

# Teaching “Information Literacy” with the Introduction to Information Systems Course

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## Abstract

Designers of the computer information systems introductory course, that is mandatory for all business school majors, face significant challenges and trade-offs. Specifically, three questions need to be addressed in any such course design efforts. How best to (1) incorporate the theoretical aspects of Information systems so non-CIS majors understand the implications of IS for their careers, (2) pack enough exposure to technology so that they get the marketable skills that employees are so desirous of and (3) provide the practical work in productivity technology (Microsoft office – spreadsheets and database) that are required by follow-on business school curricula. The end goal of any mandatory IS course for all business majors is to develop “information literacy”. In a business school curriculum, “Information literacy” emerges when a student can utilize their computer skills to effectively apply them to their major field of study to solve problems. This paper develops a model to measure the contribution of the above three components of an Introduction to IS course on the overall outcome of building “information literacy”. Using regression analysis of student surveys the paper finds that information literacy is positively influenced by practical assignments and studying the role of IS in organizations

**Keywords:** Foundations of Information systems, Information literacy, Curriculum, Teaching information systems.

## 1. INTRODUCTION

Computer information System has become a foundational discipline for other fields of business education (McKenzie, 2005). Data/information collection, processing and presentation skills have become critical to many business scenarios and work situation. Principles and skills that are taught in CIS often are required by other business curricula as well. For example, spreadsheet skills are important prerequisite knowledge for courses in management, decision making, finance and accounting. Likewise, database skills are prerequisite knowledge needed for courses in ac-

counting, customer relationship management and marketing. In addition to these productivity software skills, theoretical knowledge of information systems is important for many careers in business. A typical work assignment in a commercial organization often involves the systematic collection, organization, processing and distribution of data and information. Therefore, Information systems knowledge and information technology skills are among the three highly sought after job skills, along with communication skills and business terminology skills, by prospective employers (McDonald and Viscelli, 2008).

## Information Literacy

"Information literacy" refers to techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information solutions to problems. Information literacy rose to national consciousness in the U.S. with President Barack Obama's Proclamation designating October 2009 as National Information Literacy Awareness Month (Obama, 2009). President Obama's Proclamation stated that "Rather than merely possessing data, we must also learn the skills necessary to acquire, collate, and evaluate information for any situation". Information Literacy Competency Standards for Higher education are well documented (ACRL, 2000). These published standards provide a sequence of five information competencies and 22 learning outcomes that range from a basic determination of the information needed to having an understanding of planning and evaluating information and its sources to incorporate into the student's knowledge base in an ethical and socially conscious manner. These standards represent important skills that are critical to support lifelong learning for the student. This concept of information literacy therefore poses a potential framework to guide the design and evaluation of the content of the Introduction to Information Systems course.

## Research Goals

Designers of the computer information systems literacy course face significant challenges and trade-offs. This paper posits that the introductory course in information systems needs to support the development of skills in information literacy for all business majors at a large public college in Colorado. Specifically, the goals of the paper are the following:

1. Create a framework that can be used to evaluate an introduction to IS course and measure the contribution of the 3 components mentioned in Figure 1 (IS theory, IT concepts and Practical productive skills work) on Information literacy.
2. Collect survey data from students to measure the contribution of each of the three components (IS Theory, IT concepts and Practical productivity skills) on two aspects of information literacy – planning an IS and using an IS.

## 2. RESEARCH BACKGROUND

## Computer Literacy - Skills versus Knowledge

Today, the Internet has become a major part of our daily life, personal and otherwise. The Internet along with user-friendly computing and communication devices now play key roles in the day to day livelihood for many students. Given the diversity in the student demographics, incoming students into business programs at Metro State come with a diverse background in computer usage, knowledge and skills. Many have been using the Internet, email, word processing, and spreadsheet software throughout elementary and high school. Yet others enter this introductory course with no computer experience (Mackin, Johnson and Paranto, 2006). In spite of this proficiency with personal productivity software skills, a majority of these students have very limited knowledge of what constitutes information systems and how to design and implement information systems to meet their needs. Still other student, having significant work experience, in addition to their usage of productivity software, may have some mastery over a variety of Information systems concepts from their daily business activities. For the later group of "working" students, their knowledge needs to be rounded out to fill the gaps, while the former students have to build this knowledge. However, the previous experience with computer usage tends to make both of these categories of students to view the introduction to IS course as a repetition and superfluous, causing them to not fully engage in the learning process.

