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REEXAMINING THE EFFECTIVENESS OF THE NEURAL NETWORK APPROACH TO ASSESS RISK OF MANAGEMENT FRAUD IN THE SALES AND COLLECTION TRANSACTION CYCLE OF PUBLICLY HELD TECHNOLOGY COMPANIES

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ABSTRACT

The purpose of the study is to reexamine whether a back-propagation neural network approach could accurately assess the risk of management fraud in the sales and collection cycle of a publicly held technology company. A back-propagation neural network is an artificial neural network, which uses a back-propagation algorithm as its learning algorithm. Several prior researches acknowledge that a back-propagation neural network is an effective risk assessment tool for detecting management fraud. The study uses a back-propagation neural network approach as a fraud classification model. On the basis of the benchmark that a risk assessment tool is both effective and efficient if Type I and II error rates are significantly less than 0.5 and sum to less than 1.0, the study develops three research hypotheses. According to prior researches, the study defines nineteen financial statement accounts and ratios as independent variables, and designates fraud or non-fraud as a dependent variable. Descriptive statistics, the Wilcoxon signed-rank test, and one-sample z test for proportions are employed to analyze independent variables and examine the research hypotheses. The findings of the study are consistent with the findings from prior researches.

THE IMAGE OF ACADEMIC JOURNALS: ANALYZING EDITOR'S COMMENT

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ABSTRACT

Editor's letters is a direct channel for journal editors to communicate with their readers. The sore purpose of this genre is not only for editors to address their opinion about the trend of research and the importance of a specific topic. It also reveals the journal's positioning which the editor perceives or tries to create an image of journal. This study are concerned about the image of journal provided in editor's letters in both MISQ and CACM. Through the aid of metadiscourse analysis, we observe that it is a dialectical influence between journal image and the written style of editor's letters. More specifically, image of journal may influence the speech act in editor's letter, and the speech act in editor's letter will further enhance the image of journal image.

Keywords: Image, Editor's letters, Metadiscourse

INTRODUCTION

"Where should I publish my research?" Hamilton and Ives (1983) note that it is important to identify journals quality so that researchers can decide where to submit their study, especially under the situation that the abundance of journals and long publication lead times. Thus, to researchers who want to publish and influence their fields, they must exploit their understanding of these genres.

Editor's letter is a direct channel to create a social communication between journal editors and readers. It is not only for editors to address their opinion about the trend of research or the importance of a specific topic. It also reveals the journal's positioning which the editors perceived and what image they try to create about their journal. This study are concerned about the speech acts provided in editor's letters in two of major journals in MIS discipline. These speech acts reveal the forming of journal's image. Through the aid of metadiscourse analysis, we observe how journal image and the writing style influence each other in editor's letters.

METADISCOURSE

Metadiscourse reveals how writers attempt to influence readers' understanding of both the text and their attitude toward the content and the audience (Hyland, 1998a). Many studies have applied metadiscourse in various areas, such as written genres in business (Hyland, 1998), in science (Crismore & Farnsworth, 1990; Harris, 1991), and persuasive writing (Crismore, et al. 1993). These researches are based on an important assumption that "writing as a social and communicational engagement between writer and readers and focus on writer project themselves to their work to signal their communicative intentions" (Hyland, 1998, p.226). Hyland (1998) revises both Crismore

et al (1993)'s and Haliday's (1973)'s researches, and defines two categories of metadiscourse markers: textual and interpersonal metadiscourses.

According Hyland (1998), textual metadiscourse refers to devices which reveal the writer's intention by explicitly establishing preferred interpretations of prepositional meanings. Devices in this category help to form a convincing and coherent text by relating individual propositions to each other. This kind of markers are including (1)Logical connectives: it expresses semantic relation between main clauses and the typical examples are including "in addition, " "but," and "therefore." (2)Sequencers: it denotes sequence of text material. The examples are "first, "next," "finally," "then." (3)Frame markers: explicitly refer to discourse acts or text stages. "Finally," "to repeat," "my goal is" are belong to this sort markers. (4)Endophoric markers: it refer to information in other parts of the text. The examples are "noted above" and "see below." (5)Code glosses: it helps readers grasp meanings of ideational material, and the examples are "namely," "e.g." and "in other."

The other kind of metadiscourse considers about interpersonal relationship. Interpersonal metadiscourse "reveals the author's attitude towards both the prepositional information and the reader, thus contributing to the development of a writer-reader relationship"(Hyland, 1998, p.229). It influences the author's intimacy or remoteness, expression of attitude, commitment or propositions, and degree of reader involvement. The markers as including: (1)Hedges: it withholds writer's full commitment to statements, such as "might," "perhaps" and "it is possible." (2)Emphatics: it emphasizes force or writer's certainty in message and the examples are including "in fact," "definitely," and " it is clear." (3)Attributors: it indicates the source of quoted information, and its typical examples are "according to," and "X says." (4)Attitude markers: it expresses writer's attitude to proposition content, such as "surprisingly," and "hopefully." (5)Relational markers: it explicitly refers to or build relationship with reader and the examples are "between us," "you can see" and "I / We."

RESEARCH METHODOLGY

This study explores how journal editors create and enhance the journal image by adopting speech acts in editor's letter. The data collected in this study are editor's letters which are published in each issue of both MISQ and CACM in 2000. MISQ and CACM are chosen because both of them are suggested as top five ranked journals but on different focus (Hardgrave & Walstrom, 1997; Walstrom et al., 1995; Holsapple et al., 1994; Gillenson & Stutz, 1991). A content analysis is adopted based on the inventory of metadiscousal markers. All of editor's letters are analyzed sentence by sentence. The coding process is complied by the two authors independently and then discussed the different clarification in order to make a consistence results. ANOVA is applied to test the difference of the metadiscourse markers that appear in these two journals, too.

DATA ANALYSIS

ANOVA tests are applied to examine if the adoption of metadiscourse forces in editor's letters is different between these two journals. The result shows that the speech act of editor's letters in these tow journal is significant different in both of interpersonal forces ($F= 10.417$, $p= 0.002<0.01$) and textural forces ($F=12.871$, $p=0.001<0.01$). It means that the writing styles of

editor's letter in these two journals are different. Thus, the editors in MISQ and CACM apply different speech act to create and enhance the image of their journals. The metadiscourse markers adopted in both MIS and CACM are represented in Table 1.

