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INFORMATION SYSTEMS EDUCATION JOURNAL

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The Soul of the Introductory Information Systems Course

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Abstract

The introductory course in information systems plays an important role in a business school's curriculum. The soul of that course should be information and systems. The introductory course is where all business students, information systems majors and non-majors alike, learn why information and the technologies associated with it are driving organizations' strategy, processes, and successes. The content in that course and how it is taught profoundly shape students' perceptions of our discipline. Over the years there has been a reduction of focus on information and systems and increased focus on the latest technological innovation. We must get back to teaching how information systems drive decision making.

Keywords: Information Systems, Curriculum, Decision Support, Introductory Course

1. INTRODUCTION

Information systems are crucial to organizations. Yet a recurring theme in our journals is that non-information systems colleagues, students, and even the business community do not understand nor appreciate the importance of information systems (IS) as a discipline in a business school. A solution might be to write more journal articles or to make more presentations at conferences but those outlets cater to the people already in our discipline. A better strategy would be to engage an audience that needs to be informed about the role of information systems in organizations who can become ambassadors or at least supporters of information systems in business schools and their organizations. That audience is the student body and by extension the organizations which hire the students.

This is a long-term strategy and it requires a willingness to accept that most of students in our introductory classes have no intention of becoming information system majors. It requires that the faculty who teach the introductory course realize that student understanding of information systems in organizations is important for the acceptance of our discipline. As these students enter and progress through their careers, they will be the ones looking to information and the supporting technology to help reach organizational goals. Managers and knowledge workers are decision makers and decisions require information processed by systems.

Recruiting information systems majors should not be the only reason or even the major reason for choosing the content within the introductory information systems course. We must focus on the information systems theory and practice that should be known by every business student. A student's interest in the materials in the course will lead him or her to become an information system major. Students of all majors need to be given the foundation knowledge and then carry the appreciation for information systems into

their careers. The number of information systems majors seems to increase and decrease with the economy and job market prospects but the role of information systems in organizations is a constant.

It is important to distinguish information systems from information technology in the introductory course. AACSB standards refer to information systems and information technology as separate subjects (AACSB p. 9). These two subjects can certainly be taught within the same course but it would be prudent to make information systems the dominate subject and information technology the subordinate subject. Too many students and non-information systems faculty have the false impression that the course is just about technology.

With information technology bleeding into so many business disciplines it is easy for a student to believe an information systems course is simply a way of being taught the technology that will be most useful to his/her major. A non-information systems faculty member may believe that he/she can teach information systems because he/she teaches an aspect of information technology in his/her discipline classes. The distinction between information systems and technology is fuzzy to too many students and faculty.

That is our fault as information systems faculty. The information systems class should clearly explain the three distinct disciplines of information systems, information technology, and computer science. Although a Venn diagram would show areas of overlap between two and even all three of these fields, there are still importantly distinct areas which do not overlap and this is essential knowledge to pass to the students. One of the important distinctions is that information systems majors must consider the economic value of an information system to decision making and information systems in general to the organization.

> "The IS discipline contributes significantly to several domains, including business and government. Information systems are complex systems requiring both technical and organizational expertise for design, development, and management. They affect not only operations but also the organization's strategy." (Topi et al. 2010, p. 1)

The purpose of this paper is to begin a discussion and/or rekindle old discussions to define the soul of the introductory information systems course. Exactly what are the most important concepts we wish every business school graduate to know about information systems? The IS 2010 curriculum guidelines correctly note that information systems are not solely within the domain of business schools (Topi et al. 2010, p. 9). And the removal of a course focusing on personal productivity tools from 2002 guidelines (Ives et al, 2002) was a welcome relief. But what are the guidelines for the introductory course that meet the needs of today's students?

The description in the 2010 guidelines for the focus of the course lists the key components of an information system (people, software, hardware, data, and communications technologies) and not information itself or how it is used. Neither a theory of information nor decision support is in the description (Topi et al. 2010, p. 36). This is at odds with the stated guiding assumption that "IS professionals must have strong analytical and critical thinking skills to thrive in a competitive global environment" (Topi et al. 2010, p. 8).

