Curriculum Gaps: Aligning the Bachelor of Science in Accounting Information System to Information Systems Audit and Control Association Curriculum Model

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Abstract - **This study aims to determine how aligned Bachelor of Science in Accounting Information System (BSAIS) curriculum as per CHED Memorandum Order (CMO) No. 30 Series of 2017 is with the five domains ([1] The Process of Auditing Information Systems; [2] Governance and Management of IT; [3] Information Systems Acquisition, Development and Implementation; [4] Information Systems Operations, Maintenance, and Support; and [5] Protection of Information Assets) of Information Systems Audit and Control Association (ISACA) model curriculum on Certified Information Systems Audit (CISA) certification using content analysis as follows: (1) old Bachelor of Science in Accountancy (BSA) curriculum versus ISACA model curriculum; (2) BSAIS curriculum versus ISACA model curriculum; and (3) old BSA + BSAIS curricula versus ISACA model curriculum. Results showed that with respect to old BSA curriculum versus ISACA model curriculum, the highest alignment was with Domain 1 (91.43%) and the lowest alignment was with Domain 5 (21.67%). Moreover, with respect to BSAIS curriculum versus ISACA model curriculum, the highest alignment was with Domain 3 (88.89%) and the lowest alignment was with Domain 1 (5.00%). And with respect to old BSA + BSAIS curricula versus ISACA model curriculum, the highest alignment was with Domain 1 (91.43%) and the lowest alignment was with Domain 4 (45.00%). These results were further subjected to inputs by the ISACA Manila. Final analysis yielded plausible recommendations to regulatory bodies and higher education institutions with the aim of narrowing the content gap found.**

Keywords **- accounting information system, CISA, CMO 30 Series of 2017, ISACA model curriculum**

I. INTRODUCTION

The demand for technology-based skills increases as business models gravitate toward technology-intensive processes. This puts pressure not only on the labor resource to keep abreast with this demands but also on higher education institutions (HEIs) to design academic programs which are responsive to the emerging demand of the global labor market.

Skills gap is a prevalent issue in the accounting profession as job function scales up from value stewardship to value creation (Thomson, 2017). At present, public accountants are not only information processors but are also strategic advisors (Holtzman, 2004). However, it is often difficult for employers to find accountants, even at the entry level, who matches the job requirement. This may stem from traditional accounting curriculum which to a considerable extent fails to adopt the changing skill demands of the accounting profession. This problem is nothing but new. The gap between accounting education and accounting profession has been observed since the 1980s. This issue is further amplified due to digitalization and automation, artificial intelligence, and big data which require new skills from accountants (Thomson, 2017; Eberhard, et al., 2017). These skills do not only include manipulation of technology to process financial information, but also the creation of the system that processes the information and ensuring the integrity of the system to produce faithfully represented financial information.

The International Federation of Accountants (IFAC), through International Education Standards (IES) 7 Continuing Professional Development, recognizes that technology is a significant and integral change in the environment in which accountants work and that it is imperative for accounting professionals to update and adopt to this change (International Accounting Standards Board, 2017). Information technology is also emphasized in IES 2 Initial Professional Development-Technical Competence which labeled this as initial skill requirement to be at an intermediate level of competence, IES 3 Initial Professional Development-Professional Competence, and IES 8 Professional Competence for Engagement Partners Responsible for Audit of Financial Statements.

The accounting profession regulation of the Philippines, the Professional Regulatory Board of Accountancy (PRBOA), has tended to this gap by updating accounting curriculum and creating new degree programs. The PRBOA announced the addition of three programs relevant to the accounting profession, one of

which is the Bachelor of Science in Accounting Information System (BSAIS). This program is a merger of accounting and information system as promulgated by the Commission on Higher Education (CHED) Memorandum Order (CMO) No. 30 Series of 2017. This seems to answer the call for technology-able professionals demanded by the evolution of business operations. Further, this program also aims to qualify its graduates to take AIS certification given by international organizations (CMO No. 30, s. 2017). Apparently, there is no local AIS-certification-giving body in the Philippines, but one notable international accounting certification-giving organization relevant to AIS is the Information Systems Audit and Control Association (ISACA).

The reputation of ISACA as the leading IT governance, assurance, security and control organization made its standards globally followed by practitioners, and their certifications globally renowned. A relevant certification to BSAIS is ISACA's Certified Information Systems Auditor (CISA) which is aimed to ensure that information systems (IS) professionals can respond well to the information-based business environment (ISACA, 2012). IS professionals are multi-skilled professions who are not only competent in accounting of business financial information, and auditing financial reports for faithful representation, but also in IT governance and controls to ensure that the accounting systems used to process and generate these information and reports are reliable.

ISACA issued a model curriculum, designed to provide entry-level skills and capabilities in business areas (ISACA, 2012), that is aligned to the requirements of CISA to aid HEIs in developing IS curriculum. HEIs with curriculum aligned with ISACA enjoy the benefits of their students being CISA exam-ready even after graduation.

Statement of the Problem. As such, this study is therefore directed towards assessing whether the Philippine BSAIS curriculum is aligned with ISACA's related model curriculum which has five domains: (1) The Process of Auditing Information Systems; (2) Governance and Management of IT; (3) Information Systems Acquisition, Development and Implementation; (4) Information Systems Operations, Maintenance, and Support; and (5) Protection of Information Assets. Identifying the gaps between the two curricula is essential to the goal of PRBOA of producing graduates who are at par with international standards. This also ensures that BSAIS graduates are equipped with the necessary technology-related skills and capabilities being demanded by the existing labor market.

