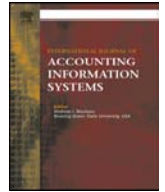


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## A conceptual foundation of design and implementation research in accounting information systems

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### ABSTRACT

This structured literature review focuses on the design and implementation of systems in Accounting Information System (AIS) research. The review has two objectives: 1) To look in depth at AIS research regarding the design and implementation of information systems related to accounting in the last fifteen years; 2) To understand design and implementation issues in AIS. To do so, this research examines the current state of design and implementation research in the domain of AIS, using a structured review of abstracts in top-level Information Systems, Accounting, and AIS journals. Using a design science in IS theoretical framework, the review categorizes themes and trends in AIS literature. Some of the most relevant themes include audit/auditors, enterprise resource planning, monitoring and control, adoption, and decision making. The most relevant issues include training, commitment, investment, culture, and existing business processes. The research includes gaps, limitations, and opportunities for future research.

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### 1. Introduction

The Accounting Information Systems (AIS) field, just like the Information Systems (IS) field, covers a broad range of topics. The nature of accounting practices has evolved greatly over the years, especially as information systems have evolved. Organizations face new accounting issues in the twenty-first century such as knowledge management (Bogdana Pugna and Boldeanu, 2014), information security (Steinbart et al., 2012), the cloud (Alali and Yeh, 2012; Geerts and O'Leary, 2015), etc. The multidisciplinary nature of these fields lends the need for a review of literature periodically to go in depth on AIS topics. One objective of this research is to look in depth at AIS research regarding the design and implementation of information systems related to accounting in the last fifteen years.

Implementation issues may not be a primary concern for researchers, as researchers should focus on benefits to the firm (Grabski et al., 2011). As such, this research aims to understand design and implementation issues in AIS, and furthermore, understand the benefits. To fulfill these purposes, this research examines the current state of design and implementation research in the domain of AIS, using a structured review of abstracts in top-level IS, Accounting, and AIS journals. The contribution of this research is summarizing and classifying design and implementation literature within the AIS community along with implementation benefits, identifying themes in the literature, and outlining and summarizing challenges and opportunities for additional research.

This literature review on design and implementation in the context of AIS research focuses on the information system side (design, development, implementation, etc.) of AIS. The review focuses on the last fifteen years of AIS research, from 2004 to 2018. This time frame is applicable because of the convergence of two important events. First, President George W. Bush signed the Sarbanes-Oxley Act into law on July 30, 2002. As a result, organizations began implementing new policies, systems, audit prac-

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tices, etc. to comply. This had a tremendous effect on businesses and accounting practices for all companies, including foreign subsidiaries, and led to the creation of laws in other countries (Kumar et al., 2008). Second, this was a time when the Web was evolving. Web 2.0 technologies, including user generated content and social media, changed how we work, interact, and design systems. Web 2.0 affected accounting by enhancing collaboration, information dissemination, and sharing (Yu and Hui, 2007). The following sections detail related literature, research method, themes identified in the research, elaboration on these themes, AIS implementation benefits, gaps where research themes are scant, and then a summary of challenges and opportunities for the AIS research community and for practice.

## 2. Background and literature review

The design and implementation of systems in accounting research has had tremendous impact on both research and practice. The effective design, implementation, and use affects many stakeholders including governments, system users (e.g., auditors, accountants), and developers. For instance, the New York state government faced complexities in adopting a new accounting system due to external issues such as legacy systems and legal constraints (Fisher and Bradford, 2005). As accounting systems evolve and governments (and any organizations) update legacy systems, they face challenges such as communication and knowledge management (Boer and Van Engers, 2013; Lye et al., 2005).

Regardless of the challenges to developing AIS, users and developers are keys to success. Many researchers have found successful implementation to influence the success of the project and financial success due to new IS. This is true across many domains and methods. For example, in the health care industry, hospital accounting systems see the highest success with the successful collaboration of development teams and physicians (Eldenburg et al., 2010).

Implementing knowledge management systems faces many challenges in the literature. Many of the issues may stem from differing managerial and cultural issues depending on country (Bogdana Pugna and Boldeanu, 2014). Training is an issue for many implementations (Bogdana Pugna and Boldeanu, 2014; Stanciu and Tinca, 2017), as is limited IT audit investments, failure to focus on knowledge management processes, and lacking focus on process implementation (Stanciu and Tinca, 2017).