Table 1 the frequency of metadiscourse markers in the two journals

	MISQ		CACM	
Categories	Total number (rank)	%	Total number (rank)	%
Interpersonal				
Attitude Markers	24 (1)	0.29	14 (3)	0.15
Emphatics	18 (2)	0.22	11 (4)	0.12
Relational Markers	18 (2)	0.22	46 (1)	0.48
Attributors	13 (4)	0.16	19 (2)	0.2
Hedges	9 (5)	0.11	5 (5)	0.05
Textual				
Code glosses	32 (1)	0.32	45 (1)	0.45
Logical connectives	31 (2)	0.31	10 (4)	0.1
Sequencers	23 (3)	0.23	17 (3)	0.17
Frame Markers	12 (4)	0.12	22 (2)	0.22
Endophoric markers	1 (5)	0.01	5 (5)	0.05

Generally speaking, editor in MISQ used a lot of code glosses and logical connectives to form rational inferences to persuade readers. On the other hand, it concerns reader intimacy as well, since a lot of relational markers are used, too. In contrast, the editor in CACM use a lot of relational markers which distinguish the editor, readers and writers, and adopt attributors to provide a brief summary of what are included in this issue.

DISCUSSION AND CONCLUSION

Editors in MISQ and CACM adopted different speech acts in their editor's letters. How these speech acts will influence mage is discussed in following section.

Images And Editor Letter Written Style

The image of journal affects the writing style of the editor's letter. With a image as a director or guru in MIS research, the editor's letter in MISQ using a lot of attitude markers which address editor's prefer to specific issues, and many emphatics which express the editor's assurance about a specific issue. In addition, editor's letters in MISQ are employed more logic connectings which denote how the writer intends the meaning relations between ideas to be understood. Theses forces

indicate the editor's letter are concerned about to direct and to advice MIS research by explicitly stating their views, organizing their ides and building arguments.

On the other hand, CACM has vary ranks in years, it lacks of a fixed position in the pool of journals. The most frequently forces used in editor's letters is "relational marker," which explicitly seek to involve the reader by selectively focusing their attention, and emphasizing a relationship in the text situation. It implies that the editor take a position to treat himself as a guide to introduce the others what has been studied in MIS discipline.

Editor Letter Writing Style and Images

The metadiscourse forces will reinforce the image of journal. In MISQ, the editor uses attitude markers and emphatics to underline their certainty and boost their presence in discourse. Both of these forces help the editors to instill confidence and trust in readers through an impression of certainty, assurance, and conviction in the views presented. In addition, relational markers are also used to demonstrate common ground with the reader, trigger agreement on the claims discussed by presenting oneself as a person with similar views, interests and objectives as the reader. All of these three forces make readers easier to be persuaded and then reinforces the image as a director.

On the other hand, relational marker, attributor and attitude marker are major metadiscourse forces in CACM. Attributions are used to support and give credit for the editor to persuade the readers. In addition, the use of third-person forms contributes to persuasiveness of a text by making the shared interests of writher and reader transparent. These two forces further strengthen the image of introducer in CACM.

To be concluded, this study applies metadiscourse analysis to examine editor's letters in MISQ and CACM in 2000. The finds show that these two editors apply different forces to communicate with their readers. It also suggests that the relationship between image and editor's letter is a reciprocal influence. Previous image and editor's reputation may determined the writing style of editor's letter, the speech act of the editor's letter will directed the reader's perception and interpretation of what has been presented in the journal and then enhance their image.

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A FRAMEWORK FOR THE DELIVERY OF IT INSTRUCTION IN PRIMARY EDUCATION AND ITS IMPACT ON IT SKILLS DEVELOPMENT IN CHILDREN

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ABSTRACT

In order to achieve success and be marketable in today's workplace, children must have a sound grasp of information technology. The skills necessary to use IT must be taught in primary education. However, integrating information technology education into the classroom is a complex issue and goes beyond the number of computers in the classroom. While the number of computers on available in the classroom is, of course, a key factor, we contend that there are a number of other factors that drive the delivering of successful IT skills instruction. At a minimum, school systems must address questions of how to educate the educator, how to design a technology classroom effectively, and how to effective deliver the instruction. Thus, the purpose of this study is to explore the salient issues affecting information technology skill development in children and propose a framework for study.

INTRODUCTION

Technology is no doubt one of the most important tools that a person needs to achieve success in today's society. Due to its criticality to the workforce, technology must be introduced and reinforced in the most elementary of places, our primary schools. Teaching the use of technology in our elementary, middle, and high schools is now becoming as fundamental as the three Rs: reading, writing and arithmetic. The question now becomes how does a teacher and schools integrate the computer and computerized technology into the fundamental curriculum?

The integration of information technology into our schools is not easy. In order for school computerization to be successful, many different external and internal factors must be examined, scrutinized, addressed, and resolved. There are a number of external issues. For example, obtaining qualified personnel is a major concern that any school system must address. Where does a school get qualified and capable teachers to teach our students the fundamentals of computers? How does a college curriculum include computers into its education major's curriculum? Where do we get the personnel to maintain our computer systems or is that the teacher's job? Internal to the issue is the classroom itself. What does a technology education classroom look like? How many computers is enough? How many computers are too many?

While all of these questions beg further exploration, one paper cannot address them all. Instead, the purpose of this paper is to develop a framework for examining these issues and launch a new program of research. We will first examine the literature on teacher education. Next we will

review issues specific to classroom design and deliver of the instruction. Then we will present a report of a case study of a Florida State University program called Project Child that was developed to help integrate technology into Florida classrooms. Finally, we'll present a framework and provide suggestions for future research.

EDUCATING THE EDUCATOR

In order for teachers to be comfortable teaching technology to students they must be proficient and knowledgeable in the subject itself. Just as a teacher should not teach mathematics unless they have a sound grasp on the concepts and theories of mathematics, the same is true of teaching computers skills. It has been observed that teachers are more hesitant in implementing computers in their day-to-day work than any other profession. One reason may be a lack of training in college curriculum. According to Halpin,

> "The general consensus has been that computer literacy involves not only the knowledge, understanding, and value of technology that are required for a teacher to feel confident with classroom integration, but also a positive attitude in their ability to apply the theory-related concepts into their real classroom instruction." (1999).

Making teachers proficient with positive attitudes requires that college education departments infuse the curriculum itself with computer education. Therefore, emerging teachers can be comfortable with their computer literacy and their ability to transfer that knowledge to their students. Two recent studies, examined how educators are trained to use information technology. In a study of 114 students enrolled in a state-mandated educational computer course at California State University in Los Angeles, researchers measured the relationship between attitudes toward computers and computer usage. The study showed that student teachers who do take computer courses have a better attitude towards computers and computer usage.

In another study, 73 pre-service teachers were surveyed (Halpin, 1999). The study surveyed students who took the same course in 2 different semesters with 40 students participating during the fall semester and 33 during the spring semester. Those students in the spring semester were encouraged to use computer technology but were not required. In the fall semester, the students were required to use computer technology such as word processing for lesson plan and spreadsheets for graphing. Participants of the class who completed one year of teaching (56 of the 73 students who took the class) were surveyed a year later.

