

Addressing cross-disciplinary accounting and information technology learning through a graduate IT course

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ABSTRACT

Accounting education is an active area of research that has been influenced by the evolution of business models, the integration of technology in enterprise operations, and the adoption of the 150-hour requirement among most of the 55 jurisdictions that regulate public accounting. While considerable flexibility and little uniformity exists for accounting program curriculum, there is agreement that future accountants and managers should be prepared to leverage the opportunities and meet the challenges presented by technological change. Enterprise business models include a wide variety of processes that reflect the mission and require the support of technology. The execution of a business process often includes the sharing of data among multiple trading partners within a technology infrastructure that is typically managed by several organizations. Accountants, in a role within an organization or as an external auditor, need to both verify business processes and analyze the information-rich data. Auditing and analysis skills may be developed to meet these challenges through a foundation in both accounting and information technology disciplines. This paper presents the details of a cross-disciplinary course that includes the recommended learning goals from various accounting associations and industry studies and addresses the challenges of auditing and managing evolving business processes architectures. The course is designed for students in graduate Accounting programs to address the complexities of the enterprise business process environment using delivery methods that are challenging and rewarding for students.

Keywords: accounting curriculum, engaged learning, cross-disciplinary, graduate education.

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INTRODUCTION

Accountants review the financial operation of a business for regulation compliance and financial improvement. Regulations define requirements for accurate record keeping, financial statement preparation, and tax liability. Financial improvement is achieved through cash flow management, cost reduction, and revenue enhancement. In order to meet these challenges, accountants require a thorough understanding of the procedures, processing, and data storage of the business' operations within its computer information system (CIS). An accountant works closely with the CIS in the role of assuring regulation compliance and identifying financial improvement scenarios.

Rapid advances in information technology have produced significant changes in the ways in which businesses operate. It is important for accounting graduates to possess knowledge and skills relevant to their role in an IT intensive business environment. This paper examines the challenges of enterprise technology architectures, describes professional organizations' recommendation for accounting curriculum learning goals, and presents the details of a cross-disciplinary course that address the challenge of managing evolving business processes architectures.

ENTERPRISE TECHNOLOGY ARCHITECTURE

An enterprise technology architecture is generally defined as a conceptual blueprint that describes the structure and operation of an organization. Creative use of information technology is essential and requires a collaboration of talent to construct an agile architecture that brings significant business value and reduces expenses (Chen, Chiang & Storey, 2012; Suresh & Shanmughana Than, 2012). Enterprise technology architectures, unique to every organization, include applications and databases that are developed in-house or acquired through a vendor. Access can vary by application and database and may be through local servers or through "the cloud". Technology support may be managed by the organization or outsourced to a vendor.

The computer information system (CIS) is an interpretation of the architecture and is used to record all business processes. The enterprise resource planning (ERP) system continues to be the backbone CIS to manage business processes, synchronize tasks and data, provide consolidated analysis, and support expanding business processes (Kurn, Jr. & Sutton, 2010). All business processes are represented as transaction(s) in the CIS. Typical transactions include executing a sale, satisfying a supplier invoice, and contracting product delivery. Although recorded in the ERP, business processes may be managed by the organization or outsourced to a third-party service provider (Kuhn & Sutton, 2010).

Business process outsourcing is not a new concept. For many years, organizations have been contracting processes that are not critical to their core competencies to improve cash flow, reduce errors, and lower operating costs. Examples include payroll, warehousing, and transportation. With the emergence of cloud computing, business process outsourcing options have increased significantly. The options range from high-resource, low-complexity transaction processing to complex decision-making and analytics support (Kuhn & Sutton, 2010; Lawson, Blocher, Brewer, et al., 2014). Business process outsourcing increases the complexity of an accountant's role in reviewing the financial operation of a business for regulatory compliance and financial improvement (Lawson, Blocher, Brewer, et al., 2014).