Involvement and commitment to the system is another issue. For instance, AIS researchers may see this challenge when capturing affect and behavior using the experience sampling method (Baxter and Hunton, 2011). Successful Enterprise Resource Planning (ERP) implementations are typically projects which include change management and training, a review of financial benefits versus costs, and understanding organizational types and cultural factors (Grabski et al., 2011). Dashboards have become a useful tool for strategic management, but often dashboard design is poor. Ways to combat this is to design with high flexibility and include relevant popups and warnings to the user (Yigitbasioglu and Velcu, 2012).

Some studies focus on specific implementations, such as converting large-scale legacy information systems. In these cases, researchers may explore these issues and practitioners can design systems based on these issues, which include the role of strategic IS planning, stakeholder analysis, organizational approaches, and business process analysis (Fisher and Bradford, 2005). Software as a Service (SaaS) and other cloud and infrastructure adoptions are also prone to challenges, such as environmental factors or system complexity, and sometimes external factors may be even greater than internal factors (Kung et al., 2015). Refer to Kung et al. (2015) for an extensive analysis of factors, which makes specific suggestions depending on the type of industry. As stated in Grabski et al. (2011), research should go beyond implementation issues, to understand the benefits of implementing new systems. Previous studies identified individual system benefits, but this is the first review (to my knowledge) to collect the benefits of multiple systems and domains in one paper.

## 3. Research method

The research method follows a structured literature review prescribed by Webster and Watson (2002). The review followed three high-level steps, which I will detail in the following subsections. First, I identified relevant journal outlets and searched for relevant articles in each journal. Second, I confirmed the relevancy of each article to design or implementation of systems within the context of AIS, with a concept-centric approach. Third, I performed a text analysis of the abstracts.

### 3.1. Identify outlets and articles

The review focused on eight of the top journals in IS (Currie et al., 2016), eight of the top journals in accounting (Mingers et al., 2012; Rowlinson et al., 2015; Scimajo, 2018), and six of the top journals in AIS (Chiu et al., 2019). The AIS journals cover a breadth of AIS topics such as IS, education, emerging technologies, and finance. Table 1 details these top 22 journals, their domain, and abbreviations.

The literature search for this study ranges from 2004 to 2018. Using online library databases such as JSTOR, ProQuest, ScienceDirect, etc., each journal discipline required a different set of search terms to identify design and implementation research in the field of Accounting Information Systems. For each of the IS and Accounting journals, I used the search criteria: "accounting information systems" on any field, AND design OR implementation IN the abstracts. For the AIS journals, I used the criteria: design OR implementation IN the abstracts only. I searched the abstracts only because the terms design and implementation are somewhat general, and if the terms appeared in the abstract, design or implementation has a higher probability of being relevant to the context of this research. The initial identification phase returned approximately 200 potential articles.

**Table 1**

Top journals in information systems, accounting, and accounting information systems.

Information systems	Accounting	Accounting IS
MIS Quarterly (MISQ)	Journal of Accounting Research (JAR)	International Journal of Accounting Information Systems (IJAIS)
Information Systems Research (ISR)	Journal of Accounting and Economics (JAE)	Journal of Information Systems (JIS)
Journal of the Association for Information Systems (JAIS)	Accounting Review (AR)	Journal of Emerging Technologies in Accounting (JETA)
Journal of Management Information Systems (JMIS)	Review of Accounting Studies (RAS)	International Journal of Digital Accounting Research (IJДАР)
European Journal of Information Systems (EJIS)	Contemporary Accounting Research (CAR)	Accounting Information Systems Educator Journal (AISEJ)
Information Systems Journal (ISJ)	Accounting, Auditing and Accountability Journal (AAAJ)	Intelligent Systems in Accounting, Finance, and Management (ISAFM)
Journal of Strategic Information Systems (JSIS)	Critical Perspectives on Accounting (CPA)	
Journal of Information Technology (JIT)	Accounting, Organizations and Society (AOS)	

### 3.2. Confirm relevancy

The next step was to confirm the relevancy of the articles to the design or implementation of systems. The criteria I used was not specific to the design or implementation specific to AIS, as this may exclude other systems. For example, many of the studies focus on the implementation of ERP systems, which is a large enterprise system that includes an organization's AIS. For the article to be relevant, the article needed to impact or have a relationship with AIS. I also removed articles for irrelevancy to ensure focus on the information systems side of AIS, because some articles include the word "design" for other reasons, such as their research design.