The post course interview showed that teachers who were required to use computer technology had a higher rate of transfer of using technology for instructional purposes. Not only was the rate of transfer higher, but the teachers also started thinking outside of the box. They began using computer technology for issues that had not been addressed in the class, such as using the computer for enrichment and remediation, research and data analysis tools for students to gather data, and spreadsheets as a grade book.

These two studies show that integrating computer technology in the college curriculum of education majors makes teachers more comfortable with computer technology. It also makes them

better able to transfer their knowledge to their students. Acquiring computer literate teachers does not have to be done outside of the teaching profession. Teachers must be trained to be able to implement and educate their students on the use of computers.

Although teachers should be proficient in the use of computers in order to better implement computer usage of their students, it is not reasonable to ask each teacher to be a "computer guru." School systems must then look at support personnel to maintain their computer systems. The number and placement of personnel depends on several factors; the computer use in the school and the school system as a whole, the school's budget, the computer knowledge of teachers, the number of computers within the individual schools and throughout the school system, and the type of computer architecture (networks, servers, etc) the school system uses. Each school and school system must evaluate these factors and many others in order to acquire the sufficient support personnel.

TECHNOLOGY EDUCATION CLASSROOM

Bringing technology to the classroom is often complicated by where we physically place the computers in the school. One logical place is the computer lab. This is a classroom used only for computer instruction. Students are allowed to work in the computer labs as a group or on a one-on-one basis. There is usually a staff member in charge of this lab.

An alternative to the computer lab is placing computers in the classroom. These computers are usually placed at stations in the classroom. Students within the class can go to the stations to reinforce lessons learned in the classroom or as a reward for good behavior. With this type of design, educators must determine the optimal number of systems. There are a variety of opinions on this subject. In one example, a school has about 400 computers and the student - computer ration is 4 to 1 (Goral, 2001). Another school has just 1 computer in each classroom (Udell, 2000). The number really deals with the schools' budget and the student and class design.

The final alternative is a hybrid that uses a combination of the first two alternatives. Through this model there is integration in the classroom and also the lab for more specialized work with a better trained instructor that can guide students through more difficult or more technical instruction.

TEACHING TECHNOLOGY TO STUDENTS

Children are often compared to sponges waiting to absorb many things. This is an analogy that works to the advantage of those teaching school aged children the wonders of technology. Certain aspects of computers were actually designed with children in mind. In fact, the mouse was first developed to help children work with computers. Researchers believed that if children could easily pick up this type of technology, adults can do the same.

Teaching information technology skills is much like other skill-related subjects. Children must be exposed to the subject, the subject must be taught effectively, and the child must also learn how to effectively use the subject in everyday application.

The literature on teaching technology to students is varied. While most reflect that technology is definitely a positive for children and a subject that needs to be taught. There is much

variation on how technology should be taught. This has already been somewhat apparent in how the design a technology education classroom.

Technology integrated into the classroom is an effective model of how to teach children technology. It teaches the child not only how to use the technology but also how to integrate technology into positive personal applications. An excellent example of how a school system has accomplished this is project CHILD.

CASE STUDY: PROJECT CHILD

Project CHILD (Computers Helping Instruction and Learning Development) is a computer program developed at Florida State University and funded by the Florida Department of Education. The project integrates computers into the core instruction of the elementary classroom. According to Kromhout and Butzin, "the purpose of the project is to provide structure, materials and training to enable typical elementary schools to integrate technology into the classroom curriculum in a cost effective and developmentally appropriate fashion." (1993) The entire purpose of this project addresses most of the pertinent questions when debating how to teach technology. Not only is it cost effective but it also integrates computers and technology into the entire curriculum of the class.

The use of technology is heavily reinforced in the classroom but it is also reinforce in the home. Parents are encouraged to participate in the education of technology to the students. Before a child is placed in a project CHILD classroom, parents are given an informational video and letters that outline the goals and structure of the classes. Parents are given the choice of rather they want there child to participate and at anytime can remove a child from the program. Parents are able to review their child's passport each six weeks. A passport is a dossier of the child's activities in each of the classrooms. Showing projects, the child's achievements and progress through the class is also included in the passport. (Kromhout and Butzin, 1993)

Results from project CHILD have all been positive. Attendance in school for those participating students has increased, where the need for a child to repeat a grade has decreased. (Kromhout and Butzin, 1993) Project CHILD does those things that are necessary for a computer program to be effective including involving parents so that they are encouraged to reinforce what has been taught in the classroom. It also teaches the child how to use the application of computers in the real world.

FRAMEWORK FOR STUDY

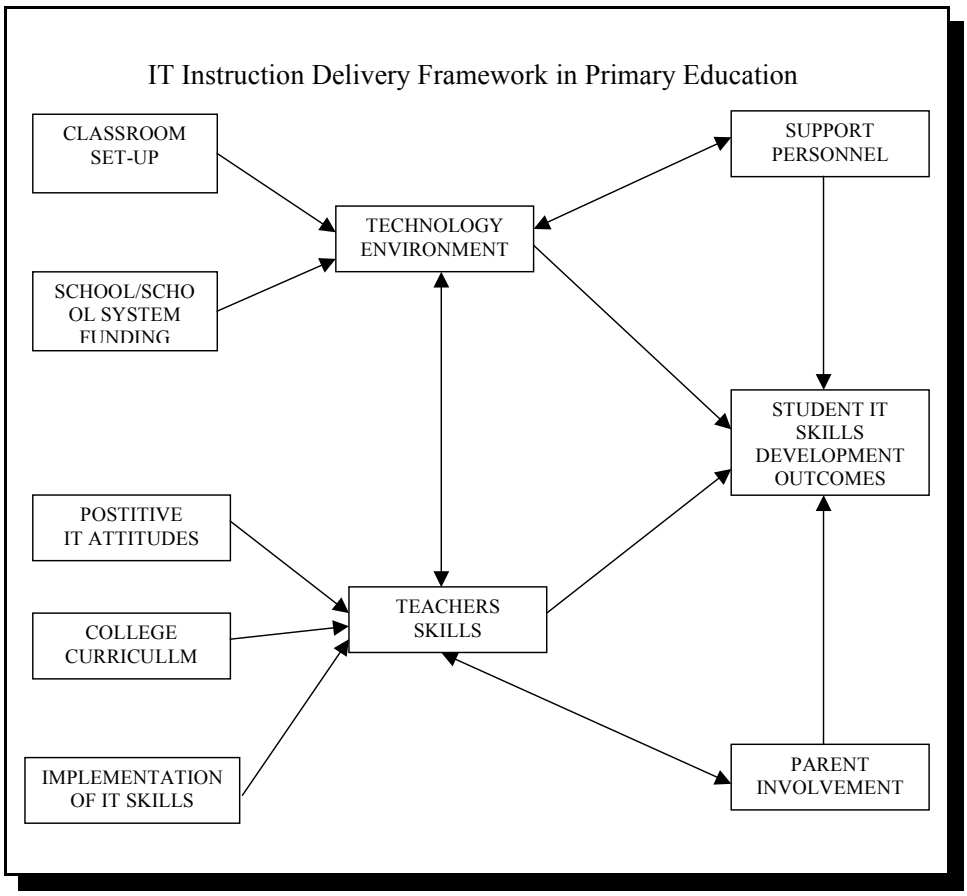
The information highlighted in this review is the basis for the content in the framework presented. Each element in the framework should be thoroughly studied and researched before a definite conclusion can be reached on whether these elements will positively achieve the expected outcome.