While technological advances enable a profession to better address change and innovation, technological advances offer a significant set of challenges to both the development of curriculum and effective learning environments (Behn, Ezzell, Murphy, et al., 2012; Black, 2012; Fichman, Dos Santos, & Zheng, 2013; Lawson, et al., 2014). Technology has made business models and transactions more complex, has shortened product life cycles, and has been the enabler for dynamic change in the business community (Fichman, Dos Santos, & Zheng, 2013; Lawson, et al., 2014). It has created a demand for instant feedback and instant answers (Black, 2012). The amount and complexity of information accountants are charged with interpreting, processing, reviewing, and reporting is continuously increasing (Behn, et al., 2012; Black, 2012, Lawson, et al., 2014).

Accountants have evolved to become enterprise performance managers (Lawson, et al., 2014). This shift in orientation from a support function to an enterprise performance management role has enormous implications for defining the determinants of success within the profession (Lawson, et al., 2014). Accounting graduates would benefit in better employment opportunities if they are equipped with relevant IT knowledge and skills relevant to their roles in providing competent and professional services (AACSB, 2014; AICPA, 2015; Brewer, Sorensen, & Stout, 2014; Graming & Rosman, 2013; Jiles, 2014).

Professional organizations and employer groups recommend that accounting students be equipped with a range of technology skills relevant to their discipline (Brewer, Sorensen, & Stout, 2014; Jiles, 2014). Technology competencies include the use of software, including proficiency in the development and use of spreadsheet models and the use of technology to enhance communication (Lehmann & Heagy, 2014; Riley & Simons, 2013). Vital IS competency includes the knowledge of the purpose and design of information systems, system architecture and application software, system security and IS continuity (Behn et al., 2012; Bloom, 2013; Crawford, 2011). Mastery of these competencies is necessary for all accountants if they are to add value to their future organizations. Accountants must also be able to design and evaluate IS controls and manage IS risks and compliance, including overseeing fraud prevention, privacy safeguards, and data integrity (Behn et al., 2012; Lehmann & Heagy, 2014; Riley & Simons, 2013). Extensive technological knowledge and skills are required to assess system needs and investment, procurement, and implementation, including oversight of vendors and service providers (Behn et al., 2012; Lehmann & Heagy, 2014; Riley & Simons, 2013).

ACCOUNTING CURRICULUM LEARNING GOALS

The American Institute of Certified Public Accountants (AICPA) Commission on Professional Accounting Education released the report *A Post-Baccalaureate Education Requirement for the CPA Profession* recommending a 150 credit hour education requirement for the CPA professions. The AICPA has suggested that the 150-hour requirement should allow candidates to obtain a well-balanced education which includes not only accounting, but other business knowledge (Briggs & He, 2012). The report describe four reasons for expanding the educational requirement an additional 30 credit hours. First, the significant increase in official accounting and auditing pronouncements and the proliferation of new tax laws have expanded the required knowledge base (Briggs & He, 2012; Depp, 2014). Second, business methods have become increasingly complex to address regulatory compliance (Briggs & He, 2012; Depp, 2014). Third, advances in technology have had a major effect on information systems design, internal control procedures and auditing methods (Briggs & He, 2012; Depp, 2014). And finally,

the staffing needs of employers are changing rapidly as approaches to auditing rely on technology to perform many of the routine auditing tasks (Briggs & He, 2012; Depp, 2014).

There has been an adoption of the 150-hour requirement among most of the 55 jurisdictions that regulate public accounting (Depp, 2014). In general, the profession's policymakers do not to specify the curriculum that is necessary for the CPA exam or for the candidate to become a licensed CPA in most jurisdictions, regardless of whether those regulators are from 150-hour states or 150-hour states (Briggs & He, 2012; Depp, 2014). Academic and practitioners have different expectations about courses that new hires have as they begin their professional careers (Gramming & Rosman, 2013). There is a continuing need for research into content and implications of the 150-hour requirement for members of the CPA profession. There are many reports regarding coursework with the vast majority agreeing that courses in information systems significantly continue to the body of knowledge needed by an accounting professional (Briggs & He, 2012; Depp, 2014; Gramming & Rosman, 2013; Mauldin, Braun, Viosca et al., 2013).