2. THE SOUL

What is meant by the "soul" of the introductory information systems course? We in the information systems discipline have too many diverse/conflicting opinions about how to answer that question. The last ACM/AIS curriculum guidelines were published in 2010 - eight years is a long time in a field that changes so rapidly. While the next decision on guidelines is being produced, we need a vigorous debate about the purpose of the introductory course. There will certainly be opposing opinions within the information systems community and those opinions should be expressed. The remainder of this section lays out the framework of how a fruitful discussion might play out. This is offered as a starting point for the discussion.

A Pareto-optimal solution to guidelines for the introductory course is not necessary. Possibly not even desirable. A consensus of the majority is a worthy goal. This statement may not be palatable to members of our discipline or to a committee that has to publish curriculum guidelines. But if the objective of a discussion about the content of the introductory course is to produce a course that will impress the importance of the information systems discipline upon every business school student then we must be willing to accept that at least some in our discipline will feel the changes make the course worse.

3. BEGIN AT THE BEGINNING – DECISION SUPPORT

It is the contention of this paper that decision support is the fundamental bedrock on which information systems rest in an organization. Three seminal works form the basis of this contention and all clearly point to decision making for the importance of information systems.

Herbert Simon passionately researched political science and psychology in addition to information sciences. In 1978 he won the Alfred Nobel Memorial Prize in Economic Sciences in large part to his research that shaped the theory of decision-making processes in organizations. He won the A. M. Turing Award in 1975 (along with Allen Newell) for his contributions to the field of artificial intelligence and other fields. Part of his brilliance was to understand not only how decisions were made but the role of information in decision making and the potential of computer-based systems to enhance the decision-making process.

His theory for decision making required three parts (Simon 1959). First, an entity is required that can make a decision. This may sound trivial but it has important implications for students in business schools who use information technology. A "decision" could be defined in a manner that would not require a human. A thermostat can "decide" to use heated or cooled air to adjust the temperature in the area controlled by the thermostat. With artificial intelligence we are seeing decision making capabilities, or at least a resemblance of that capability, being introduced into non-humans.

The second part was a set of possible choices. The choices had to be discrete so that choices could be compared and evaluated as separate objects. Before computer technology became available the number of choices in the set might be very limited simply because of the computational requirements to evaluate each choice.

Limiting the number of choices in a choice set is rational for a decision maker because of the associated information connected to each choice. Consider a situation where a decision maker makes a choice (i.e. a decision) about staffing levels which is then followed by an event occurring. For example, the manager may have the choices of (1) adding a second shift for production, (2) committing to overtime pay for current employees, (3) keeping staffing levels unchanged, or (4) reducing staff by 25%. Assume three market events may occur once the manager's decision is made; (1) the demand for the company's product rises by 20%, (2) stays unchanged, or (3) drops by 10%. For each possible choice added (such as adding a second shift) the manager must determine (1) the economic impact an event (e.g. demand dropping by 10%) has on profits and (2) the probability that that event will occur. In our scenario each added choice to the choice adds 3 more economic impacts to be determined as well as an additional probability associated with the new choice. Depending upon the number of possible choices and the number of events that can occur after a choice the additional information added to the decision process could become substantial.

In our paper we will limit the number of choices in a choice set to some number that a decision maker might reasonably consider in a short period of time – such as two weeks. For example, instead of have choices be $1M, $900,000, $800,000, $700,000, etc. for the amount of a marketing budget we may limit the choices to 3 by executive fiat as $1M, $500,000, and $0. Readers who wish to learn more about the theoretical underpinnings of choice sets can find additional information in (Reutskaja, et al, 2011), (Karni, 2013), and (Manski, 2017).

The third part of Simon's theory was a keen insight for his time – the selection of a choice could be made upon either optimizing or satisficing the value/utility gained from decision making. The ability to have a satisficing choice brings the ability to apply managerial judgement to the selection process. A simple computer program would lack the ability to make judgements about satisficing solutions.