"Information literacy" refers to techniques and skills that can help in molding information solutions to a variety of business problems. Rather than merely possessing data, we must also learn the skills necessary to acquire, collate, and evaluate information for any situation. Though we may know how to find the information we need, we must also know how to evaluate it, process it and report it. In a business school curriculum, "Information literacy" emerges when a student can utilize their computer skills to effectively apply them to other disciplines (Vanlengen and Haney, 2006). In this process, a clear understanding of information management must occur. In this process, critical thinking skills are combined with computer skills and applied to a wide range of problems to economically collect data/information, efficiently process the information and elegantly present the results of the

processing. The following examples illustrate the challenges that students may face in business situations that might require the application of "information literacy" skills.

1. Student is assigned to manage multiple customer projects using a set of internal and external resources, which need to be effectively planned, tracked, coordinated and compensated. Several of the resources are specialized skill sets and require special equipment that need to be deployed in an optimal manner. A variety of reports need to be produced, that are used for forecasting future resource needs, compensation plans and supplier contracts (Sales/Marketing and Project Management).

2. Student is assigned to reengineer and manage the product registration process in a company's complex supply chain, which consists of multiple distribution channels (direct, indirect thru resellers, indirect thru service providers, grey market) and follow-up service maintenance relationships with the end customer. Data needs to be collected/received thru several avenues such as POS (point of sale) feeds, shipping/receiving invoice feeds, reseller data entry, etc. The data must be processed and customer entitlements must be setup to allow the delivery of correct levels of service to customers (Supply Chain and Customer Relationship Management).

3. Student is assigned to collect data on a network of physicians for a variety of specialties on procedures and tabulate, model and monitor the patient outcomes for each provider. As new medical procedures/treatment protocols and pharmaceutical formularies are introduced into the network by the healthcare plan, the effectiveness of these new innovations needs to be tracked using the risk adjusted outcomes model (Operations Management and Healthcare).

The above three scenarios illustrate the importance of developing Information systems skills for business majors. The students need to have a working understanding (computer literacy) of information technology so as to build the "data/information pipelines" and to deploy adequate computer storage and processing capacity. (The definition of "working understanding" will vary based on the student's program of study, i.e. Information Systems major will be expected to a deeper understanding than non IS business majors.) Moreover, in addition to the use of such IT infrastructure,

the student needs to be prepared to analyze the data/information needs, system's policies and procedures and the effective use of reports downstream from these processes. The ALA Information literacy standards that particularly apply to our study include Standard 3 – "the student evaluates information and its sources critically and incorporates selected information" and Standards 4 & 5 – "the student uses information ethically and effectively to accomplish a specific purpose" (ACRL, 2000). Our study relates these information literacy standards into outcomes mapped to the planning and use of business information systems.

### Alternatives

The core Information Systems course is evolving in many business curricula and it is now better preparing students for careers that use technology for information processing. A large portion of business schools are using writing and problem solving in their core IS course, which hopefully is addressing the current business requirements that students enter the job market better able to communicate and solve problems deploying the necessary computer technology in the process (McDonald and Viscelli, 2008). The nature of information literacy suggests that it is a higher order learning that is supported by studying popular information systems components and practical work that provide skills in productivity tools.

Traditionally, the introductory information systems curriculum can take one of three directions – (1) a single course covering both IS theory and tools (MS Office), (2) a sequence of two courses with first one focused on tools and the second one on theory, or (3) a single course focused on IS theory, and students getting the tools elsewhere. The breakdown of schools shows that option 2 is the most common (McDonald and Viscelli, 2008). Several schools that have students taking multiple information systems courses in the business curriculum have moved the tools skills training into a separate course. The emphasis on skills training in office supports the need of businesses to hire students that are already versed in these skills. The second course focuses on IS theory and moves away from office tools the core Information Systems course is evolving while better preparing students for careers that use technology. 46.67% of the schools are using writing and problem solving in their core IS course, which hopefully is addressing the current business requirements that stu-

dents enter the job market better able to communicate and solve problems (Mackin, Johnson and Paranto, 2006).