The Institute of Management Accountants (IMA) and the Management Accounting Section (MAS) of the American Accounting Association (AAA) formed a Task Force to address these issues and make curriculum recommendations for all accounting majors. The task force issued a report referred to as *The Pathways Commission on Higher Education: Charting a National Strategy for the Next Generation of Accountants* (Bloom, 2012). The task force recommends that accounting education focus on curricular requirements for long-term career and the knowledge, skills, and abilities of an accounting education should emerge and be developed within the curriculum as integrated competencies, as this is how those competencies will be deployed within the organization (Lawson et al., 2014).

The Pathways Commission Report of 2012 identified a need for a new model of education that is better aligned with the contemporary environment and evolving demands on accounting professionals throughout their career (Black 2012; Bloom, 2013). Accountants who are responsible for financial reporting analyze business transactions compliance with increasingly complex regulatory requirements. In addition, their responsibilities are expanding to include reporting on risks, pro forma performance measures, and sustainability. These new areas of responsibility require a broader definition of the competency of reporting and provide opportunities for accountants to advise top management on matters related to risk, structuring of transactions, and expanded performance measurement (Black 2012; Bloom, 2013; Lawson et al., 2014). The integrative role of accounting creates value in an organization that includes the analysis of processes and data (Black 2012; Bloom, 2013).

The Institute of Certified Management Accountants (ICMA) recommends three levels of competencies in its report *An Integrated Competency-Based Framework for Accounting Education* (Brew, Sorensen, & Stout, 2014). This report emphasizes that education should provide a foundation for long-run career of the accounting professional. Three levels of competencies are identified: *foundational competencies* (communication, ability to leverage technology, and analytical thinking and problem solving, among others), *broad management competencies* (including leadership, ethics and social responsibility, and process management and improvement), and *accounting competencies* (external reporting and analysis; planning, analysis, and control; taxation: compliance and planning; information systems; assurance and internal control; and professional values, ethics, and attitudes) (Brew, Sorensen, & Stout, 2014).

The report describes internal and external reporting, including financial statements, management control, decision support, and analytics, depend on the successful design and

deployment of an information system (IS). IS competencies involve gathering, validating, and analyzing data to enable cross-functional and global cooperation and communication. Included here are data, transaction flow, data organization and access, and database management. Strategic and operating decisions require integrated information systems such as specialized software/reporting systems with decision support, enterprise resource planning (ERP) systems, business intelligence, enterprise analytics information search and retrieval, and data mining. Accountants must also be able to design and evaluate IS controls and manage IS risks and compliance, including overseeing fraud prevention, privacy safeguards, and data integrity. Extensive technological knowledge and skills are required to assess system needs and investment, procurement, and implementation, including oversight of vendors and service providers (Brew, Sorensen, & Stout, 2014).

The Association to Advance Collegiate Schools of Business (AACSB) emphasizes the importance of technology skills in the *AACSB International Accounting Accreditation Standard A7: Information Technology Skills and Knowledge for Accounting Graduates* (AACSB, 2014). AACSB recommends a wide range of technology-related skills and knowledge for schools to consider in better preparing accounting graduates for the business environment (AACSB, 2014). Standard A7 states that accounting degree programs develop skills and knowledge related to the integration of information technology in accounting and business. The standard emphasizes learning experiences in data creation, sharing, analytics, mining, reporting and storage within and across organizations. AACSB recommends that the focus of accounting education be beyond accounting information systems to include the computer information systems of the entire enterprise and its trading partners (AACSB, 2014).