Figure 1 illustrates the factors we believe affect the IT skill development outcome of primary school students. The literature previously presented supports the assertion that there are two key factors that affect the skills development outcome: the technology environment and the teachers' skills. While there are numerous extraneous variables that affect each of these factors, we believe there are several key variables affecting each factor.

The technology environment simply refers to the technology available in the classroom for student use and teacher instruction. School funding drives many of the decisions regarding technology adoption and the limitations facing schools in terms of what technology they can afford to put in place. The configuration of the of the classroom also has an impact on the environment for the delivery of IT instruction.

We also assert that the teacher's skill set is affected by the college curriculum in their degree program. Was technology incorporated into their own experience? Did their coursework prepare them for teaching IT skills to students and incorporating technology into their own classrooms?

It is also plausible to contend that teacher's IT instructional skills are affected by their own attitude toward technology. We believe teacher's computer self-efficacy will affect the degree to which they will be willing to learn the technology in order to teach it to their students.



CONCLUSION

Computerizing schools is not just a question of how many computers does a school need. School systems must determine where they will get qualified personnel (or how to train personnel),

how the classroom needs to be designed to better facilitate learning technology, and also what is the best way to teach our children. Education of the educator must begin in the curriculums designed by colleges and universities. This education must continue throughout the career of the teacher. The technology classroom design depends very much on the budget and the goal of the school system. Last but not least, the education of the child must include exposure, retention, and reinforcement both by the school system and by the parent. The framework for study clearly outlines the areas that need to be focused on for further research. Integration of technology into the public school curriculum is paramount. Technology and our children are the future; we must make sure that their relationship is a positive one.

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Available upon Request

REINFORCING COMPUTER SKILLS WITH STREAMING MEDIA TUTORIALS

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ABSTRACT

Students in computer classes often misunderstand subtle processes. They also forget how to manipulate files or objects in their programs. By using Camtasia, a video capture suite of programs, you can easily create tutorials for any software or any process within an operating system. This gives the instructor the ability distribute these tutorials on CD, DVD, or streaming on the web via RealPlayer, QuickTime, Windows Media Player or other formats. This presentation will cover all facets of development and distribution of these tutorials.

INTRODUCTION

University campuses are dotted with pockets of innovation, in terms of internet usage for classes. Many professors utilize "home grown" web sites that include syllabi, class notes, and study guides. Some institutions have adopted universal plans that include WebCT or Blackboard as the foundation of class web sites. Scores of textbook publishers have rushed to embrace these commercial foundations. They offer ready-made course supplements with a copy and go mentality. Course Technologies, a well-known computer book publisher, offer their supplements in a wide variety of formats. As the technologies progress, the innovative instructors test the possibilities of other distinct ways to use the internet to support instruction. One large step forward, from simple class web sites with general information, is to incorporate interactive materials into their sites. WebCT allows the instructor to provide on-line quizzes and exams. The software records scores and allows the instructor many options of how students may take the test. The instructor can allow one attempt and use that score, or may allow five attempts and use the best score of the five. Also, the instructor may allow a number of attempts and use the average score of the attempts. Using WebCT, allows the instructor to view the students activity on the site. Professor Jones might assign the class to read an article posted on the web site. The Professor can track the students and see which individuals have opened the article.

The next logical progression of the class web, is to provide reinforcement of the in class activities through on line videos. This would not have been possible a few years ago. Limitations of the streaming technologies, as well as, limitations on connection speed or bandwidth would have all but eliminated this possibility. Today, with the proliferation of high speed internet connections to the home, students have access to vast quantities of information. Not only vast quantities in "library of congress" terms, but in the ones and zeros that fly into and out of the computer. Classes that involve computer techniques can use a suite of programs from the TechSmith Corporation, called Camtasia. The suite of programs empowers the end user to recreate an in-class demo like a "computer VCR" and distribute the video to their classes on CD or via the internet.

CAMTASIA

The Camtasia Suite includes three separate programs, the Recorder, Producer and Player. Each one is particularly useful. The heart of the suite is the Recorder. The Recorder is the program that, as the name suggests, actually records the action on the screen. There are many options within the Recorder. The program allows the user to select a complete window, dialog box, fixed region, or the complete screen. The flexibility allows the creator to only record the portion of the screen deemed necessary, thus reducing the amount of resources needed to display the recording. The recorder also provides the ability to record voice along with action. The creator can explain what he/she is doing on the screen as they are doing it. Another nice feature of the Recorder is to highlight the cursor on the screen. The highlight also graphically displays the click of the mouse. The highlight is especially useful when in use via the web.

The producer is the traffic cop of the suite. It allows the creator to combine multiple clips together to produce a single video file. The default format is the standard AVI file. Using the Producer, the Professor is able to use video taken from a camcorder and incorporate it into the video presentation. This yields a nice effect on the screen incorporating both screen shots and the human element. The output features of the Producer include; the standard AVI format, as well as, Real Player, Quicktime, Windows Media Player and a few other obscure file formats. There is an audio editor included in the Producer. The audio editor allows for simple editing of the existing audio track.

The Camtasia Player is a simple media player similar to the Windows Media Player or the Real Player. The Player will display the proprietary video files native to Camtasia. The Player, or a web based plug-in is required to play a native Camtasia file locally or via the internet.

DISTRIBUTION

Distribution of the video content can take on many forms. The professor may simply copy the video files to a CD-ROM or DVD and distribute as necessary. The video files become very large, very quickly. Even a relatively short demonstration results in a huge file. On a high speed internet connection, downloading the file would still result in a wait. An alternate delivery method, is streaming, via the web. The streaming technology involves starting the download and watching the video as the video is downloading. Streaming the video even allows users on a dial-up connection to utilize the content. A special server must be available to store and distribute these files appropriately. A free streaming server is downloadable from Real Networks. The Real Server will distribute streaming media in the real format. The free version will support up to 25 simultaneous users. It will run on Windows 2000 Professional or XP Professional. One note of caution, the use of streaming server takes up a great deal of the bandwidth of the network. The appropriate network administrative group should be aware of a streaming server on the network.