Using input-process-output framework (Figure 1), content analysis was done as follows: (1) old Bachelor of Science in Accountancy (BSA) curriculum versus ISACA model curriculum; (2) BSAIS curriculum versus ISACA model curriculum; and (3) old BSA + BSAIS curricula versus ISACA model curriculum. After alignments and gaps identified were analyzed, they were presented to ISACA Manila for further inputs. Among the contribution of this study is to come up with plausible recommendations that will enable HEIs to design BSAIS curriculum that is responsive to the emerging demand of the global labor market in terms of skills and capabilities.

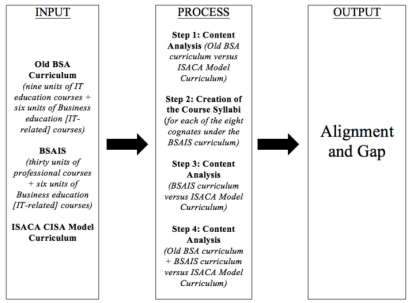

Figure 1. Schematic Representation of the Framework of the Study

Review of Related Literature

Business organizations, now, operate in an environment coined as the "fourth industrial revolution" or "Industry 4.0". It is characterized by the transformation of the entire industrial production by merging digital and internet technologies to conventional industry (Stancioiu, 2017). At minimum, the fourth industrial revolution brings about communication using the internet, cooperation in real time, information storage using Cloud Computing, new software technologies for modeling, simulation, virtualization, and the digital manufacturing, among others (Stancioiu, 2017). In general, it is expected that technology and devices will become an increasing part of each of our personal ecosystems "listening to us, anticipating our needs, and helping us when required, even if not asked" (Schwab, 2016).

However, parallel to the opportunities are tough challenges resulting from the characteristics inherent to "Industry 4.0" such as velocity of evolution, unprecedented paradigm shifts, and effects on the entire system across societies (Schwab, 2016). In addition, the digitized business operations result to data management and security issues which should be resolved (Stancioiu, 2017).

"Industry 4.0" puts pressure in both supply and demand for information systems. The demand side involves the exigency for "increasing transparency, customer engagement, and new patterns of consumer behavior" while the supply side involves the need for advances in technology to respond to said demands as well as the people who shall maneuver such technology-based platforms (Schwab, 2016).

With "Industry 4.0", business models of companies are expected to change and professionals must update their skills sets to the digital (Sachon, 2017). While all these benefits sound too enticing, a long-standing question is whether professionals of today are at pace with the fast-changing business world.

VUCA Business Environment. In synch with the fourth industrial revolution, the business environment of today is characterized as volatile, uncertain, complex and ambiguous (VUCA) (Thomson, 2017, Martin, 2012). One important implication of the VUCA business environment is the need for strategies to be pro-active and animated instead of static. As a result, organizations are supposed monitor trends steadfastly and to react to such quickly giving way to strategy choices which change as the context changes (Martin, 2012). Inherent to VUCA are challenges, but also opportunities which may be leveraged to the organization's advantage (Martin, 2012).

What Does the Industry Need? The new and fast-paced business environment inherent to "Industry 4.0" brought about challenges to the accounting academe as much as to accounting standard setting. Changes in information systems technologies, applications, and personnel bears the need to revisit the skill's for tomorrow's IS professionals (Trauth, Farwell & Lee, 1993), like the accountants. Moreover, there have been recorded a dilemma among employers to fill new and existing positions due to skills mismatch (Thomson, 2017). A research by the Institute of Management Accountants (IMA) and American Productivity and Quality Center (APQC) has found that "hiring managers face increased time and recruiting costs to fill positions", and ends up hiring less qualified individuals (Thomson, 2017). This gap between what the industry demands and what accountants are capable is said to be caused by the accounting education failing to keep up with the changes brought by technology (Aleqab, Nurunnabi, & Adel, 2015). A research by Trauth, Farwell, and Lee (1993) has cited that the IS education process, which apparently includes the accounting education, "has been criticized as incapable of producing qualified, employable IS professionals (Archer, 1983; Cardinali, 1988), and universities have been faulted for teaching obsolete technologies and irrelevant or obsolete computer programming languages" (Mandt, 1982). The emergence of advancements in technology which include "automation, artificial intelligence, and the preponderance of data', all require new skills from accountants (Thomson, 2017).

Businesses of today have extended "from value stewardship to value creation" (Thomson, 2017). To uphold this new thrust, business have invested in various information systems which is deemed to lead to substantial economic benefits, and competitive advantage (Lim et al. 2008; Dehning et al. 2003; Im et al. 2001; Ranganathan and Brown 2006; Burg and Singleton 2005) as cited by Curtis, Jenkins, Bedard, & Deis (2009). More specifically, information systems are increasingly becoming automated, requiring little to no human intervention.

Information technology has been "pervasive and impact every area of accounting"- affecting both management and financial accounting as well both financial and non-financial data relevant to the business. Accountants should, therefore, be agile in developing their skills in order to respond to the demands of the technology advancements in information systems. In fact, a research by Merhout & Buchman (nd) cited that aside from desired specific software skills, like web related tools, e-mail tools, database query languages, and PC operating systems (Fang, Lee and Koh, 2005), the preferred database skills include Oracle, PeopleSoft, JD Edwards, among others. Inevitably, "the day will come soon when accountants will need to be competent in data science to leverage and harness the power and potential of artificial intelligence (Thomson, 2017).