THE COURSE

The title of the course is “Data Management for Business Intelligence”. The course involves students in the dynamic nature of data management practices to strategically leverage information and technology assets to access, analyze, and present information for better decisions. This course explores best practices in business intelligence requirement gathering, the extract-transform-load process, data mining techniques, and information presentation alternatives. Course activities utilize existing and emerging information technology. The course may be offered in the Masters of Accountancy (M.Acc.) program and the Masters of Business Administration (M.B.A.) program. In addition, the course is valuable as an elective for students in specialized master degree programs in business disciplines and also other programs that may lead to careers with decision making responsibilities.

The student learning objectives (SLOs) are the knowledge, skills, and applications that students will be able to demonstrate upon completion of the course. Four SLOs are identified for this course. First, analyze strategic business opportunities in terms of the situation context, available resources, and impact to an organization’s goals. Second, design business intelligence and analytics models, supported with technology, to address enterprise opportunities. Third, implement business intelligence and analytics models that support the analysis of the business opportunity and reflect the data management structure of the enterprise. Fourth, appraise data visualization techniques and applications that represent enterprise information assets and business opportunity alternatives.

The class is taught by a professor of information technology. Course material is delivered primarily through an interactive approach that integrates business processes with technological

techniques and tools. The interactive approach is successful at engagement a class of students with a wide variety of prior technology experience. The student learning objectives (SLOs) are achieved through a series of three projects. In most cases, concepts introduced in one project are reinforced in a later project. An introductory database management textbook is helpful to support students in the understanding of the IT concepts. Textbook content should introduced the relational database model concepts and big data management. The course is best taught in a computer lab to provide the interactive experience. The computer lab is equipped with tools, with the exception of Microsoft Office, that are available with free licensing. Ideally, the tools operate on a variety of devices and operating systems. This provides flexibility for the students to complete assignments and exercises out of the computer lab. Periodic examinations can serve to assess the readiness and understanding of the students.

Course projects include the examination of a payroll outsourcing opportunity, the expansion of the target customer base, and Big Data analysis. All course projects are related to the course's SLOs through a two part approach. Students critically consider and report on the managerial issues when implementing a new business strategy. And, students demonstrate the implementation using information technology tools and techniques. The projects uses Microsoft Office Excel and Word (Microsoft Corporation, 2015), MySQL relational database management (Oracle Enterprise Manager, 2015), and R: The R Project for Statistical Computing (The R Foundation, 2015). The details of the each of the three project is included in the Appendix. The purpose, content delivery suggestion, resource requirements, the assignment deliverables, and the assignment background/directions are described.

IMPLICATIONS AND CONCLUSION

Information technology has been a driving catalyst for change in the design and management of business models. It is important to prepare business graduates, especially accountants, to possess knowledge and skills relevant to their role in an IT intensive business environment. Professional organizations highly recommend incorporating information technology concepts in curriculum to better prepare students for entry-level positions and careers.

A cross-disciplinary course is presented that addresses the challenges of managing evolving business process architectures. Course material is presented through a series of interactive projects that engages students with a variety of technology expertise in the learning process. The projects help student develop business professional and information technology skills. Refinement of the projects will continue based on the results of future offerings of the course and in response to innovations in business models and information technology.

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APPENDIX: PROJECT 1

Title: Payroll Outsourcing Project

Purpose: The purpose of this project is for students to critically consider the implications of outsourcing a business process. Students report on the management issues when outsourcing the business payroll function. Students design a repeatable process for verifying and reporting information about the outsourced function. Students also have the opportunity to experience data management techniques and practice advance Microsoft Office Excel functions.

Content Delivery: Before introducing the project, develop student understanding of the issues surrounding the outsourcing of business functions through assigned reading, lecture, and discussion. Describe the purpose and features of macro-enabled workbooks. The class should experiment with simple macro functions before introducing the project.