### 3. RESEARCH MODEL and HYPOTHESES

The research model connecting the four aspects of the "foundations of Information Systems" course is illustrated in Figure 1. In the model three boxes form the foundation topics: (1) Information systems theory with adequate case studies of popular IS roles such as CRM, SCM, (2) Information technology - HW, SW, database, networking, standards, and (3) practical work with productivity tools and enterprise technologies for "hands-on" experience.

These three building blocks can then be used to develop a higher level student outcome, referred to as "Information literacy" that allows the student to plan and use information systems effectively in their varied careers in the business world. It is posited that each of the three components significantly impacts the formation of "information literacy" among students of the Introduction to Information systems course. Hence we have three hypotheses as below:

**H1: Increased level of understanding of the Role of Information Systems significantly increases the level of Information Literacy.**

**H2: Increased level of understanding of Information Technology significantly increases the level of Information Literacy.**

**H3: Increased level of practical work with productivity tools significantly increases the level of Information Literacy.**

### 4. METHODOLOGY

The survey was administered on students in several sections of the CIS 2010 course, during the 14<sup>th</sup> week of classes. The survey questions are included in the next section. 34 students filled out completed surveys. The survey was designed to measure whether the students of the introductory information systems course understood the technical aspects of IS and develop a holistic knowledge how to plan and use information systems in different areas of business activity.

### College Profile

The college is an urban institution which serves non-traditional, working students. The student demographics were reported by Segall, Gollhardt and Morrell (2007) and can be summarized as follows. The average is roughly 30 years with approximately 15% of students reporting English as a Second Language (ESL). A large set of business degree seeking students work in IT, retail, government and banking industries. The college, like most other Universities that offer Bachelor's degree in Business, also requires an "information systems" course - CIS 2010, currently titled as "Foundations of Information Systems". However, there are significant challenges faced by faculty who are assigned to teach these foundational classes, heavily populated with non CIS business majors. Baugh (2007) notes a lack of motivation as non IS-majors do not see the value in this course. Additionally, Baugh (2004) reports a variety of student background and computer experience that plays into negative perceptions towards this course. More advanced and computer literate students view the class as unnecessary, while less literate students have significant difficulty technical nature of the class. Often, limited space in a typical business curriculum for non CIS majors necessitates a single course that must cover both information systems theory and personal productivity software skills (VanLengen and Haney, 2006).

### Intro to IS (CIS 2010) Course Profile

The CIS 2010, titled "Foundations of Information systems" is a required Information systems course for all business majors. It covers extensive IS theory using a Text book and examinations focused on topics from the text book. In addition, the course had practical assignments in Excel and Access. The Excel assignments utilized built-in functions, definition of complex formulae, pivot tables, multiple worksheets and conditional formatting of data. The Access assignments involved multiple tables, changing table definitions, query, forms and reports using multiple related tables and loading data from spreadsheets and database maintenance. There were lab assignments on creating web pages on a UNIX based web server, however, there was no practical work with enterprise systems. The practical work and the theoretical parts of the course seemed

disjoint to students as the practical work did not complement the theory.

### Survey Items

The survey items are listed below in Table 1. Two questions (questions 1 and 2) were used to assess information literacy:

1. This course gave you an understanding of how Information Systems can be used in business.
2. The course gave me an understanding of how I can plan an information system to meet my business need.

The "IS Role" was measured by questions 3 that listed several functional areas where Information Systems are used in a typical organization and the value of the variable is calculated by adding up all the "True" answers. So the minimum value is 0 and the maximum value is 6 for the student's rating of their perceived understanding of "IS Role".

Likewise, "IT Concepts is measured in a similar fashion with the True/False questions and 6 choices. The range of values for a student's rating of their perceived understanding of IT concepts can vary from a minimum value of 0 to a maximum value of 6.