As a result and in response to the emerging IT trends in information systems, auditors should also be equipped with necessary skills for an efficient audit. Most information systems include application controls designed to ensure the validity of transactions, reduces misstatements, mitigating the risks of certain frauds, and contribute to efficiency (Merhout & Buchman, nd). However, such application control may not function as expected. In addition, Curtis et al. (2009) cited the research of Lynch and Gomaa (2003, 296) which suggest that IS "inadvertently provide sophisticated means and opportunities for employees to perpetrate fraud." Hence, "obtaining assurance on these systems requires greater focus on testing the process rather than the output" (Curtis et al., 2009).

For instance, in the United States from generalist auditors to IT auditors, they "shall focus on the computer-based aspects of an organization's information systems, including but not limited to, the assessment of the proper implementation, operation, and control of computer resources" (Hall and Singleton, 2005) as cited by Merhout & Buchman (nd). Also, they evaluate systems through reviewing documents, interviewing personnel, and reviewing large data sets using computer programs; and assist clients in performing control assessments mandated by SOX (Merhout & Buchman, nd).

The rapid pace of technology advancements in information systems also poses a challenge for auditors as those "without extensive systems knowledge may have difficulty understanding the complex technology supporting the business processes of their clients" (Merhout & Buchman, nd). These professionals agree that "auditors must keep pace electronically with their clients" (Bierstaker et al. 2001, 163 as cited by Curtis et al. 2009). In addition, it is imperative that auditors be aware of the factors that affect their technology acceptance.

In a recent finding of Tugas and Tullao (2017), it was found out that perceived usefulness, perceived ease of use, ethical perception, and teamwork competence significantly affect technology acceptance. As such, accounting firms should focus on interventions that would improve the technology acceptance of their auditors. As technology acceptance improves the likelihood of technology alienation decreases (Tugas & Tullao, 2017). Not to mention, that "IT auditors must also possess the general business and operational acumen often associated with internal and external auditors" (Cangemi, 2000) as cited by Merhout & Buchman (nd). More than ever, future auditors will likely need to develop and maintain even higher levels of competence with respect to understanding

and evaluating information systems and internal controls, preventing and detecting fraud, and evaluating the fair value of assets and liabilities (PCAOB) as cited by Curtis et al. (2009).

Information Technology audit may be performed by a person proficient in pure information technology, however, in the US-based research of Wier, Hunton and Beeler, IT auditors are promoted more quickly when they have the CPA designation than when they do not (Merhout & Buchman, nd). Faster promotion as well awaits IT auditors with a CISA designation (Merhout & Buchman, nd).

Accountants and auditors are faced with new challenges with the advent of technology. IS professionals of today, as a whole, "will devote as much effort in analyzing business problems as in developing technical solutions" and "they are expected to integrate technologies and applications to provide better access to corporate data" (Trauth, Farwell, & Lee, 1993).

Defining the Gap. Despite the now apparent impact of information technology to the profession, most accounting professionals still lack the necessary skills to synch with the advancements in technology. Accordingly, the industry and organizations point to the traditional accounting curriculum that has not kept pace with the evolving role of the CFO (Thomson, 2017). Further, accounting education has failed to keep up with changes brought by technology (Aleqab, Nurunnabi, & Adel, 2015). Despite the indispensable role of education to professionals, there has been a growing gap between "what accountants do and what accounting educators teach" (American Accounting Association, 1986 as cited by Thomson, 2017).

The gap is more particularly defined by (Trauth et al., 1993) as the "curriculum gap." Accordingly, the "most notable differences between the priorities of educators and practitioners fell into two areas: integration and management" (Trauth et al., 1993) or what is taught and how it is taught. The problem dwells on the lack of tools in teaching students about the hands-on aspects of integrating technology and business applications; the emphasis on traditional systems development (Trauth et al., 1993), as well as on traditional expertise such as financial accounting (Thomson, 2017); and lack of updated knowledge on information systems (Aleqab et al., 2015). This gap is attributed to problems with the relevance of IS curricula resulting from the absence of a shared vision of the appropriate knowledge and skill mix for the IS professional (Trauth et al., 1993).

In an interview with academicians in Jordanian universities, Aleqab et al. (2015) found that one of the most prevalent concern, aside from the contents of the AIS curricula, is that instructors involved in AIS curricula development and implementation have no sufficient IT knowledge." In fact, none of the instructors used business process reengineering (BPR), executive information systems (EIS), IT architecture, decision support systems (DSS), expert systems (ES), or electronic data interchange (EDI) (in contrast to what IFAC deems necessary) (Aleqab et al., 2015). In support to this, technical content is significantly missing from the content of AIS courses. (Aleqab et al., 2015).

A potential component of the curriculum gap is brought about by differing perception of the industry and the academe toward the relevance of IS. In a survey, surprisingly, "practitioners rated computer application skills as their single most important element, and they rated them to be far more important than did students and faculty" (Bain et al., 2002) as cited by Baker (2013). Aside from the content of instruction or what to teach, who is teaching, the mode of instruction, and the perception toward the relevance of IS, the following are also aspects of the curriculum that creates the gap: (a) lack of hardware and software facilities and computers or laboratories; (b) lack of school administration support; (c) excessive teaching load; (d) unfamiliarity with IFAC requirements; and (e) lack of availability of textbook (Aleqab et al., 2015).

The "Learning Theory" states that technology has affected accounting education; on one hand, "a teaching approach should offer the opportunity to experience, observe, and reflect concepts and testing implications." Hence, accounting faculty should design AIS curricula which accommodate the current best practices of IS (Flanagan and Stewart, 1991) as cited by Aleqab et al. (2015).

Requisites to Curriculum Development. In a report in the mid-1990s, the AICPA asserted that the speed of IS development had outstripped the preparedness of various domains (e.g., educators, regulators, and audit firms) to address it (AICPA 1996) as cited by Curtis et al., (2009). Trauth et al. (1993) even suggested that there is a shared vision of an IS professional between industry and the academe, but, there is an implementation problem of translating that shared vision into the academic reality.