Peter Keen and Michael Scott Morton extended Simon's concept when they began to explore effectiveness as opposed to efficiency for dealing with semi-structured decision making (Keen and Scott Morton 1978). A particularly useful line of research since many knowledge workers engage in decision making where mathematically optimal solutions may not exist or where they may be impractical. The title of their second chapter is particularly insightful, "Management, Information, Systems, and MIS." It quickly establishes that what we commonly call "MIS" is actually an amalgamation of ideas and concepts. They call the phrase "management information systems" an example of something that means different things to different people with no generally accepted definition recognized by those working in the field. They are as correct today as they were in 1978.

Academics in the information systems discipline might argue that there is most certainly a widely accepted definition of information systems. But we are looking inward, teaching our doctoral candidates, who are in turn going out to teach other doctoral students as well as undergraduates about information systems. Our observed and reported experiences with non-information systems faculty and people in industry document the lack of a generally accepted definition. The ramification of not having a generally accepted definition is that the information systems discipline is not highly valued.

The third seminal work is by Ralph Sprague. He correctly described decision support systems as those drawing from and interacting with other information systems in an organization to support the work of managers and knowledge workers in organizations (Sprague, 1980). He also observed that decision support systems were no longer the sole purview of information systems professionals. This acknowledges that non-information systems majors have a need to study information systems in their business school coursework.

Sprague's models often related to a triad of dialogue, data, and models for the systems he envisioned. This reinforces the theme that information systems are not only for IS professionals since they presumably would not need the dialogue feature. Berinato (Berinato, 2019) also writes about the need to effectively communicate between decision makers and analytics professionals in order for projects to succeed. The concept of an intuitive user interface is the natural progression of Sprague's model.

Hugh Watson (2018) revisited Sprague's framework for developing decision support systems. Watson suggested that the Sprague's model is still relevant today. He emphasized the idea that information and systems are about decision support and the practice of decision support continues to evolve considering the new technological development such as enterprise data warehousing, real-time data warehousing, big data analytics, etc. (Watson, 2018). Sprague's work is robust enough to embrace emerging technologies.

There is a common theme that connects these seminal works – decision making. All of the authors understood and wrote about the technology behind information systems but it was (a) information in a digital format that (b) could be processed, assimilated, and reported that led to (c) a choice among competing possible actions that could be taken by a decision maker. Satisficing criteria for the choice among competing decisions, the effectiveness of the selected decision, and technology all go into supporting the managerial judgement. The keystone of the decision-making process is managerial judgement.

Figure 1 represents how technology both supports digitized information while being the repository for digitized information. Flowing upward, the digitized information feeds the decision maker, a choice set, and processes/information systems (models) described by Simon. Managerial judgement sits atop this flow and is the final process guiding decision making. Advances in the technology, the emergence of (big) digitized data, and the wide range of data and knowledge sources have increased the importance of strategic information systems that support managerial judgment and decision-making processes.

The phrase "decision support systems" is a classical (possibly old fashioned) term that is well known and understood but it may not be alluring to students. The phrases "decision analytics" and "business analytics" are beginning to be used and they might be easier terms that more students in business schools can understand (Power 2013; Vob 2014; Rodammer, et al. 2015; Schiller, et al. 2015; Vob et al. 2017; Arunachalam, Kumar, & Kawalek, 2018). Research shows that businesses that use analytics strategically at the managerial level often outperform their competitors (Frederiksen, 2009; Harris, 2008).