CONCLUSION

The technologies involved with classroom teaching continue to evolve. The techniques utilized today could not have been predicted a few years ago. Using products like Real Server in conjunction with Camtasia provide opportunities for students to learn outside of traditional classroom hours. There are many direct applications of these techniques for computer related fields. However, these techniques can be applied to any discipline, instructors of non-computer areas must be more creative in their endeavors.

A COMMENT ON "BIG BLUE'S" FORMER GLORY

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ABSTRACT

IBM has been involved in virtually every facet of computing, offering hardware from mainframes to PCs, software, networking services and financing. In spite of all this, there is a large investment risk associated with IBM. There is a constant hazard of finding additional growing businesses to add to IBM's portfolio in an effort to offset any declining or stagnant businesses that are already in IBM's portfolio. If IBM can return to its former customer focus orientation, channel its efforts to increase shareholder wealth and increase its product and service base, it could exhibit the ability to again become the market leader.

INTRODUCTION

IBM entered the computing market with its Automatic Sequence Controlled Calculator in 1944. The Mark I was followed by a series of products in the 1950s that helped establish the future of IBM and the computer industry. In 1952, Thomas Watson, Jr., became the president of IBM. Watson envisioned the future of computers and pushed IBM to meet the challenge. Under his leadership, revenue grew from $900 million to $8 billion. One of Watson's greatest moves for IBM was the unbundling of the components of hardware, services, and software that were previously sold in packages. This move gave birth to the multi?billion dollar industry that exists today (Carroll, 1993). Throughout the 1960s and 1970s, IBM introduced many products that helped transform the computer industry. The 1960s saw the introduction of IBM's System/360, which allowed customers to upgrade portions of the computer without having to incur the greater expense of replacing the entire computer.

MANAGEMENT OF IBM

The 1980s marked IBM's entrance into the personal computing market as well as the beginning of its decline in the industry. Beginning with the leadership of John Opel, IBM began to make strategic mistakes. In the late 1970s, Opel made the decision to turn IBM into the lowest cost producer. Focusing on price performance in the 1980s left little or no room for IBM's traditional values, which were largely comprised of customer service. John Akers became CEO of IBM in 1985, and immediately focused on streamlining the company's operations. While Akers is predominantly blamed for IBM's downfall, his leadership style seemed like it would be a success; Akers was known as a natural leader. He was able to make the necessary decisions, but also was known for listening to his subordinates and could consistently count on their support in his early years of management (Carroll, 1993). When Akers moved into the position of president of IBM, the company was capturing approximately 70 percent of the entire computer industry's earnings.

Akers had stepped into the position of president with charisma and personality, but never with the anticipation of having to engineer a company?wide turnaround. In response to the problems IBM was facing, Akers set up several task forces. In mid?1987 the task forces turned in their reports and made it clear that IBM was not facing a small problem, but was instead at the beginning of downfall and defeat at the hands of competitors. Akers began to try and break apart different segments of IBM's business and have them operate in small, independent environments. By 1993 it became apparent to the Board of Directors of IBM that Akers would not be able to turn the corporation around. Akers had consistently promised higher revenues and greater profits for the board and shareholders of IBM and had not delivered. Breaking away from IBM tradition, the board began to search for outside leadership. In April of 1993, Louis V. Gerstner, Jr. was brought on board as IBM's CEO. Gerstner brought with him a customer?oriented vision and a strategic-thinking expertise that he honed through years as a management consultant. Gerstner immediately began to take action to rebuild IBM's product line, shrink the workforce, and make significant cost reductions. IBM had become so bureaucratic through the years that it was Gerstner's number one priority to reduce the bureaucracy.

THE INDUSTRY

Information technology is turning out to be a significant productivity engine which is not only continuing to drive into its historical markets, but is also taking aim at a broad based technological future. Revenue for the worldwide information technology market is forecasted to grow at 9% annually through 2001. Revenue for this three year time period is expected to grow from $801 billion to $1,039 billion, an addition of approximately $80 billion in revenue annually (Jones, 1999). According to Salomon Smith Barney's January 1999 industry analysis report, this growth is broad?based, with all major product and service sectors expected to participate as well as consumers driving it both directly and indirectly.

Can IBM meet the challenge? The industry's largest information technology customers are cautiously hopeful that IBM can meet the challenge. One high level IT executive from an East Coast Fortune 10 company was quoted as saying: "… Gerstner deserves credit for crystallizing a direction for a company of IBM's size to go in, but I can't build a career on a road map and a slogan. They have to deliver all the pieces that add up to some clear value?added for online enterprises. They have those pieces on paper, but it is their game to lose" (Scannel, 1998). IBM is focusing on specific business segments such as Personal Computing, Internet Strategy, Services (Total Solutions) and Customer Service, Software, Partnerships and Management changes.

PERSONAL COMPUTING

The emergence of the PC was almost pure serendipity, a succession of happy accidents. The genius of IBM management was that it was able to let this happen. IBM, through a series of agreements with third parties, began to lose control of its end customers. The company enthusiastically embraced its third parties but it failed to recognize the importance of maintaining relations with its end-users.

The rapid growth of the PC has been an outstanding success, but it left IBM with a number of problems. First, the open architecture of the PC makes IBM reliant on outside suppliers. Had IBM planned its strategy in this market in its usual meticulous manner, there would have been a greater degree of IBM control. Instead, IBM lost the faster market growth and competitive position that it could have enjoyed.

The second problem IBM faced in the personal computing business segment was its position in the price war. As the market became less buoyant, dealers who were independent of IBM's control started a price war that was beneficial to no one, least of all IBM. This price war began as a shakeout of those dealers who could not make the grade and who, with liquidity problems, began to liquidate their stocks. A significant strategy was IBM's discounting structure whereby the dealer was encouraged to sell the last few machines at a heavy discount in order to reach the next price break and obtain a better price on all their purchases. While this strategy looked good on paper, loading in stock to create pressure on retailers is a standard consumer goods marketing technique. The end-buyers wanted the IBM logo but were increasingly persuaded that Compaq, which was not so heavily discounted in the price war and was more profitable to the retailer, was a better deal (Mercer, 1987).

WHERE IS IBM HEADING IN THE PC MARKET?

The PC revolutionized the market because it provided each user with a stand?alone machine. But when PCs are connected to a network, some of the old centralization problems occur. If all users can use a software program that is stored on the network?server, the necessity for an individual copy of the software for each user is eliminated. IBM's plan is to provide a new technology ? the network computer. The network computer will be an inexpensive replacement for the personal computer in a networked environment; 100,000 of these computers were sold in 1997 (Cook, 1998).