What to Teach. Perhaps, the major contributor of the curriculum gap is the specific topics and skills in accounting information system taught in school. More specifically, "the key is an integrated approach to curricula, competencies, and training that aligns with the way business is actually conducted for sustainable value creation" (Thomson, 2017). Based on existing literature, there is indeed, a discrepancy between what the schools taught and what the industry expects. One recommendation to address this is for industries to get involved with the academe in curriculum development by communicating to universities about their expectations while recognizing that the mission of university business programs is career education and not job training (Trauth et al., 1993).

Aside from significant partnerships between the industry and the academe, "universities and colleges are encouraged to use the ISACA model curriculum (2004) when creating IT audit programs or offering IT audit courses" (Merhout & Cothran, 2006). The model curriculum is made for the purpose of setting a benchmark for industry-specific and technology-inclined competencies of IS auditors. Presented in Figure 2 is the COBIT cube, a conceptual framework, where ISACA model curriculum is anchored on. The said universally-accepted framework aids "IT professionals and enterprise leaders fulfill their IT governance and management responsibilities, particularly in the areas of assurance, security, risk and control, and deliver value to the business"(ISACA, 2012).

Moreover, ISACA developed a compliance grid which allows academic institutions and creators of curricula to map existing university programs to the ISACA model curriculum. It provides both management information systems (MIS) and accounting information systems (AIS) programs a means to compare their existing curricula to the ISACA curriculum model to be able to identify gaps (Merhout & Buchman, nd). To further this, it has to be understood that HEIs recognize the need of the industry for them to be able to provide graduates who possess the skills and capabilities which the profession needs (ISACA, 2012). The ISACA model curriculum expands the IT resources in the COBIT framework into more academic-inclined topics. These are topics intended to provide students with the necessary competencies relevant to IT resources.

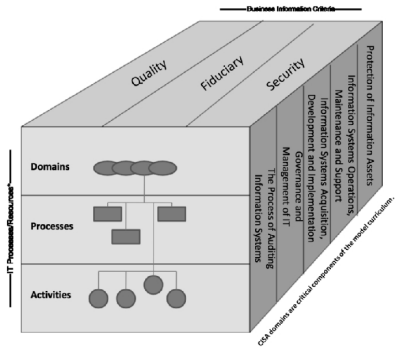

Figure 2. COBIT Cube (ISACA, 2012)

Furthermore, existing guidance on including computers, information technology and information systems in curriculum developments is also promoted by IFAC (2012) which recommends that undergraduate students should achieve broad knowledge in IT. The guidance also aims to ensure that economic decision makers can rely on the competence of accountants regardless of the country where they receive their education and training (Aleqab et al., 2015).

Who to Teach. The competence and credentials of teachers and administrators are important in implementing and running a BSAIS program. Though possessing them is ideal, it has been found out, however, that a shortage of qualified AIS in academe exists. Needless to say, this impedes knowledge transfer and learning. Anecdotally, in the Philippines, there is a dearth of AIS professionals, those with CISA and/or-related qualification and/or industry experience, who are immersed in the academe. As a result, HEIs now face faculty preparedness and readiness issues as they respond to CMO No. 30 Series of 2017.

Synthesis. The Pathways Commission of the American Institute of Certified Public Accountants (AICPA) came up with recommendations and action plans embodied in a guidance entitled "In Pursuit of Accounting's Curricula of the Future." One of the recommendations enclosed in the guidance is "develop curriculum models and engaging learning resources and mechanisms for easily sharing them as well as enhancing faculty development opportunities in support of sustaining a robust curriculum" (The Pathways Commission, 2012). Two of its action items are: (a) to connect the accounting body of knowledge to a map of competencies and related performance levels; and (b) to examine the current and emerging technologies in business. Both are relevant in creating curricula for Accounting Information Systems.

Indeed, gone are the days when accountants serve only as stewards of value, performing tasks on financial accounting, tax, and audit alone. Today, accountants are value creators. One of the ways of value creation is developing an accounting curriculum that responds to the emerging needs of the industry thereby narrowing the gap. More specifically, there is an apparent need to create a curriculum that ensures students acquire relevant technology-related skills and capabilities and in turn increase their relevance in the labor market (Parvu, Ipate & Mitran, 2014).

II.RESEARCH METHOD

Descriptive research and content analysis were employed in this study.

Old BSA Curriculum versus ISACA Model Curriculum. Firstly, the old BSA curriculum, characterized by nine units of Information Technology Education courses and six units of IT-related Business education courses, was compared to ISACA model curriculum using the five domains of CISA. The researchers determined the extent of alignment and gap between the old BSA curriculum and the ISACA model curriculum. If the old BSA curriculum is significantly compliant, then it is deemed to entitle its graduates to immediately take and pass the CISA examination, thereby eradicating the need for the BSAIS curriculum. On the other hand, if the old BSA curriculum is not significantly compliant, then there is a need to bolster the existing BSA curriculum with new courses depending on the extent of non-compliance.

Creation of the Course Syllabi. Secondly, for the proceeding steps to be done, there is a need to create course syllabi for the eight cognates under the BSAIS curriculum. It has to be understood that they are entirely new and no syllabi were included in the released CMO No. 30 Series of 2017. Hence, the researchers benchmarked on existing syllabi from the Information Technology, Computer Science, and Information Systems programs of

the CHED, if any, on international HEIs, and on other international professional certification bodies. The most recommended references among the syllabi gathered were used to define the subtopics of each major topic.