During this phase, I skimmed or searched the articles for relevant terms to determine context and relevance to this review. If the article did not fit the context, I removed the article from the analysis. If the article did fit the context, I captured the author(s), keywords, abstract, year, and journal name. In some journals, especially Contemporary Accounting Research, the authors do not supply keywords or an abstract. When this occurred, I developed a set of three to 6 keywords for the article to represent the keywords and abstract. For instance, I skimmed each article, identified the main topic, research methodology, and phenomena of interest (e.g., ERP, auditing). At the end of this phase, I had 112 articles to analyze.

### 3.3. Text analysis of abstracts

The final step of the analysis was to analyze the abstracts to identify themes across the literature. When performing a text analysis, analyzing research article abstracts in a quantitative way may be able to unveil the content of a collection of articles in an informative way (Gillaerts and Van de Velde, 2010). To perform this analysis, I copied all 112 abstracts into a Microsoft Word (Word) file (four articles did not contain abstracts, so I added keywords instead). Next, I performed a spell check to identify any errors in the copy/paste process of going from a Portable Document Format (PDF) to Word format. For example, if a word overlaps two lines in the PDF, sometimes Word hyphenates the word (e.g., accounting becomes account-ing).

Third, I combined dozens of common phrases, terms, and acronyms so the analysis tool would understand the terms. I removed any acronyms within parentheses, because authors often introduce the acronym at the first occurrence. For example, when authors introduce Information Technology (IT) to the readers, the term Information Technology appears only once, not twice. I then changed acronyms to full terms – for example, ERP (and ERPs) became EnterpriseResourcePlanning. Next, I combined salient terms. For example, Accounting Information System, Accounting Information Systems, AIS, and AISs became AccountingInformationSystem. I then did the same for Information System(s), Information Technology(ies), Management Control System(s), and so on.

Fourth, I copied the text and pasted it into an online word counter (Countwordsfree, 2018), then copied the results to Excel. The original analysis identified 1000 different words. I then removed many of the common irrelevant words, such as articles (e.g., the, an), prepositions (e.g., with, in), and other generic words (e.g., research, paper, information). Next, I sorted alphabetically by the words, combined word forms missed in step three, and updated the word counts (e.g., if management control system occurred eight times, and management and control system occurred nine times, I combined these into a single term which occurred 17 times). Last, I removed words which occurred fewer than ten times. I chose this number because if a word occurred ten or more times, the word likely appeared in at least two different articles.

## 4. Results

The results begin with demographic-type information based on journals and discipline. I then go in depth on word counts, popular topics, and themes. The results by discipline show the AIS discipline publishes the most design and implementation research related to AIS topics. The top IS journals rarely publish any AIS research (six articles related to design and implementation in eight journals). Accounting journals publish significantly more (40, in eight journals), while AIS produces the most design and implementation research (65, in only six journals). See Fig. 1 for the total publications by journal and discipline from 2004 to 2018.