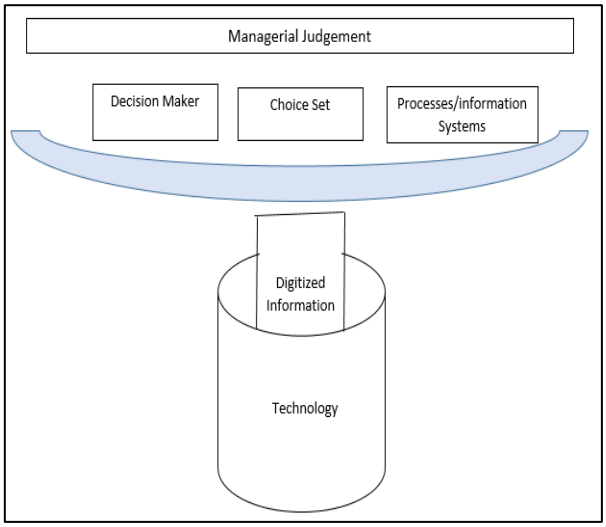

Figure 1 - Technology as the Support and Repository of Information

4. LISTENING TO CRITICS

It is fitting to look at criticism of the information systems discipline when we search for its soul. Some of that criticism is valid. Russell Ackoff was an early critic of those who viewed of the role of technology as supreme in a field where quantitative decisions for managerial issues seemed to rely too much on information technology and not enough on the decision to be made. He blamed the researchers of the era (Ackoff 1967, p. 147). His admonition is important since it forces academics in information systems to realize what is taught in our courses is more important than the technology used by the discipline.

> "Enthusiasm for such systems is understandable: it involves the researcher in a romantic relationship with the most glamorous instrument of our time, the computer."

Ackoff went on to foreshadow the era of big data. He argued that managers do not suffer from a lack of information but from too much information. Digitized information comes in from many sources and the people acting upon the information can become overwhelmed by the volume especially if they wish to consume detailed transactional data. He argues that decision makers have too much transactional data while actually lacking aggregated information that is relevant to the decision to be made.

We believe that one of Ackoff's criticisms - that decision makers lack relevant data - has been corrected in the years following Ackoff's paper. However, his criticism concerning our fascination with technology is still relevant to why the discipline of information systems does not get the respect it deserves. He feels our discipline creates information systems where we are too concerned with how easily the system can be used and that we are not concerned enough with the user's understanding of how information drives the system. If students leaving the introductory information systems course believe that it is a course about tools and technology then Ackoff's criticism still rings true 50 years after his paper was published.

Nicholas Carr is a more recent critic of our field. His premise is that information technology no longer matters to business organizations (Carr 2003). It is profoundly disheartening that an article would be published in the *Harvard Business Review* which perpetuated the misconception that our field is information technology.

There were many papers published in rebuttal to Carr that made reasoned arguments showing information systems are not equivalent to information technology and that while technology may be trending towards a commodity that information and the systems using information are still growing, evolving, and driving the success of many organizations. We may have convinced ourselves but too many students, colleagues, administrators, and business leaders still believe Carr was correct. It is through the introductory information systems course that we can change this perception in all business students.

5. LEARNING FROM PAST SOUL SEARCHING

There was a steep decline in the number of information systems majors between the 1990s and the early 2000s. This sparked some introspection among IS faculty (Granger et al 2007). There was even a fear that information systems might not stay as a component of the core body of knowledge in AACSB standards. In response to that perceived threat 40 leaders in the information systems academic community coauthored a paper on what every business student should know about information systems (Ives et al, 2002). Their reasoned argument stated that we are in the fifth wave of capitalism, the digital/knowledge economy, and the impact of information systems on industry makes it imperative that students understand the role of information systems.

Ten key concepts were proposed for students with learning objectives attached to each concept. The concepts focus on business not technology. Technology is the tool, the artifact used for information system development. Ives, et al. feared that a primary focus on the technology might lead to information technology expertise being a subject taught outside the business school. Such a situation would result in organizations unable to find sufficient numbers of information systems professionals with the business skills needed to be analysts, project managers, and senior information officers (Ives et al., 2002, p. 472).

Firth and his coauthors (Firth, Lawrence, & Looney, 2008) recognized this same enrollment decline. They even referenced that the president of AIS noted the crisis in his 2006 address at ICIS. The important contribution of the Firth paper was finding that the information systems class should

teach information systems – not information technology nor computer science. If we want to attract students to information systems and gain the non-information systems majors as information systems supporters then subject materials in the introductory class need to hold the interest of all students (Ferratt et al., 2010; Zhang 2007). Being the person making decisions in an organization will be interesting to all students.

Hershey (Hershey 2003) also takes issue with the 2010 guidelines for the introductory information systems course. Effective, impactful application of information systems in business processes and operations will stimulate IS and non-IS majors alike. But a fixation on technologies will reinforce the perception by non-IS majors that not much in the introductory course is important to the non-IS major.