BSAIS Curriculum versus ISACA Model Curriculum. Thirdly, the BSAIS curriculum, characterized by 30 units of professional courses and six units of IT-related Business education courses, was compared to ISACA model curriculum using the five domains of CISA. This was performed to determine whether or not the BSAIS curriculum is aligned with that of the five domains of CISA. CMO No. 30 Series of 2017 provides that the new BSAIS degree program shall entitle its graduates to take global certifications related to Accounting Information System, which may include CISA. If the BSAIS curriculum is significantly compliant to the five domains of CISA, then CMO No. 30 Series of 2017 achieves its objectives. If not, then there is a need to revisit the BSAIS curriculum in order to integrate into the courses topics that were not included or to add additional courses, if necessary, to directly align with ISACA model curriculum.

Old BSA and BSAIS Curricula versus ISACA Model Curriculum. Lastly, another content analysis was initiated to compare the compliance of the combined old BSA curriculum and BSAIS curriculum to ISACA model curriculum using the five domains of CISA.

Methodological Limitation. Contrary to the alignment procedure of ISACA which requires an indication of the time allotted for each ISACA topic or counterpart topic, alignment procedure in this study between the programs (BSA plain, BSAIS plain, and BSA plus BSAIS) and ISACA model curriculum was performed on an item-per-item basis. This may limit the explanatory factor of degree of alignment of each program curriculum with ISACA model curriculum. Nevertheless, this is a preliminary study which may later on be expounded to apply rigidly the method of ISACA.

Additional Procedure. After alignments and gaps identified were analyzed, they were presented to ISACA Manila for further inputs. The presentation and discussion was held on May 10, 2018. This was attended by members of the board of ISACA Manila.

III. RESULTS AND DISCUSSION

The ISACA model curriculum towards the CISA certification is intended to develop industry-specific and technology-inclined competencies of IS auditors. The five domains identified by ISACA are: (1) The Process of Auditing Information Systems; (2) Governance and Management of IT; (3) Information Systems Acquisition, Development and Implementation; (4) Information Systems Operations, Maintenance, and Support; and (5) Protection of Information Assets. Fitted for academic instruction while still anchored on the COBIT framework, they are designed to ensure that IS auditor are able to cope with the changes in technology, determine their impact on the control and audit process, and communicate the results and evidence of their professional undertaking (ISACA, 2012). These domains were used as bases for analyzing whether the old BSA curriculum and the BSAIS curriculum are aligned with the minimum requirements of ISACA. The major topics of each domain are included in the appendices.

Old BSA Curriculum versus ISACA Model Curriculum. Presented in Figure 3 is the percentage of alignment of the old BSA curriculum with ISACA model curriculum. It can be noted that the BSA curriculum is 91.43% aligned with Domain 1. This may suggest that the current program is substantially compliant with the audit competencies prescribed by ISACA. The ISACA framework was first created as an audit tool before it became widely accepted by different companies; hence, it evolved into management tool due to the acceptance and relevance of the framework to private companies (ISACA, 2012).

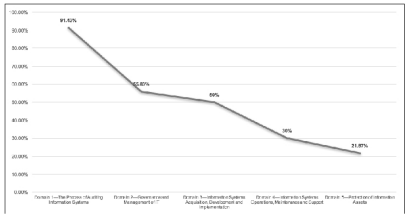

Figure 3. Old BSA Curriculum versus ISACA Model Curriculum

There were only two subtopics from Domain 1 that were not covered in the old BSA curriculum: (1) Technology and audit environment changes; and (2) Use of self-assessments. However, this result does not necessarily mean that these topics were not introduced in the class. This may suggest that under the current curriculum they are not considered as main subtopics.

Moreover, the old BSA curriculum also fails to emphasize *IT strategy, policies, standards and procedures* for an enterprise including the essential elements of each, and the *role of IT audit in governance*. These subtopics are under the second domain. Further, subtopics *IT policies, standards and procedures, monitoring and assurance practices, and IT resource management* of the second domain have zero percentage of alignment. This may suggest that these topics are also not emphasized in the current curriculum.

It can be noted that as the domain progresses to a more IT-technical discussion, the degree of alignment of the old BSA curriculum decreases. This may suggest that the current curriculum is designed to focus more on providing academic and technical knowledge for traditional accountants and auditors. Knowledge on information system and technology is only basic and fundamental. If this is the case, however, the old BSA curriculum is short in honing the skills demanded by globalization which include manipulation of technology and ensuring the integrity of the medium that processes financial information.

Considering the degree of alignment of the old BSA curriculum to the ISACA model curriculum with auditing as the common ground, it can be said that graduates of the old BSA curriculum are not fully equipped with the technical knowledge to pass the CISA examination. Graduates of the old BSA curriculum lack at least 44.17% competence in the remaining domains. Hence, they may undergo further studies or enroll in review classes to fill in the gaps, specifically on the other four domains. In addition, this may further suggest that there is a need for a new academic program which focuses not only on accounting and auditing but also on IT and IS such as BSAIS.

Creation of the Course Syllabi. CMO No. 30 Series of 2017 highlights 30 units of cognates or professional courses that are intended to provide technical, competencies, and skills for professionals who are both adept in accounting and computer software. In addition, six units of Business education courses (IT Application Tools in Business and Accounting Information System) are also inclined to IT. The CMO on BSAIS did not include sample syllabi. Hence, to come up with syllabi for the eight cognates (24 units), the researchers decided to benchmark with CMOs of related academic programs with related syllabi, international universities, and other other international professional certification bodies. Table 1 presents the bases of the created syllabi for the eight cognates. Together with the other cognates, the created syllabi were used in performing the succeeding procedures.