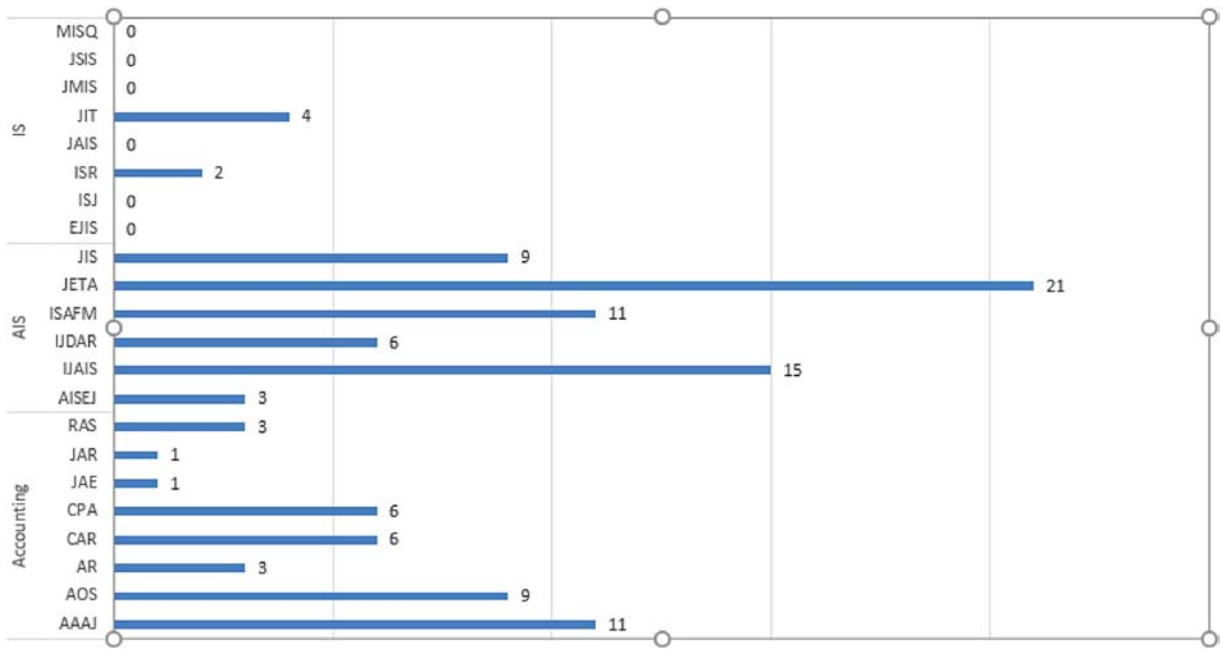


Fig. 1. Total publications of design and implementation research related to AIS, 2004–2018.

Next, I assessed the publications by year. From 2004 to 2018, as seen above, top IS journals do not publish much AIS research. Prior to 2004, some of the top journals in IS and Accounting published research on AIS. However, most top IS journals stopped producing AIS research after around 1990. In sum for the three disciplines, there were 112 articles - see Fig. 2 for details by year. The results show there is a slight negative trend.

Next, I counted the occurrences of relevant words or phrases in the abstracts. The counts include combined terms to avoid duplicating the base words. For example, *Accounting* appears 147 times while *Accounting Information System* appears 68 times – this means *Accounting* appears 215 times. See Table 2 for a list of the 60 relevant most used terms.

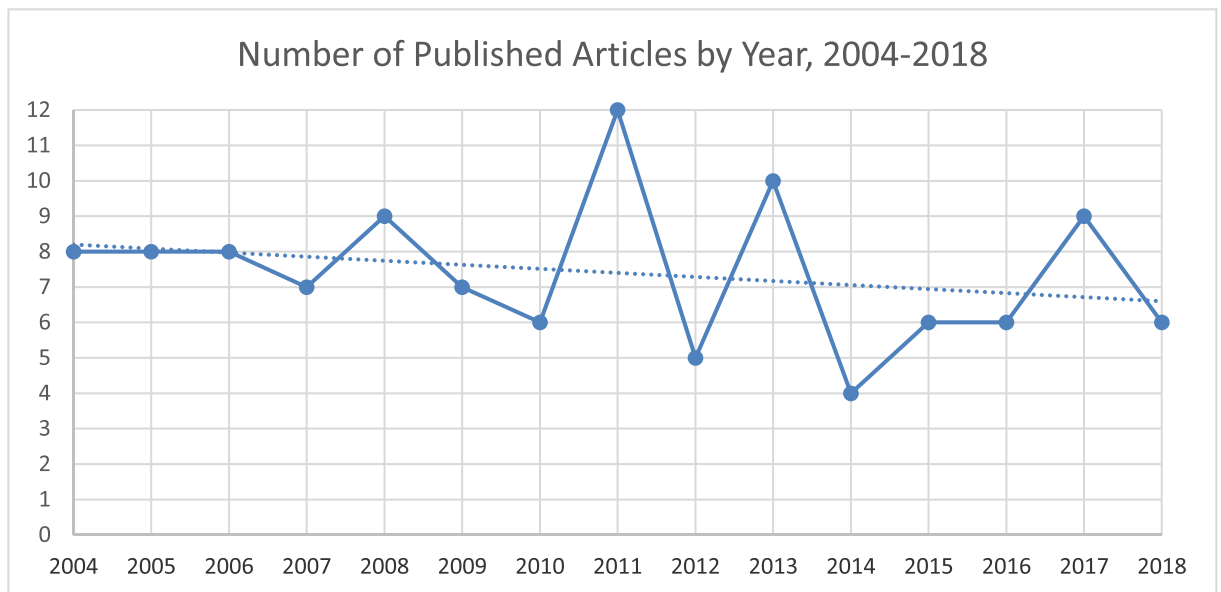


Fig. 2. Total publications of design and implementation research by year, 2004–2018.

**Table 2**

Count of the most used words and terms from the articles.