Topic	Faculty	Students
System security	1	1
IS in organizations	2	5
Valuing IS	3	9
IS development	4	7
Globalization	5	4
IS infrastructure	6	6
IS ethics	7	2
The internet and WWW	8	3
IS components	9	10
Business intelligence	10	8

Table 1 - McCoy, Everad, and Jones IS Topic Importance in Rank Order

Faculty teaching the introductory course try to impress their opinions of the relative importance of the topics in the course. However, student perceptions do not agree with the IS faculty perceptions of the rank order importance for the topics in the 2010 guidelines for the introductory course (McCoy et al. 2015). The topics were condensed to the 10 by McCoy, Everad, and Jones as shown below in Table 1. Since the faculty control what is taught in the introductory course and have the ability to impress their views onto students in the course, wouldn't it seem intuitive that student and faculty rankings would be similar?

The disparity in rank order between faculty and students for "valuing IS" and "the internet and WWW" is very striking. If the introductory course is where IS faculty wish to impress all business majors with the importance of information systems for the businesses where they will work and for their personal careers then we are failing. Pay particular attention to "Valuing IS" and "The internet and WWW."

6. TECHNOLOGY STILL NEEDS TO BE TAUGHT

This paper does not mean to imply that information technology should not be taught in the introductory class. It has an important role to play but that role is subordinate to the focus on information systems and decision making. Like Ackoff noted, the computer is the most glamorous instrument of our time. There will always be some new technology that bursts upon the scene to capture our attention. If we constantly chase the newest technology it would easily overwhelm all of the time we have to teach our students.

The power of computing doubles every 18 months and although predictions of the death of Moore's Law seem to pop up occasionally it has held since the mid-1960s (Denning and Lewis 2017). Databases, spreadsheets, and other software can be easily used to support an understanding of decision making. For example, teaching students how to perform mathematical operations on cells in a spreadsheet adds little value to the introductory information systems class since those skills were probably taught to the students while they were in high school. However, using the SOLVER feature in Microsoft Excel to optimize a problem expressed in algebraic form or using the VLOOKUP feature to act as a primitive database query would further the concepts more appropriate for the introductory class.

Do you wish to ignite a discussion concerning personal information privacy? Then have your students go to MYACTIVITY.GOOGLE.COM and sign in with their GMAIL account. The discussion can easily spread to metadata and how metadata might be used to predict specific behaviors. How can privacy be retained and reduce the threat of private data be misused? Have students visit the TED Talk "A New Way to Stop Identity Theft" (Birch 2012). The resulting discussion brings you back to a solution to Ackoff's complaint that managers have too much information and not enough of the information they need. This use of technology to encourage discourse embraces the constructivist learning model (Leidner and Jarvenpaa 1995) but since the pedagogy for teaching the introductory course is beyond the scope of this paper further arguments will be left to later research.

7. CONCLUSION

A discussion is needed to decide the important content of the introductory information systems course in business schools. This paper argues that the two flaws of the current introductory course are (a) focusing too much on recruiting IS majors and not enough on educating non-IS majors and (b) too much emphasis on technology itself and not enough on how technology enhances decision making. IS faculty must accept the fact that most careers in business organizations are filled by non-IS majors and the number of IS majors must reflect that fact. Creating a commonly understood meaning for information systems in organizations and the value brought to organizations by those information systems will create the respect for the information systems discipline that seems to be lacking at this time.

This paper lays out an initial argument for the content in the introductory course based upon the early foundations for the information systems field. It looked at past criticisms of the discipline as well as some soul searching from within the IS discipline itself. It argues that information technology should be taught within the context of how it supports information systems and processes and not as an equal partner to information systems. These are debatable points. A robust discussion to the content of the introductory course will help shape a concept of the IS discipline which can be clearly understood by students, non-IS faculty, administrators, and the business community. That will be a major step towards the information systems discipline achieving its rightful acknowledgement of a driving, valuable discipline for all business majors to study. Please join the discussion.

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