Table 1
Bases of BSAIS Professional Course Syllabi

	Cognates	Bases
1.	Project Management	Carnegie Mellon University; BCS – The Chartered Institute for IT (UK); The University of Sydney
2.	Information Systems Analysis and Design	Carnegie Mellon University; Stevens Institute of Technology (New Jersey); BCS – The Chartered Institute for IT (UK); George Mason University (Virginia); CHED
3.	Managing Information and Technology	University of Texas; University of Albany
4.	Information Systems Operations and Maintenance	BCS – The Chartered Institute for IT (UK); University of Saskatchewan (Canada); CMO No. 25 Series of 2015
5.	Information Security and Management	Carnegie Mellon University; Information Technology Promotion Agency (Japan); Kennesaw State University (Georgia)
6.	Enterprise Resource Planning and Management	Georgia State University; University of New South Wales (Australia)
7.	Data Warehousing and Management	Carnegie Mellon University; Philadelphia University; Syracuse University; University of West Florida; USC Viterbi
8.	Management Information System	Carnegie Mellon University; Ming-Chuan University (Taiwan); Al al-Bayt University (Jordan); BCS – The Chartered Institute for IT (UK); King Saud University (Saudi Arabia); Texas A&M University

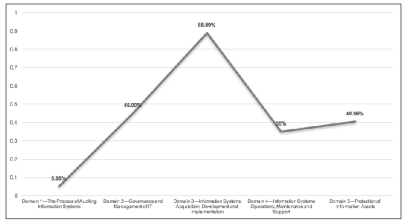

Figure 4. BSAIS Curriculum versus ISACA Model Curriculum

BSAIS Curriculum versus ISACA Model Curriculum. As reflected in Figure 4, the BSAIS curriculum is only 5% aligned with the first domain. This is attributed to the presence of the *Accounting Information System* course which tackles risk exposures and internal control structure. In addition, this insignificant level of alignment is due to the program outcome focus. BSAIS is designed to produce professionals skilled in business, accounting, and computer systems, while ISACA model curriculum to produce IS audit professionals. It can also be seen that the major topics not covered by the BSAIS curriculum in the second domain pertain to *IT policies, management, monitoring, and practices*. Domain 2 which focuses on *Governance and Management of IT*, is closely related to audit and internal control. To reiterate, BSAIS is not designed for audit professionals but for accounting professionals who are at the same time proficient in computer software.

It can also be noted that the BSAIS curriculum is more aligned with ISACA model curriculum on the last three domains than the old BSA curriculum since the former is inclined to technology and information system. However, it can still be noted that the BSAIS curriculum is less than 50% aligned with ISACA, except for Domain 3 where it is substantially aligned with ISACA model curriculum. There were only two subtopics in Domain 3 that were not covered: *(1) risk management practices applied to projects; and (2) IT architecture related to data, applications, and technology.*

The subtopics not covered by BSAIS curriculum may be attributed to the differences in the course content of the HEIs and organizations from which the created syllabi were based from with that of the content of the domains as recommended by ISACA model curriculum. These results may provide an initial assessment of what needs to be included in the course syllabi of the cognates of the BSAIS curriculum.

Notably, graduates of the BSAIS curriculum lack at least 55.00% competence in the remaining domains. This indicates that they need to be equipped more on Domain 1 and additional courses related to Domain 2, Domain 4, and Domain 5 for them to pass the CISA examination. This further suggests that BSAIS curriculum may not be able to achieve one of its goals of enabling its graduates take and pass relevant professional certifications after graduation; hence, the BSAIS curriculum needs to be revisited.

Old BSA and BSAIS Curricula versus ISACA Model Curriculum. The global labor market currently demands the following skills from business professionals: (1) manipulation of technology to process financial information; (2) creation of the system that processes the information; and (3) ensuring the integrity of the system to produce faithfully represented financial information. The old BSA curriculum already answers the first skill requirement and provides basic knowledge on the third skill requirement. On the other hand, the BSAIS curriculum provides technical knowledge on computer systems thereby addressing the second skill requirement. Hence, combining the two curricula will result in more skill requirements being achieved.

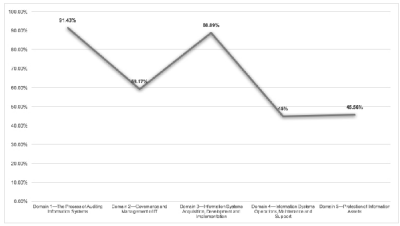

Figure 5. Old BSA and BSAIS Curricula versus ISACA Model Curriculum

As depicted in Figure 5, combining the two curricula results in a higher level of alignment with respect to Domain 2, Domain 4, and Domain 5. The increase in the alignment with respect to Domain 2, from 45.00% to 59.17%, can be attributed to the *IT governance and audit* components of the old BSA curriculum. Though increases in the level of alignment relative to Domain 4, from 30.00% to 45.00%, and Domain 5, rom 21.67% to 45.56%, are noticeable, inclusion of topics such as *service level management practices, end-user procedures and operations, maintenance of information systems, and change, configuration, and release management* in Domain 4, and *data classification processes and procedures* in Domain 5 is still to be done.

The level of alignment with respect to Domain 1 and Domain 3 did not change. This suggests that these domains are the strong points of the individual curriculum relative to ISACA model curriculum. This can be further explained by the old BSA curriculum being audit process intensive already and the BSAIS curriculum being information systems acquisition, development, and implementation heavy already. The old BSA curriculum discusses little topics on *IT project and its management* and the BSAIS curriculum discusses negligibly topics on *risk management practices applied to projects and IT architecture related to data, applications, and technology*. Despite this, a combined curriculum gives the graduates a higher chance of passing the CISA examination with less additional courses needed to be taken up.