Rank	Word/Term	Count	Rank	Word/Term	Count
1	Accounting	147	31	Internal	34
2	Systems	128	32	Risk	31
3	Research(ers)	120	33	Issues	30
4	Management	117	34	Continuous audit/control/monitoring systems	27
5	Organizational/organizations	112	35	Integration	26
6	Implementation	102	36	Social	25
7	Design	90	37	Environment	23
8	Audit/auditing/auditors	76	38	Quality	23
9	Develop(ment)	75	39	Framework	21
10	Processes	75	40	Information technology	21
11	Enterprise resource planning	71	41	Blockchain	20
12	Accounting (information) systems	68	42	Database	17
13	Controls	67	43	Operational	17
14	Information	67	44	User	17
15	Models	63	45	Fraud	16
16	Data	62	46	Governance	16
17	Knowledge	61	47	Emerging	15
18	Firms	58	48	Generalized audit software	15
19	Performance	56	49	Software	15
20	Analyze/analysis	55	50	Adoption	14
21	Financial	52	51	Assurance	14
22	Technologies	52	52	Economic	14
23	Theoretical/theories	49	53	Empirical	14
24	Strategic/strategy	47	54	Monitoring	14
25	Reporting	46	55	Ontologies	14
26	Decisions	42	56	Management control systems	13
27	Information systems	37	57	Experiments	12
28	Students	37	58	Usefulness	11
29	Produce/productivity	35	59	IFRS	10
30	Structural	35	60	Microfinance	10

## 5. Discussion

The discussion focuses on a few primary categories within the literature. Information systems affect people, organizations, and technology, through both practice and research. As such, I will categorize the discussion around these elements. First, I discuss overall trends and themes in AIS design and implementation research from an individual, organizational, and technology perspective, regarding themes and terms worthy of further discussion. Second, I discuss the research categories of these topics from the perspective of theories used or developed, and common research methods. Third, I identify gaps in the research, which include opportunities for future research. Last, I identify benefits in the AIS research. Throughout this section I identify current design and implementation issues.

### 5.1. People

The people components correspond to themes of auditors, management, and ERP. As audit is one of the primary disciplines within accounting, auditors are an important theme in the research. They also are the primary users of AIS, so some studies in this theme take the view of auditor attitude and self-efficacy as an influence on their intention to use an audit support system; the results show their attitudes may affect the design of the AIS (Dowling, 2009). Another paper identified ERP systems as presenting new challenges to external auditors – they found even though there are new challenges, ERP systems do not decrease the quality or efficiency of auditors' work (Pincus et al., 2017).

The theme of management from the people perspective in the abstracts falls mostly under behavioral intention or system use, decision making, IT adoption, or a combination of these. Some systems-related components for people are with implementing ERP systems, the manager's interaction with enterprise-wide systems, and changes in control and operational processes (Dillard and Yuthas, 2006). Decision making is an important theme within the studies with a managerial focus. One study assessed managerial accounting practices, such as the optimal design of a managerial accounting system to support decision making and data quality (Maas et al., 2012). Another created a model to assess the impact and use of AIS for decision control and management for physician managers in the context of teaching hospitals (Abernethy and Vagnoni, 2004). Performance management systems (PMS) are also important for supporting management decision making, depending on the individual manager and organizational culture. The organizational culture has a significant effect on the design and use of PMS (Henri, 2006). Managers have new difficult decisions to make with changes in outsourcing and the emergence of cloud technologies, and the environmental factors relating to the decision to adopt SaaS (Kung et al., 2015).

## 5.2. Organizations

The organizations component has many different implications in the literature. One study examines the perceptions of investors by comparing the difference between continuous auditing (CA) versus periodic auditing, and found investors do not value one system over the other (Farkas and Murthy, 2014). Thus, the price of implementing CA systems may not be worth the cost in the context of investor relations. Audit organizations are constantly seeking to design and implement quality audit support systems, as the systems may affect the efficiency and effectiveness of audits (Dowling, 2009). Audit analytics is an emerging field, where organizations build AIS to perform analytics and simulation of computing capacity and system performance, which is an upgrade to the traditional modeling and documentation in past AIS implementations (Kim et al., 2017). Audit is also important in the realm of information security, and the research shows there are many factors influencing the relationship of audit and security functions, such as internal audit feedback and top management support (Steinbart et al., 2012).

Control is another theme, although it is more general in nature. For instance, management control systems appear in the technology component. Some studies of control in the dataset include management decision making (Abernethy and Vagnoni, 2004), management control in ERP deployments (Beaubien, 2013; Nicolaou, 2008), planning and control of management accounting information in an AIS (Jong-min, 2004), internal control processes, monitoring technology, requirements, and weaknesses under the Sarbanes Oxley Act (SOA) (Hammersley et al., 2008; Masli et al., 2010), and control strategies, policies, and procedures to mitigate data quality risks in AIS (Xue et al., 2012).