Network computers (NCs) will be an interchangeable commodity that will save money for their customers but may also erode the sales of current mainline PC makers, including Compaq. NCs will not be a replacement for the PC, but instead will eliminate the higher expense of purchasing PCs in a work environment when there is not the necessity for every user to have one. Instead, PCs will be reserved for mobile users (laptops) and for personnel that need to run very powerful programs, such as computer?aided design (CAD).

INTERNET STRATEGIES

The key mission of IBM's software division is helping customers exploit E?Business opportunities (Weil, 1998). A large part of IBM's future rests on its participation in the Internet and E?Business revolution that is sweeping through the information technology industry. There is much opportunity in this field for qualified solution providers. A significant amount of revenue is being directed to IBM's Consulting and Service Divisions, which saw an addition of $8 billion in 1998 to its services backlog which now totals approximately $50 billion (Jones, 1999). IBM is projecting that over the next four years close to $600 billion will be spent on E-Business/E?Commerce solutions. Hardware is projected to account for 28% of this amount, IT services 58% and software 14% (Weil, 1998). Because of its large size and many business components, IBM is one of few

firms capable of offering customers a total solution that incorporates all the necessary hardware and software services.

The Internet is presenting one of the biggest opportunities for IBM to recover from its years of poor performance and participation in the growing information technology industry. IBM's mission on this front is to combine its strength in computing and networks with the worldwide reach of the Internet. Its goal is to create secure Net?based environments where buyers can meet sellers and transact business in confidence. To further this goal, IBM has been rolling out its products and services in this area in the form of business solutions for small, startup companies. IBM will assist a small company in marketing its product on the Internet and taking orders securely from customers. This helps the small company get its start and helps to move IBM to the forefront of the Internet business (Cook, 1998).

SERVICES

Part of IBM's restructuring process is to build up its Global Services business segment. IBM's overall valuation is in line with that of other multi?billion dollar information technology service providers (DeLamarter, 1986). Contributing to this valuation is the speed with which IBM is completing its assignments. The size of the Global Services' segment is $49 billion. Its 1998 third quarter revenues were $5.8 billion (Weil, 1998). These figures are evidence that IBM is receiving a high degree of customer satisfaction. The Global Services segment is also providing IBM with a sales channel for the company's software and hardware.

Global Services is having difficulty keeping up with escalating demands. As a result of this, management is having to screen new projects against a profitability hurdle rate in order to raise the division's rate of return. This fact is in spite of hiring approximately 15,000 experienced staff in 1998 alone (Weil, 1998). Global Services has the ability, at this rate, to deliver better margins that could increase IBM's future profitability.

SOFTWARE

One of IBM's most important focuses is a concentration on software for its line of servers. These servers control desktop PCs on corporate networks and the Internet. In essence, IBM is seeking to bypass Microsoft's system and applications software that runs on 80% of the world's desktop PCs (Weil, 1998). IBM's software business is approximately the same size as Microsoft's, but revenue in the past came largely from the mainframe business which is a seriously declining market (Cook, 1998).

In 1995, Gerstner launched IBM into the world of networked desktop computing by acquiring Lotus Development. IBM wanted Lotus Notes for its powerful communications capabilities in a networked world. The acquisition has proved to be an enormous success for IBM. There were 1.6 million Notes users when IBM purchased the company. There are now over 20 million, with 4 million of those being added just in the fourth quarter of 1997. To further its presence in the software market, IBM also purchased Tivoli Systems in 1996. Tivoli is a manufacturer of software designed to manage distributed computing systems. A third of IBM's software revenue came from network computing software in 1998 (Cook, 1998).

FUTURE DIRECTION OF IBM

IBM still remains on shaky ground as it strives to regain the number one market position. A series of poor management decisions could easily destroy the recovery that IBM has been making since Gerstner's arrival. One strategy that IBM is taking to help its multimedia business succeed is bringing in executives from outside the computer industry. For years IBM was closed to company and industry outsiders. Many believe that this strategy was one of the main factors of IBM's downfall. Furthermore, Gerstner has focused on improving IBM's customer service in an effort to make IBM the industry leader.

IBM has been involved in virtually every facet of computing, offering hardware from PCs to mainframes, software, networking, service, and financing. It is among the top five PC companies; it is the number three UNIX systems company and the number four disk drive company, and it is in the top three of software companies (Niles, 1999). In spite of all of this, there is a large investment risk regarding IBM. The mainframe business segment still suffers from slowing growth. There is also a constant hazard of finding additional growing businesses to add to IBM's portfolio in an effort to offset any declining or stagnant businesses that are already in its portfolio.

CONCLUSION

IBM is in the process of rebuilding itself to become the market leader; it does not plan to enter the retail business in any form as this might place it in competition with its customers. Essentially, IBM is offering applications (solutions) and value-added tools, and via its services arm it is encouraging its customers to outsource tasks such as system design, management and operation, and system integration and maintenance (Weil, 1998). In a return to customer focus, efforts to increase shareholder wealth and plans to increase its product and service base, IBM has the ability to become the market leader. IBM's participation in the information technology industry over the next two to three years will prove whether or not it has weathered the storm or merely staged a false recovery.

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COMPLEX ADAPTIVE SYSTEMS DESIGN FOR LEAN MANUFACTURING

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ABSTRACT

This paper describes a technique for using principles of complexity science to guide the development of a Lean Manufacturing system. The complex adaptive systems viewpoint advocates that a system be examined as a whole, rather than as a collection of elements. Unfortunately, few tools exist that provide a holistic view of manufacturing process and information flows. This paper describes the application of the Value Stream Mapping tool to guide the development of a new system, and also applies Michael Church's model for organizing simply to cope with complexity. The preliminary findings suggest that principles of complexity science can be successfully applied to the design and development of a high variety manufacturing system. Value Stream mapping is shown to be a very powerful tool for the simultaneous redesign of manufacturing information flows and processing steps. Furthermore, the Church model is shown to be indispensable as a model for organizing simply to deal with complexity.

INTRODUCTION

One of the most persistent consumer trends today is the increasing demand for highly customized goods. Pine (1999) refers to this trend as "Mass Customization" to distinguish it from the more common practice of Mass Production as pioneered by Henry Ford. The desire for a wider variety of products is a significant adaptive challenge for most manufacturing companies. To meet this adaptive challenge, many companies choose to implement complex manufacturing planning software. A wide array of MRP (Manufacturing Resource Planning) and ERP (Enterprise Resource Planning) systems promise to solve the challenges of mass customization.