Additional Procedure. The researchers were able to get valuable responses and insights from the members of the board of ISACA Manila when results were presented and discussed to and with them. According to them, the results are indicative of a BSAIS curriculum development team that has to have a better appreciation and perspective of what the information system and technology professionals of today render and offer. Though CHED requested for their involvement, the invitation came at the tail-end of curriculum development where significant recommendations can be less likely effected. Nevertheless, as a reactive measure, ISACA Manila will partner with the national association of certified public accountants (CPA) in education (nACPAE) in equipping teachers and developing learner's materials on technical IT and IS courses. Lastly, ISACA Manila will appreciate an earlier invitation from CHED to review the BSAIS curriculum as this they think is more than necessary.

IV. CONCLUSIONS

One of the reasons for the initiation of BSAIS curriculum was to heed to the call of IFAC to produce professionals who are able to adopt to the emerging demands of the business environment brought by various factors with technological advancements at the forefront. The resulting curriculum combines business, accounting, and computer system skills.

This study aims to determine how aligned BSAIS curriculum as per CMO No. 30 Series of 2017 is with the five domains of ISACA model curriculum on CISA certification as follows: (1) The Process of Auditing Information Systems; (2) Governance and Management of IT; (3) Information Systems Acquisition, Development and Implementation; (4) Information Systems Operations, Maintenance, and Support; and (5) Protection of Information Assets using content analysis as follows: (1) old BSA curriculum versus ISACA model curriculum; (2) BSAIS curriculum versus ISACA model curriculum; and (3) old BSA + BSAIS curricula versus ISACA model curriculum.

Graduates. Taken each separately, the old BSA curriculum and the BSAIS curriculum fall short when aligned with ISACA model curriculum. The highest alignment for old BSA curriculum was with Domain 1 *The Process of Auditing Information Systems* (91.43%), whereas for BSAIS curriculum it was Domain 3 *Information Systems Acquisition, Development and Implementation* (88.89%). Graduates of the old BSA curriculum lack at least 44.17% competence in the remaining domains. Meanwhile, graduates of the BSAIS curriculum lack at least 55.00% competence in the remaining domains. It is, therefore, recommended that graduates of either curriculum undergo further studies or enroll in review classes to fill in the gaps brought about by low alignment domains if they want to pass the CISA examination.

Results also suggest that, unlike graduates of each separate curricula, graduates of the combined old BSA and BSAIS curricula are not only well-versed in accounting and auditing but also with information systems and technology. Though combining the old BSA and BSAIS curricula might just have addressed the insufficiency of auditing skills and information system and technology-related skills in the BSAIS curriculum and the old BSA curriculum, respectively, the resulting curriculum still brings into concern the level of misalignment of at least 40.83% in the remaining domains given that the levels of alignment in Domain 2 *Governance and Management of IT*, Domain 4 *Information Systems Operations, Maintenance, and Support*, and Domain 5 *Protection of Information Assets* are only 59.17%, 45.00%, and 45.56%, respectively.

V. RECOMMENDATIONS

Higher Education Institutions. It is, therefore, recommended that higher education institutions, as they offer BSAIS program, do one or more of the following: (1) invite IS and IT professionals to teach technical courses; (2) incorporate additional semester for review courses in their curriculum; (3) partner with review centers to handle review courses; and (4) revisit existing BSAIS curriculum with respect to Domain 1, Domain 2, Domain 4, and Domain 5. In conjunction with the just mentioned recommendations, it is advised that they explore the development of a double-degree program curriculum (BSA and BSAIS). Such enhanced curriculum is deemed fit to meet the emerging demands of the global labor market and the escalating requirements of the CISA certification examination.

Regulators. As overseers of the programs of HEIs and accountancy profession, CHED and PRBOA, respectively, are strongly encouraged to ensure that competencies (accounting and auditing) encompassed by the old BSA curriculum is intelligibly integrated into the design of the enhanced BSAIS curriculum. They should also seek active involvement of ISACA Manila early on in reviewing the BSAIS curriculum.

ISACA Manila and nACPAE. ISACA Manila and nACPAE are enjoined to reinforce their partnership and come up with projects aimed at equipping teachers and developing learner's materials on technical IT and IS courses. If their schedule permits, members of ISACA Manila are also enjoined to handle classes or mentor teachers in HEIs. This will not only address the technical content gap but also the dearth of qualified IS and IT teachers thereby narrowing the "who to teach" and "what to teach" aspects of the curriculum gap and potentially that of the "mode of teaching" aspect.

Areas for Further Research. The electives recommended in the BSAIS curriculum were not included in the data analysis procedures of this study. Inclusion of these electives may affect the level of alignment between the old BSA plus BSAIS curricula versus the ISACA model curriculum. As such, it is recommended that syllabi covering: (1) risk management practice applied to projects; (2) IT architecture related to data, applications, and technology; (3) service level management practices, end-user procedures, and operations; (4) maintenance of information systems, and change, configuration, and release management; and (5) data classification processes and procedures be also benchmarked and created. Furthermore, it is recommended that future researchers pursue studies geared at narrowing other aspects of curriculum gap such as "who to teach" and "mode of teaching." In addition, future researchers may endeavor to conduct a wider and more comprehensive study of the actual skill demands of the industry particularly in the Philippines vis-à-vis the extent of how HEIs meet them. With respect to the methodological limitation on the use of item-per-item (per topic) instead of the time devoted for each subtopic as per ISACA recommendation, it is strongly advised that future research utilize the latter in determining the level of alignment. Finally, in relation to the created syllabi on eight cognates, though properly benchmarked, it is recommended that future research subject them to review by ISACA Manila and other IS and IT experts.