Students are assigned the independent task of becoming familiar with the project components. After reviewing the project, while together in the lab, the class brainstorms for an agreement of the design of a step-by-step process that calculates the appropriate tax payments and formats an appropriate report. The instructor demonstrates, working along with the students, the macro creation by building and testing the students' implementation of the design. As students' skill in the use of macros develops, the lecture changes to an "open lab" with the instructor providing support. Depending on the success of the class, students can be encouraged to experiment with the implementation of advanced features in macro development including execution buttons and formatting options. Student volunteers could present their final project to the class.

Technology Resources: Microsoft Office Excel to create macro-enabled worksheet and Microsoft Office Word to create the management report.

Deliverables: This project requires two deliverables. A Microsoft Office Word document that addresses management issues to consider when outsourcing the payroll business process. A Macro-enabled Excel Spreadsheet that generates a report which may be run repetitively, without error, each payroll cycle.

Assignment Background/Directions: PIM, a small plastic injection molding business of about 350 employees, specializes in the manufacture of special order components for a variety of customers. PIM has locations in Pennsylvania, New Jersey, and Delaware. PIM success is directly related to its practice of developing innovation and efficiency in its core competency. Managers work within an agile development environment with you as the Activity-Based Cost Accountant (or Manager).

The organization is considering outsourcing their customer invoicing and employee payroll services to IP (Invoice/Payroll) Management Company. With this decision, PIM exchanged the often unpredictable capital investment and maintenance costs of onsite invoice and payroll processing (hardware, software, printers, and technical staff) for a contracted price. In addition, PIM can benefit from the economies of scale and expertise of the IP Management Company's whose focus is invoice and payroll services.

In addition to your role as the Activity-Based Cost Accountant (or Manager), you monitor the activity of the IP Management Company. Recently, IP Management Company implemented an electronic data interchange method for payroll and invoice processing. PIM's Enterprise system is considering periodically sending standard formatted transactions to IP Management Company for processing. After processing the transactions, the IP Management Company will send a report to PIM.

As a well-educated accountant (or manager), you need to evaluate the issues surrounding the outsourcing of the payroll function to the IP Management Company. Provide a report that describes the issues with initiating and maintaining a business process outsourcing relationship.

You also realize that it is necessary to verify IP Management Company's report with data from PIM. You are creating a formatted report contained in an Excel Spreadsheet that can be run repetitively, without error, each payroll cycle. This report may be used to compare with the IP Management Company's report. Please post your Macro-enabled Excel file to the course drop box for this assignment no later than the due date.

The data file that PIM provides to IP Management Company is included in a workbook. The Payroll worksheet includes employee payroll information. The columns include: Employee Sequence Number (to hide identity), Department, an Employee Benefit flag (not used to calculate State Tax), Gross Income, and Office Location. The PA State Tax Table worksheet includes payroll tax information for Pennsylvania. The NJ State Tax Table worksheet includes payroll tax information for New Jersey. Please note, Delaware does not collect a state payroll taxes.

Complete the following steps:

1. Place an appropriate heading on the report that includes the company name, current date, and the username who processed the report.
2. Include a summarization area that includes the Total Gross Income by State and the Total State Tax Amount (if applicable).
3. Place appropriate column headings on the report that include:
Employee Sequence Number, Department, Gross Income, Office Location, State Tax Amount for payroll period (which your report calculates)
4. Include formatting for a report that is easy to read with a professional appearance.

APPENDIX: PROJECT 2

Title: Expanding Customer Base

Purpose: The purpose of this project is for students to consider the information requirements when a company's customer strategy expands to include an additional target market. Students report on the information collection and analysis when an organization adopts a new strategy, as in this project, expanding the customer base. Students become familiar with the relational data base model techniques and implementations.

Content Delivery: Before introducing the project, develop student understanding of the relational database model through assigned reading, lecture, and discussion. Describe the purpose and features of the third normal form, entity-relationship diagrams, modifying and creating tables in the MySQL environment, and creating simple and complex SQL queries. The class should experiment with multiple examples prior to introducing the project.