Unfortunately, few of these information systems deliver on the promise of simplifying the work of planning and controlling manufacturing operations. These systems are frequently delivered late and over budget, and they still fail to provide the improved levels of predictability and control that were promised.

This failure of MRP or ERP implementations may have little to do with the quality of the software or the skill of the implementation team. While the software and its implementation can be important elements of success, they will not guarantee success. The failure of complex software implementations in manufacturing may be to be due to several important factors:

The failure to diagnose the fact that the underlying manufacturing system is a complex adaptive system, and not a Newtonian model.
The failure to recognize the systemic coupling between the manufacturing process and the information system that makes it impossible to change one without affecting the other.
The failure to understand the role that information systems should play in facilitate self-organizing behavior.

This paper seeks to demonstrate the benefits of manufacturing systems design from a complex adaptive systems viewpoint. This paper will demonstrate how coordinated changes in the production process and the development of a simpler information system can result in a more adaptive total system.

BACKGROUND

ABC Corporation is a manufacturer of armored electrical cable and non-metallic PVC conduit. When the company was founded over 25 years ago in west coast, the product line was limited to simple two and three wire configurations that were armored with heavy gage aluminum. The high demand and low variety were achieved with custom designed machinery that could run for days on the same product. As the company grew, customers demanded an increasing variety of wire colors, gauges and combinations of solid, stranded and twisted pair wires. This escalating demand for total volume and the underlying demand for variety pushed ABC to design and build a new facility on the East Coast.

To achieve economies of scale with the existing infrastructure, the new facility was expected to use the existing MRP software package running on an AS/400 in west coast. This MRP system handles everything from Raw Materials purchasing and forecasting to Production planning, warehouse management and cost accounting. The company utilizes a separate HR information system that tracks employee payroll and related status data.

As the number of SKU's produced in the east coast plant increased, the problems with the MRP system became very apparent. The predictive models used by the software had generated large inventories of raw materials and finished goods that were not needed, while hot jobs were rushed through the plant by expeditors. Customer order fulfillment rates dropped and sales margins dropped due to the need to move excess inventories at reduced prices.

A great deal of debate ensued as to the mechanism for resolving this problem. The range of solutions included either improving/replacing the information system or improving the manufacturing process. Due to the influence of systemic coupling, the best direction seemed to be to turn an either/or solution into an "and" solution and improve the process and information system simultaneously.

The east coast plant was designed to produce low variety in high volume. Changes in the competitive environment resulted in customer demand for high variety in low volume. The system of manufacturing and the information system are not adequate for the new requirements. This creates the problem of designing a new system of work (both process and information flows) that is adaptable to unpredictable customer demand in low volumes. The purpose of this study is to determine if principles of lean manufacturing and complexity science can be effectively deployed

to guide the development of a system of work that is more conducive to high variety and unpredictable demand.

THE HISTORY AND BENEFITS OF LEAN MANUFACTURING

The term Lean Manufacturing was coined by James Womack in his seminal book on the Japanese Auto Industry entitled The Machine That Changed the World. Although Womack began his study as an examination of Japanese automakers in general, he quickly recognized that the best practices were all attributable to one manufacturer: Toyota. Consequently, the term Lean Manufacturing has become synonymous with the Toyota Production System.

Womack's initial study (Womack, 1990) revealed that lean manufacturing was so superior to mass production, that it required half the human effort, took up half the floor space, required half the investment tools, demanded half the normal engineering hours, and permitted practitioners to develop new products in half the time. This phenomenal performance improvement opportunity drew the attention of manufacturers in industries beyond the auto industry, but did not gain widespread application because it was not obvious how to make the transformation from Mass Production to Lean Production. Womack released a second book, Lean Thinking (Womack, 1994) that helped to identify the key practices that Toyota employed to achieve its phenomenal success. These practices included specific methods that yielded a more efficient use of resources and the continuous elimination of waste. While it was not considered a major part of Toyota's competitive advantage, it was noted that Toyota did not rely on MRP systems for its production planning. Instead, Toyota used rather crude scheduling cards called "kanbans" and a simple production leveling system called "heijunka".

Jusko (1999) reports that despite growing interest, the adoption rate of Lean is still low. Half or nearly half of the total survey sample has adopted each manufacturing practice associated with lean production. In several instances, percentages approach 60%. A reported 70% say they have adopted quick-changeover techniques and cellular manufacturing. The percentage is nearly 80% for predictive- or preventive-maintenance techniques. However, this does not imply pervasive and integrated use of the lean concepts. When it comes to reporting "wide adoption" of the practice, the percentages drop dramatically. While 20.3% of the survey respondents say they have widely adopted predictive and preventive maintenance, no other lean technique has reached the 20% mark in terms of wide adoption percentages. In short, Lean manufacturing still appears to be a collection of tools that is neither widely adopted nor widely supported by information systems.

THE APPLICABILITY OF COMPLEXITY SCIENCE PRINCIPLES TO ORGANIZATIONAL BEHAVIOR AND SYSTEM DESIGN

"Every act of organizing is an experiment. We begin with desire, with a sense of purpose and direction. But we enter into the experience vulnerable, unprotected by the illusory cloak of prediction. We acknowledge that we don't know how this work will actually unfold. We discover what we are capable of as we go along. We engage with others for the experiment. We are willing to commit to a system whose effectiveness cannot be seen until it is in motion" (Wheatley, 1998)

Margaret Wheatley (1992) was an early advocate for the application of complexity science to organizations. Previously, complexity science served mostly as an interesting model for academics studying common patterns in biological systems and weather (van de Vliet, 1994). Wheatley noted the inconsistencies in organizational behavior and drew important parallels to principles of complexity science. She noted that:

> *"Until recently we really believed that we could study the parts, no matter how many of them there were, to arrive at knowledge of the whole. We have reduced and described and separated things into cause and effect, and drawn the world in lines and boxes" (Wheatley, 1992, 29)*

Complex systems are differentiated from "simple", or Newtonian systems, by the fact that a complex system will adapt to its environment and therefore does not exhibit linear predictable behavior. This does not imply that simple systems are easy to understand, or that complex systems are beyond the comprehension of mere mortals. Simple systems could include a sophisticated microprocessor circuit with millions of transistors. A CPU is "simple" only because it is not capable of adapting to its environment in some organized way.

Frohlich (1999) looked at the implementation of advanced manufacturing technologies and determined that the adaptation of the information system to the new manufacturing technology was of primary importance to success. This placed IT adaptation ahead of the adaptation of process technologies, human resources, and operational structures.

Warren (1998) summarizes the relationship between the complex adaptive system and its environment by noting that:

Systems and environments perturb each other and are therefore both constantly changing. This constant flux is adaptive; the system will tend to adjust to the environment in a harmonious manner and the environment that systems respond to will make complimentary responses.