Finally, the practical productivity tools are measured on a Likert scale (1-5) using four questions 5-8. The course covers four types of practical work and hence four questions are used to measure the student's perceptions of the value of each of the four types of assignments – Excel, Access, Server commands on UNIX/FTP and web page development.

### Survey Results

The averaged data from the student survey is shown in Figure 2.

Figure 2 shows that students that had completed nearly the entire CIS 2010 course (survey data collected in 14<sup>th</sup> week of 16 week semester) had a better perception of their knowledge of Information technology concepts (average rating of 50%) but a much lower perception of the role of information systems in business processes (average rating of 35%). This indicates that while the course is good at providing the IT concepts, it did not adequately

meet the need to develop the understanding of the role of information systems in an organization and the concept of "information literacy" among the students.

The results of these questions indicate that the students perception of their knowledge of planning (3.29) and using (3.50) information systems in their business needs was slightly above neutral (3.0). The scale of measurement is on a scale of 1 -5 (least favorable being 1 to most favorable being 5, and 3 as neutral).

### Regression Analysis

A linear regression analysis was performed with the normalized data to test the research model and the 3 hypotheses. These results are presented in Table 2. The data was normalized before the regression analysis. Calculated variables are used to represent the dependent variable – information literacy and the 3 independent variables – IS Role, IT Concepts and Practical labs. The Information literacy variable is calculated by averaging the responses to the two questions 1 and 2 and then normalizing the value to a scale of 0-1.

The independent variables, "IS Role" and "IT Concepts" are calculated using the values from questions 3 and 4, respectively and normalizing them to a scale of 0-1.

The independent variable "Practical Labs" is calculated as an average of the values from the four questions 5-8 and normalizing the result to a scale of 0-1.

These four calculated values are then used in the step-wise linear regression analysis using SPSS version 12.

The results show that there is a significant positive relationship between "Understanding the Role of IS" with "Information Literacy" (Hypothesis H1:  $\beta = .172$ ,  $t = 2.024$ ,  $p = .029$ ). The results also show that there is a significant positive relationship between "Practical Lab work" with "Information Literacy" (Hypothesis H3:  $\beta = .616$ ,  $t = 3.424$ ,  $p = .002$ ). However, the relationship between "Understanding the Role of IS" with "Information Literacy" (Hypothesis H2:  $\beta = -0.34$ ,  $t = -0.164$ ,  $p = .871$ ) is not significant. Therefore, the regression model supports Hypotheses H1 and H3, but not H2.

## 5. CONCLUSIONS

Based on the survey results, the CIS 2010 course continues to emphasize teaching the two components that are found to significantly support the goal of building "information literacy" among the students. These are building an understanding of the role of information systems in the main business processes, such as ACC, DSS, CRM, SCM, Forecasting and providing adequate practical lab work to students in productivity tools (Microsoft Access and Excel) and server technologies - UNIX and FTP. Information technology concepts were found to be not significantly impacting information literacy. This finding contradicts the posited theory in the paper. The reasons for this failure need to be investigated in a future study. Perhaps the way the IT concepts are covered in the CIS 2010 course are not allowing the students to make the mental connection between these technology concepts and how they relate planning and using an Information System. This certainly presents an opportunity to explore and perhaps re-design the course, so that the connection is clearer to the students.

In summary:

1. Continue to focus on IS theory with rich examples and practical case studies and examples that support the understanding of the broad and diverse role of Information systems in a business. Continue to focus the class lectures on IS theory to cover the cases in SCM, CRM, and other systems in practical use. Emphasis the system policies, procedures and information requirements.
2. Continue to emphasize Information technology concepts, such as software, hardware, networking, security, database and internet standards.
3. Continue with practical work using Excel and Access Assignments that involve multiple tables and relationships among the tables. Continue to expose students to UNIX and FTP and Web page creation assignments to give them exposure to server side capabilities.

## 6. CONTRIBUTIONS

The study makes a valuable contribution to the IS education planning literature by building a model that can be used to assist in the plan-

ning and evaluation of the Introduction to IS course and understand how best to develop an understanding of Information literacy among the students. The model accounts for 46.5% of the variation in "information literacy understanding" among a sample drawn from students in the 14<sup>th</sup> week of an "Introduction to Information Systems" course.