IT adoption is a major topic in IS literature, and organizational adoption plays a major role in AIS. Adoption can be on the individual and organizational level, but most studies in this review focus on organizational adoption. Many factors may affect an organization's intention to adopt SaaS, such as environmental factors, competition, and technology complexity (Kung et al., 2015).

Continuous auditing and monitoring is another theme. Continuous monitoring has grown in the research because of the response to the Sarbanes Oxley Act (Masli et al., 2010). Continuous monitoring may be beneficial because it can provide assurances over periodic monitoring and decrease the likelihood of errors, although the systems can be more sophisticated and costly (Farkas and Murthy, 2014).

Implementation issues regarding ERP systems is a major part of the literature. Companies in certain countries, SMEs, etc. face broad challenges to ERP such as cost and training. To combat this, understanding the critical success factors (such as user training) are an important focus in the research. Many organizations implement ERP in a long-term effort to reduce costs and increase productivity, although one study shows ERP implementations fail to produce these outcomes (Drum et al., 2015).

As ERP systems include accounting systems as a core component, accounting practices have evolved over the years. To address this, one study develops an agenda for ERP research for the areas of critical success factors, organizational impact, and economic impact (Grabski et al., 2011). The resulting taxonomy has implications to accounting, audit, risk management, regulatory issues, internal and external impacts of ERP, and the design of MCS. Regarding audit work, another study identified ERP as a key benefit because they can improve audit quality and efficiency, such as fewer restatements, fewer filing delays, and lower fees (Pincus et al., 2017). Another benefit of ERP systems in the context of accounting and audit is increasing management and control of inter-organizational relationships (Nicolaou, 2008).

Another focus of ERP implementation in the literature is the effect of ERP on an organization's management control systems. One study found the perceptions of ERP creates an illusion of control, which may jeopardize existing business practices (Beaubien, 2013). Another sees ERP best practices do not always work, so companies may lose some control (Dillard and Yuthas, 2006). To respond to this, they develop a Habermasian framework to analyze the cultural and social context of the organization to incorporate the ERP systems to maximize management and control. With the enterprise-wide focus, organizational performance because of an ERP implementation may be difficult to measure. One study develops a model for organizations to determine the extent adopting ERP systems impacts operational and overall performance (Uwizeyemungu and Raymond, 2009).

## 5.3. Technology

Because of technology adoption, the technology component has many overlapping themes, so I try to focus on systems and technologies: information technologies (IT) and management and control systems (MCS). First, IT appears many times in the literature, often centering on the design, implementation, and assessment of IT in the wake of SOA (Bowen et al., 2007; Masli et al., 2010) and IFRS (Ghedrovici et al., 2014; Gîrbina et al., 2012). Some of the most productive ways to delivering IT business value and project success are to create governance performance outcomes, create active IT steering committees and governance policies, align business and IT decision makers, and communicate comprehensive IT strategies and policies (Bowen et al., 2007).

Next, many studies focus on the evolution of technology and how this affects MCS. As discussed in the people section, ERP systems can create an illusion of control – as such, individuals must have agency when adopting ERP systems (Beaubien, 2013). The purpose of many MCS is to make organizations more efficient and flexible, although many organizations are unable to reap these benefits (Ahrens and Chapman, 2004).

Blockchain is an emerging technology that may have a major impact on the accounting field. While blockchain is not prevalent in this literature review, appearing in only three articles, it is starting to gain traction. The research on blockchain has many applications in the literature. Transaction processing systems (TPS) provide real-time accounting through a blockchain, and may integrate seamlessly with ERP and CCM systems (Wang and Kogan, 2018). Blockchain technologies may also improve supply chain performance, and ontologies may contribute to improved blockchain design (Kim and Laskowski, 2018). One important question is whether blockchain may come to be a more secure alternative to current accounting ledgers (Coyne and McMickle, 2017).

## 5.4. Research

The Research category consists of two components – developing/building theory and justifying/evaluating theories.

### 5.4.1. Develop/build theory

Much of the literature uses or builds theoretical tools for the design, implementation, and use of AIS. One tool uses a temporal perspective to understand the effects of ERP systems on an organization's MCS (Beaubien, 2013). Many studies also use existing theory to explain phenomena in the context of AIS. Social theories, such as labor process theory, are lens for viewing organizations on a broader perspective, and to recognize the social forces of the design and use of an AIS in organizations (Dillard, 2008). Other lenses are common in many IS studies – Adaptive Structuration Theory and the Theory of Planned Behavior. Much IS research also uses the theory of communicative action in the context of developing and implementing systems. One study uses this Habermasian view to develop a framework for the development and implementation of an ERP system (Grabski et al., 2011). Structuration theory contains an ontological framework for the role of accounting in an organization and changes in accounting practices (Englund et al., 2011).