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APPENDIX

Appendix A

Old BSA Curriculum Alignment with ISACA Model Curriculum

Domains	Number of Subtopics	Old BSA Curriculum	Average Alignment
Domain 1—The Process of Auditing Information Systems	Risk-based IT audit strategy	80%	91.43%
	Specific audit planning	100%	
	IT audit standards	85.71%	
	Audit reporting and communications and follow-up	100%	
Domain 2—Governance and Management of IT	IT governance structures	33.33%	55.83%
	IT organizational structure and HR	75%	
	IT strategy and direction	100%	
	IT policies, standards and procedures	0	
	QMS and IT management of controls	50%	
	Monitoring and assurance practices	0	
	IT resource management	0	
	IT contracting strategies and policies	100%	
	Risk management practices	100%	
	Business continuity planning (BCP)	100%	
Domain 3—Information Systems Acquisition, Development and Implementation	Business case development	50%	50%
	Project management practices	33.33%	
	Project reviews	0	
	Develop project controls	66.67%	
	Information systems implementation and migration	50%	
	Post-implementation reviews	100%	
Domain 4—Information Systems Operations, Maintenance and Support	Information systems reviews	50%	30%
	Service level management practices	0	
	Third-party management practices	50%	
	End-user procedures and operations	0	
	Maintenance of information systems	0	
	Data administration practices	100%	
	Capacity and performance monitoring	0	
	Problem and incident management	0	
	Change, configuration and release management	0	
	Backup and restoration of systems	100%	
Domain 5—Protection of Information Assets	Information security policies, standards and procedures and generally accepted practices	25%	21.67%
	Design, implementation and monitoring of system and logical security controls to verify confidentiality, integrity, availability (CIA)	33.33%	
	Data classification processes and procedures	0	
	Physical access and environmental controls	50%	
	Processes for storing, retrieving, transporting and disposing of information assets	0	

Appendix B

BSAIS Cognate Alignment with ISACA Model Curriculum

Domains	Number of Subtopics	BSAIS Curriculum	Average Alignment
Domain 1—The Process of Auditing Information Systems	Risk-based IT audit strategy	20%	5%
	Specific audit planning	0	
	IT audit standards	0	
	Audit reporting and communications and follow-up	0	
Domain 2—Governance and Management of IT	IT governance structures	66.67%	45%
	IT organizational structure and HR	50%	
	IT strategy and direction	50%	
	IT policies, standards and procedures	0	
	QMS and IT management of controls	50%	
	Monitoring and assurance practices	0	
	IT resource management	0	
	IT contracting strategies and policies	66.67%	
	Risk management practices	66.67%	
	Business continuity planning (BCP)	100%	
Domain 3—Information Systems Acquisition, Development and Implementation	Business case development	100%	88.89%
	Project management practices	100%	
	Project reviews	50%	
	Develop project controls	83.33%	
	Information systems implementation and migration	100%	
	Post-implementation reviews	100%	
Domain 4—Information Systems Operations, Maintenance and Support	Information systems reviews	50%	35%
	Service level management practices	0	
	Third-party management practices	50%	
	End-user procedures and operations	0	
	Maintenance of information systems	0	
	Data administration practices	100%	
	Capacity and performance monitoring	50%	
	Problem and incident management	100%	
	Change, configuration and release management	0	
	Backup and restoration of systems	0	
Domain 5—Protection of Information	Information security policies, standards and procedures and generally accepted practices	25%	40.56%
	Design, implementation and monitoring of system and logical security controls to verify confidentiality, integrity, availability (CIA)	77.78%	
Domain 5—Protection of Information Assets	Data classification processes and procedures	0	40.56%
	Physical access and environmental controls	50%	
	Processes for storing, retrieving, transporting and disposing of information assets	50%	

Appendix C

Old BSA Curriculum and BSAIS Curriculum Alignment with ISACA Model Curriculum

Domains	Number of Subtopics	Old BSA Curriculum + BSAIS Curriculum	Average Alignment
Domain 1—The Process of Auditing Information Systems	Risk-based IT audit strategy	80%	91.43%
	Specific audit planning	100%	
	IT audit standards	85.71%	
	Audit reporting and communications and follow-up	100%	
Domain 2—Governance and Management of IT	IT governance structures	66.67%	59.17%
	IT organizational structure and HR	75%	
	IT strategy and direction	100%	
	IT policies, standards and procedures	0	
	QMS and IT management of controls	50%	
	Monitoring and assurance practices	0	
	IT resource management	0	
	IT contracting strategies and policies	100%	
	Risk management practices	100%	
	Business continuity planning (BCP)	100%	
Domain 3—Information Systems Acquisition, Development and Implementation	Business case development	100%	88.88%
	Project management practices	100%	
	Project reviews	50%	
	Develop project controls	83.33%	
	Information systems implementation and migration	100%	
	Post-implementation reviews	100%	
Domain 4—Information Systems Operations, Maintenance and Support	Information systems reviews	50%	45%
	Service level management practices	0	
	Third-party management practices	50%	
	End-user procedures and operations	0	
	Maintenance of information systems	0	
	Data administration practices	100%	
	Capacity and performance monitoring	50%	
	Problem and incident management	100%	
	Change, configuration and release management	0	
	Backup and restoration of systems	100%	
Domain 5—Protection of Information Assets	Information security policies, standards and procedures and generally accepted practices	50%	45.56%
	Design, implementation and monitoring of system and logical security controls to verify confidentiality, integrity, availability (CIA)	77.78%	
	Data classification processes and procedures	0	
	Physical access and environmental controls	50%	