To enhance the validity of the survey designed in this study and the contributions of the study, a follow on survey that can co-relate the results of this survey with each responding student's performance on other assessment instruments (e.g. exams, labs, projects) in the Introduction to Information systems class needs to be performed. This requires that the responding student identities be tracked and mapped to their academic performance in the course. This data was not available in the current study as student surveys were done anonymously.

## 7. ACKNOWLEDGEMENTS

We wish to thank all the CIS 2010 faculty in the Computer Information Systems department with their continuing help and support with the student surveys.

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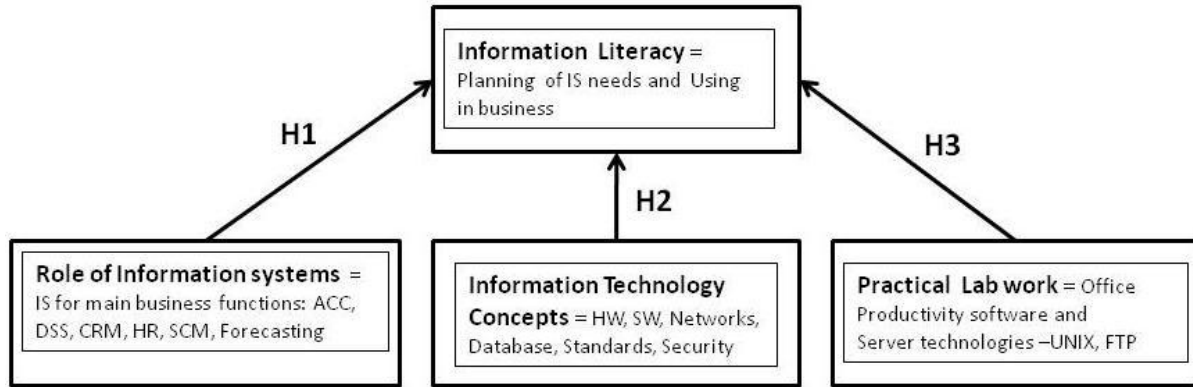
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## Appendices and Annexures

**Figure 1: Model for evaluating “Information Systems Introduction” Course**



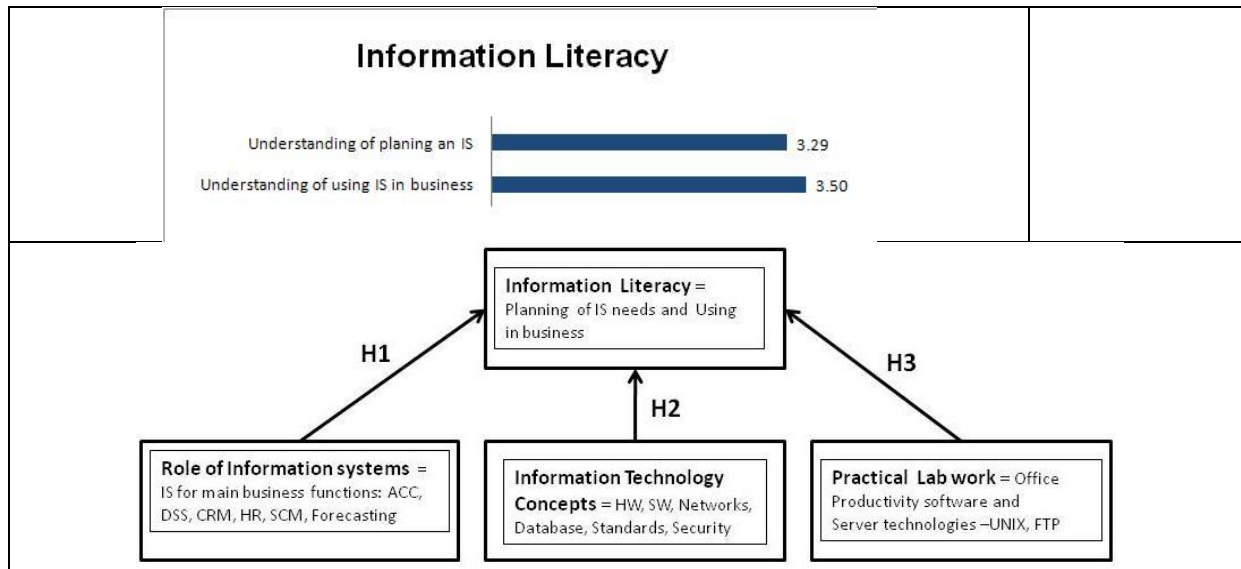
**Table 1: Research Constructs and Survey Instruments**