Researchers found an auditor's attitude and self-efficacy influence their intention to use an audit support system (Dowling, 2009). Institutional theory has grown as a theoretical perspective in accounting literature, especially regarding organization theory, and provides a basis for the development of social theory for developing a framework for the socio-economic and political context of organizations (Dillard et al., 2004). Institutional theory may also explain the intention to adopt emerging technologies (e.g., SaaS) based on environmental pressures and technology complexity (Kung et al., 2015). Researchers also use institutional theory to understand how new accounting and management controls affect the adoption of management accounting and control systems in the non-profit sector (Järvinen, 2016). Administrative hierarchies can lead to administrative evil, so one study creates a critical theory methodology for identifying and describing administrative evil from a technical accounting perspective (Dillard and Ruchala, 2005).

Design theory is an important IS method for designing an IT artifact, and studies in AIS literature also use design theory. A digital platform that supports online communities (DPsOC) facilitates the online interaction of individuals in communities. Designing an effective DPsOC requires a digital platform architecture to support the mix of social interactions online (Spagnoletti et al., 2015). Design science researchers also created a web-based e-learning environment called INCASE (Arnold et al., 2013). Another study designed a fraud audit assessment system to reduce litigation and improve audit effectiveness (Lombardi and Dull, 2016).

### 5.4.2. Justify/evaluate theory

This portion includes the research methods researchers used to justify or evaluate theories and is an iterative process with the previous subsection. This subsection focuses on methods of analyzing, empirical studies, and case studies (there are others, such as field studies and experiments, but these are the common themes).

Many of the analyses center on management control systems. For instance, one study examined ERP deployments, finding changes in technology have a strong effect on management control (Beaubien, 2013). Another study analyzed MCS processes, and provides suggestions for researchers to pursue efficiency and flexibility through a MCS (Ahrens and Chapman, 2004).

Empirical studies come from many different contexts in AIS literature. Evidence shows authority structures may impact the use of AIS for decision control, management and, on cost structures (Abernethy and Vagnoni, 2004). IS reliability, especially in the wake of SOA, is another focus of empirical research. Using a formal, process-oriented ontology of an AIS, designers can define components and constraints of the AIS, which may lead to efficiency and effectiveness of reliability assessments (Krishnan et al., 2005). Following on the institutional theory focus from the previous section, empirical evidence shows significant direct and interaction effects of environmental factors influencing an organization's choice to adopt SaaS (Kung et al., 2015). Last, organizations may see positive effects of IFRS implementation, such as an increase in transparency and a decrease in capital expenditures (Ionascu et al., 2014).

Case studies are also prevalent in the literature, and assess the implementation of new IS. One paper executed a longitudinal explanatory study, exploring the differences for accountants inside and outside the accounting department regarding a new accounting system. They found inside accountants embraced new systems to improve their current identity and image, while outside accountants did not receive the new system well (Beaubien, 2013). Another study assessed the implementation of ERP systems and their effect on organizational performance. They developed a method to enable organizations to understand the operational and overall performance based on the implementation (Uwizeyemungu and Raymond, 2009).

## 5.5. Benefits

This subsection will summarize the research on benefits from IS implementations. The benefits cover a wide range of system benefits and domains. Researchers have posited the creation of environmental management accounting (EMA) would deliver innovation. One study found this link may be true, and that by using EMA practices, organizations will also achieve economic benefits, while enhancing environmental performance (Ferreira et al., 2010). Business intelligence systems also drive organizational benefits, such as successful integration of knowledge management, ERP, and management control systems (Elbashir et al., 2011). In the wake of the Sarbanes Oxley Act, organizations implemented internal control monitoring systems. The benefits rise above simply compliance, such as smaller increases in audit fees and reduced delays in auditing (Hammersley et al., 2008). Organizations implementing continuous controls monitoring may see benefits in as little as one year, such as improved

accountability and risk control, protecting cash flows, improved fraud deterrence, stronger vendor relations, stabilized controls, lower risk, and more flexible audit plans (Lombardi et al., 2014)

Researchers have also suggested the importance of alignment between internal audit, information security, and IS professionals when developing AIS. Many factors may influence this relationship, such as the level of collaboration – too little collaboration may lead to inefficiency, while too much collaboration may lead to lower auditor independence (Steinbart et al., 2012).

