995). Opportunities Neglected: Foundations for Behavioural Accounting Research in Information Systems, *Advances in Accounting Information Systems*, 3: 201-223.

Sutton, S.G. (2004a). Editors Comments: Rediscovering our is Roots, *International Journal of Accounting Information Systems*, 5: 1-4.

Sutton, S.G. (2004b). Editors Comments, *International Journal of Accounting Information Systems*, 5: 281-284.

Sutton, S.G. (2005). Editorial: The Role of AIS Research in Guiding Practice, *International Journal of Accounting Information Systems*, 6: 1-4.

Walker, K.B. and Denna, E.L. (1997). Arrivederci, Pacioli? A New Accounting System is Emerging, *Management Accounting*, 79, 1: 22-30.

Williams, P. (2000). E-Commerce Now and the Future. *A Paper Presented at International Research Symposium on Accounting Information Systems*, Brisbane, Australia.

Winograd, B.N., Gerson, J.S. and Berlin, B.L. (2000). Audit practices of Pricewaterhouse Coopers, *Auditing: Journal of Pract Theory*, 19, 2.

Appendix A

General IT Knowledge Requirements	
Knowledge Area	Illustrative Topics
IT architecture	General systems concepts, transaction rocessing, hardware, software, data organization and access
System acquisition/ development	Investigation and feasibility study, system design, selection, development, implementation, maintenance
Management of IT	IT organization, change controls, performance monitoring
IT strategy	Enterprise strategy and vision, IT strategic planning, IT governance
Business process enablement	Impact of IT on entity's business models, processes and solutions

IT Controls Knowledge and Comptency Requirements	
Knowledge Area	Illustrative Topics
Control frameworks	Select suitable control criteria to analyze and evaluate controls
Control objectives	
Responsibility for control	Evaluate control environment
Control environment	Evaluate system acquisition/development process and controls
Control over acquisition/ development	Evaluate risk assessment processes
Risk assessment	Evaluate system processing operations and controls
Control activities	
Information and communication	Evaluate monitoring processes
Monitoring of control compliance	

Appendix B

User Role Competency Requirements
- Apply appropriate IT systems/tools to business/accounting problems
- Demonstrate an understanding of business and accounting systems
- Apply controls to personal system

Manager Role Competency Requirements
- Manage entity's IT strategy
- Manage IT organization
- Manage IT operations effectiveness and efficiency
- Manage inter-organizational computing
- Manage end-user computing
- Maintain financial controls over IT
- Manage IT controls
- Manage system acquisition, development and implementation
- Manage system change and problem management

Designer Role Competency Requirements
- Analyze and evaluate role of information in the entity's business processes and organization
- Apply project management methods

(*Continued*)

79

(Cont.)

- Apply system investigation and project initiation methods
- Apply user requirements determination and initial design methods
- Apply detailed system design, acquisition/development methods
- Apply system implementation methods
- Apply system maintenance and change management methods

Evaluator Role Competency Requirements
- Obtain and document an understanding of the flow of transactions and elements of control relevant to the audit
- Tests and evaluate relevant information systems controls over financial reporting processses and asset safeguarding
- Test computer-based records to establish their accuracy and to substantiate financial representations
- Plan system evaluation
- Evaluate system, including application of computer-assisted audit techniques (CAATs)
- Communicate results of evaluations and follow up

80