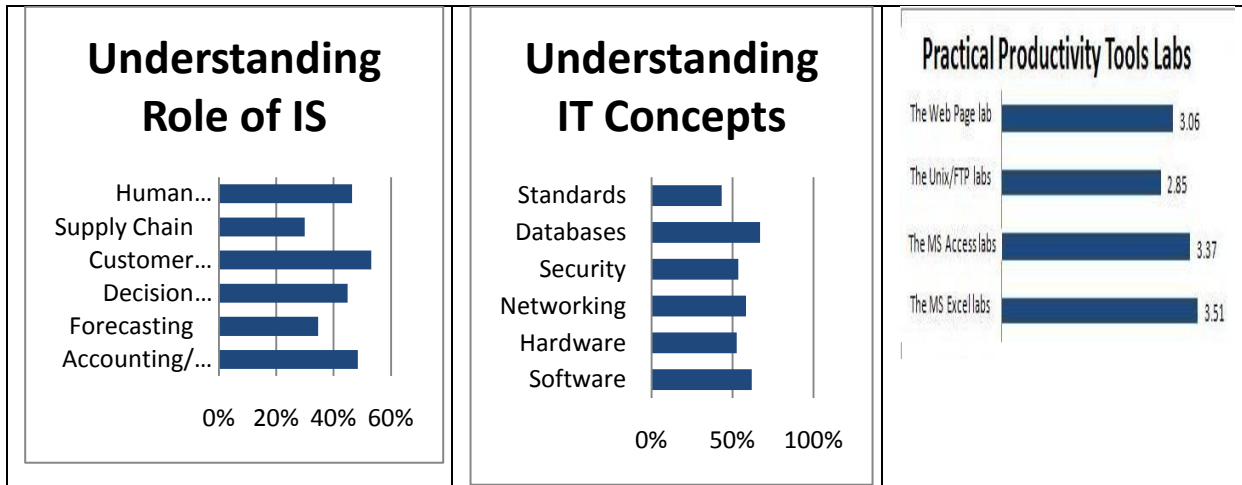
Construct	Survey Items	Measurement Scale
Information Literacy	1. This course gave you an understanding of how Information Systems can be used in business  2. The course gave me an understanding of how I can plan an information system to meet my business needs	Liekert Scale (1-5) Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree
IS Role	3. I understand the role of Information Systems in a business process such as (Circle all that apply)- Accounting, CRM, Decision Support, SCM, HR, Forecasting	True or False
IT Concepts	4. The course helped me understand computer technology concepts that apply to information systems such as (Circle all that apply)- Software, Hardware, Networking, Security, Database and Internet standards.	True or False
Practical Prod-	5. The MS Excel labs taught me new	Liekert Scale



activity Tools	<p>skills that are useful to me in my work and studies</p> <p>6. The MS Access labs taught me new skills that are useful to me in my work and studies</p> <p>7. The Unix/FTP labs taught me new skills that are useful to me in my work and studies.</p> <p>8. The Web Page lab taught me new skills that are useful to me in my work and studies.</p>	<p>(1-5)                  Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree</p>
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**Figure 2. Averaged Survey Results**





**Table 2: Regression Model Results**

Dep. Variable		Standardized Coefficients	t	Sig.
Information Literacy	R-square = .465	Beta		
	IS Role (H1)	.172	2.024	.029
	Info Tech Concepts (H2)	-.034	-.164	.871
	Practical Labs (H3)	.616	3.424	.002

Dependent Variable: Information Literacy