Understanding the cost versus benefits is an important role in AIS, especially in the ERP literature. The financial benefit often depends on organizational type and cultural factors – however, it is difficult to measure inter-organizational benefits of ERP integrations (Grabski et al., 2011). Other researchers have answered this call by assessing critical success factors in ERP implementations. Organizational benefits are typically greater when the ERP system includes finance and accounting systems – organizations may see higher accruals-based auditing quality, lower audit fees, and fewer Form 10-K filing delays (Pincus et al., 2017). Financial reporting also may improve because of the impact of ERP on constraining opportunistic management behavior (Paredes and Wheatley, 2018).

Fraud is another area of impact for investors, creditors, and other stakeholders. By developing a fraud detection model, detection mechanisms may improve by enhancing the accuracy of fraud detection (Chen et al., 2019). Updating expert fraud systems has been an ongoing challenge to auditors. AudEx is an information system which researchers designed to be flexible, adaptive, easy to learn, and may enhance auditor decision making for fraud risk assessment (Lombardi and Dull, 2016). Last, blockchain is a nascent technology, and research on its benefits is unclear. Future research can investigate how accounting will need to change to leverage the benefits of blockchain, such as security and distributed order verification (Coyne and McMickle, 2017).

### 5.6. Gaps

The purpose of this subsection is to identify areas where there is a dearth of design and implementation topics. First, privacy and security are important concerns in the design of IS, but the research lacks these considerations as privacy does not appear in any of the abstracts. Security only appears in two articles, on the relationship between internal audit and information security (Steinbart et al., 2012), and security of the blockchain (Coyne and McMickle, 2017). Second, big data, data analytics, etc. is poorly represented in the literature, although some studies address audit analytics. Business intelligence takes data from multiple sources – internal, external, competitors, etc. – and analyzes the data to make strategic decisions. These topics appear in fewer systems articles in AIS implementations versus IS literature. This could lead to a few questions. What dashboards could be useful to auditors? What data sources are most important to financial accounting practices? How does unstructured data fit into the accounting function?

Third, many people in accounting, such as CPAs, are seeing automation and artificial intelligence take over auditing and control tasks. Automation only appears a few times in the articles, as does artificial intelligence. Last, another IS direction is the cloud. Entire organizations are outsourcing their architectures to cloud platforms like Amazon Web Services. Only a few articles discuss the effect of SaaS, and none address how this may affect existing accounting information systems.

## 6. Contributions, limitations, and conclusions

This research used a theoretical framework of design IS research to identify patterns and themes in design and implementation research. Researchers can refer to this structured review to find topics for further design and implementation research depending on context, technology industry, etc. Next, researchers can build on the broad set of themes to understand specific themes on a deeper level. This research also identified gaps in the research, which provides opportunities for research concerning privacy and security of the design and implementation of systems, and blockchain systems.

Last, this research also contributes to practice. Practitioners may refer to the research to understand potential design and implementation issues of new IT systems. They may refer to the knowledge base to see how previous research has addressed environmental issues such as people, organizations, and technology. Managers and project managers may recognize these issues within their organization and plan projects accordingly.

One limitation is there is a lot of overlap in the topics. The structured analysis attempted to categorize themes but cannot reach a 100% fit. Some topics are general and are difficult to fit into boxes. However, the purpose was to give an overview of the existing literature, and this does not detract from the resulting framework. Second, the research identified 112 relevant papers, and I cannot cite all papers. This does not mean the uncited papers are unimportant, but some papers simply did not fit with the themes. Moreover, some of the papers did not contain abstracts. As such, I tried to cite the content of those papers. Third, this review contained only the top journals in IS, Accounting, and AIS. A deeper review could include middle and lower journals, and conference papers.

For researchers looking to publish AIS articles, top journals in IS contain few AIS articles. For instance, the only MIS Quarterly articles which contain “accounting information systems” are author departments! However, top accounting journals do regularly publish AIS research. If an IS researcher wishes to publish research specific to AIS, the top outlets are the specialized AIS journals first, followed by accounting journals.

One objective of this research was to look in depth at AIS research regarding design and implementations of information systems related to accounting in the last fifteen years. This review does so by providing an overview of themes relevant to the design and implementation of information systems in the context of accounting information systems. Some of the most relevant themes include audit/auditors, enterprise resource planning, monitoring and control, adoption, and decision making. Another objective of this research was to understand design and implementation issues in AIS. The most relevant issues include training, commitment,



investment, culture, and existing business processes. By addressing these issues, organizations may see the benefits such as improved application and data integration, innovative systems and accounting practices, improved fraud detection, and more.

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