Students are assigned the independent task of becoming familiar with the project components which include an existing database in the MySQL environment, an entity-relationship diagram for the organization based on retail-only customers, and an entity-relationship diagram for the organization based on both retail and big box store customers. After reviewing the project artifacts, while together in the lab, the class modifies the original tables in the database to now include the appropriate tables reflecting the organization's choice to expand its customer base. Due to the wide-variety of technological expertise within the class, the database modification process is a collaborative effort. After verification of the tables, data is entered into the database from the Microsoft Excel sheet provided by the instructor. Students respond to queries using SQL. The SQL queries are based on single table select statements that incorporate column selection, a variety of selection conditions (where, wild cards), sequencing requirements (order by), scalar and string functions. Depending on the success of the class, advanced SQL queries based on multiple tables (joins and subqueries) may be introduced.

Technology Resources: The resources include a database for each student in the MySQL environment, Microsoft Office Excel to access data for the tables, and Microsoft Office Word to create management report. MySQL is available free. This tool, developed by Oracle, provides a good representation of the relational database management systems used in industry.

Deliverables: This project requires three deliverables. A MySQL database environment that includes the appropriate tables and data that reflects the organizations expansion to both retail and big box store customers. A Microsoft Office Word document that describes a suggested process for determining the information required to manage and evaluate the new customer market. A Microsoft Office Word document that includes the SQL statements that address each query prompt.

Assignment Background/Directions: The HDC organization has expanded their business model from providing products to only retail customers to also include a wholesaling operation for the Big Box Stores. Various departments collaborated and determined the information required to begin doing business with the new customers. The existing database structure should be been

modified to reflect the new strategy, the appropriate data should be loaded into the revised database, and SQL queries should be addressed.

Two entity-relationship diagrams are available to you. One reflects the database organization with retail-only customers, the other reflects the database organization with both retail and Big Box Store customers. A database environment has been created for you in MySQL that reflect the business plan that includes retail-only customers. A Microsoft Excel workbook containing data for all tables and document containing SQL query requests are also available.

Complete the following steps:

1. Create a short report that describes the suggested process for determining the information required to manage and evaluate the new customer market.
2. Modify your MySQL database environment to reflect the structure of the entity-relationship diagram that includes both retail and Big Box Store customers.
3. Load the data from the Microsoft Excel workbook into the revised MySQL database.
4. Respond to the SQL queries contained in project directions sheet by including the SQL query in the submission Word document.

APPENDIX: PROJECT 3

Title: Big Data Analysis

Purpose: The purpose of this project is for students to learn techniques to discover information from large data files. Students work with advance Microsoft Office Excel functions to prepare data for an analytics tool *R Project for Statistical Computing*. Students apply statistical models to the data and create graphical presentations.

Content Delivery: Before introducing the project, develop student understanding of data mining and analytics functions through assigned reading, lecture, and discussion. Describe the purpose and features of advanced Microsoft Office Excel functions and the R Project.

Students are provided with one or more large files of data. Files with large record, large field count are readily available through the Internet. A suggested resource is Amazon.com. The class works in unison to “clean” and organize the data, and making discoveries within both Excel and R Programming tool. This project is successful at engaging students because of the rapid feedback the students receives as they perform each Excel and R Programming function.

Resources: Microsoft Office Excel and the *R Project for Statistical Computing*. This tool is available free and provides a good experience with business analytics functions.

Deliverables: This project may be graded on the participation of the students during the interactive activities. As an option to consider, students may prepare a reflection memo on experience with this assignment.

Assignment Background/Directions:

Class independently reviews with the *R Project for Statistical Computing* directions manual available through the website. Suggested topics include: Introduction and Preliminaries, Simple Manipulations, and Lists and Data Frames.

The instructor and class complete the various Excel functions then R Programming functions in unison. A brief open discussion of the appropriate application follows each function.

Suggested advanced Microsoft Office Excel functions: Text, Logical, Information, Lookup & Reference, Database, and Pivot Table.

Suggested R Programming: Reading data from files, Probability distributions, Statistical models, and Graphical procedures.