This interplay is known as structural coupling and forms one of the key premises for the whole-systems approach used described in this paper. This paper combines an awareness of the importance of structural coupling with information exchange practices that support self-organizing behavior and local autonomy to yield a final outcome that is more adaptive than the prior solution.

The problem with much of the complexity science literature is that authors tend to use metaphorical constructs to link concepts of complexity to organizations. While metaphors provide for fascinating rhetoric, they do not always offer a substantive model for decision-making. The absence of a firm theoretical foundation for applying complexity principles to the design and implementation of new work systems is a significant limitation to practical use of complex adaptive systems concepts.

Man has utilized the hierarchical model of organization for thousands of years to achieve significant social and economic gains. Given this overwhelming evidence of success, it would seem fair and appropriate to examine the possibility that hierarchy may in fact be an essential part of our adaptability. To simply discard hierarchy without reasoned exploration and refutation would be unscientific.

The appropriate context for applying complexity science principles to system design should be to begin with existing organization theory and either disprove present theory with fact, or extend

current models with new cases. Church (1999) builds an argument in favor of organizational design for complexity that is based upon extensions of existing organizational design theory.

METHODOLOGY

Evolution of the New Work System

This work system design began with an identification of the critical success factors that would be required for the new system of manufacturing and information flows. Following the development of a short list of critical success factors, the present manufacturing and information flows were graphically depicted via the use of a "Current State Value Stream Map. Immediately after the development of the current state map, plant management and information systems personnel collaboratively reviewed the current state map and identified the required changes to the product and information flows to develop a Future State Value Stream Map that incorporated the Lean concepts. From the Future State map, a preliminary design was created for a database application that could handle the requirements of the new system.

Critical Success Factors

1. The system must provide the minimum critical specifications for successful order fulfillment to allow local autonomy and simple work rules.
2. The system must provide missing quality feedback data to allow for self-organization and individual corrective action.
3. The system should be capable of producing aggregate management reports for inventory accuracy checking.
4. The system should be capable of tracking performance of an individual kanban through the system.

Components:

1. Value Stream Maps
2. Visual Factory Elements
3. Level Specific Capability
4. Level Specific Information Processes
5. Shared Values
6. Level Specific Work Processes
7. Coordinating Mechanisms
8. Minimum information needs for self-correcting work processes
9. Implementation strategy
10. Existing State Mapping
11. Creation of New State Mapping
12. Establishment of Database Information Requirements
13. Assessment Criteria

CONCLUSION

In conclusion, the principles of complexity science provide excellent guidance to those looking to design a manufacturing system that can deal with high variety. Instead of developing a linear predictive model that is dependent upon the computer to do all the thinking, complexity science principles motivate one to look for systems that will flexibly adapt to non-linearity within the process. This search for non-linear adaptive methods should lead to the appropriate decision to redesign the work processes and information systems to support local autonomy. Local autonomy is optimized by providing the minimum critical specifications for the process. To quote Albert Einstein "Systems should be made as simple as possible, but not simpler." The system design utilized in this project consistently sought ways to reduce the constraints to the point that any further reduction would undermine the informational value and any increases in constraints would reduce flexibility.

There are many avenues for future work in this area. The most promising seems to be in the area of applying the tools of complexity science to Business Process Re-Engineering. Although this project focuses narrowly upon a manufacturing process, the concepts should logically extend to many administrative and service areas. As any business faces the adaptive challenge of variety, this approach and these tools should be of great value. Instead of building huge, complex systems that rigidly control inputs and outputs, it would be advisable to consider more flexible and adaptive systems that support local autonomy.

REFERENCES, FIGURES, AND TABLES

Due to the page limit, bulk of the body of the text and references, figures, and tables are removed from this paper. Please contact one of the authors to receive a copy of the full paper.

A COMPARATIVE STUDY OF E-COMMERCE BUSINESS MODELS

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ABSTRACT

As the Internet democratizes societies and empowers citizens with information, it is also yielding profound changes in the classic economic paradigm of buyer and sellers. New models of commercial interaction are developing as businesses and consumers participate in the electronic marketplace and reap the resultant benefits.

This paper will examine the most popular sis e-Business models (Store Front, Auction, Portal, Name-Your-Price, Comparison, Pricing, and B2B Exchange), and establish a discussion and agreements to facilitate the growth of commerce on the Internet. Significant concern exists regarding the overlap and the vulnerability of the current models infrastructure. Businesses and consumers need to feel comfortable that the Internet is a secure and reliable commercial medium, and that safeguards are in place to ensure the reliability of the Internet.

STOREFRONT MODEL

There are many e-Business models that a company may choose that will increase the profit to a company. One of these models is the Storefront model. The advantages of this model are:

- Transaction processing. Transactions may be processed via the Internet using the latest of technology. Online payment is made where the customer may send their payment through the net. This payment is secured using various encryptions software. Within this transaction, the company maintains a customer database.
- Online catalog. The e-Commerce storefront has an online product catalog where customers may view the items they wish to purchase.
- Shopping cart. Most e-Commerce has shopping cart technology. This technology enables the customer to put the product in a shopping cart just like being in a store. They can choose to buy the product right away or wait to purchase the product.
- Great convenience. Shopping online provides a greater convenience to the customer. One doesn't have to travel to a store to purchase a product. Also, multiple products may be purchase by the customer as well.
- Online customer service. E-Commerce also provides customer service to their customer at any time.

The disadvantages are:

- Untimely order fulfillment. Orders are not filled in a timely manner. So orders are shipped to customers within days or weeks.
- Lack of physical contact. When orders are purchased on the web, there are no physical contacts with that product. Also, the photos of the product are not the same as the product that was on the web.
- Limited Internet accessibility. E-Commerce has another major drawback in that customers without Internet access cannot access the storefront. This makes it an inconvenience to customers.

THE AUCTION MODEL

The e-commerce auction model acts as a forum through which Internet users can log-on and assume the role of either a bidder or a seller. In an online auction, commission is collected on every successful auction. Sellers post items they wish to sell and wait for buyers to bid. There are many pros and cons of the auction model in e-commerce.

The pros include, receiving merchandise cheaper than market value. Purchasing and bidding from a place of convenience. This can be done at any place with Internet access. All auctions are real time and can be monitored 24/7. Another pro would be finding hard to find items or collectibles. It requires little setup time to sell products online. Most online auction websites provide feedback about sellers and an online help session to provide assistance to novice sellers or buyers.

Cons include losing money from a seller's point of view due to the auction buyer purchasing merchandise for lower than market value because of low demand for the merchandise. The newness of the model can confuse bidders who may get disappointed when they are outbid. The seller may not come through with the product once the auction has ended. Technical problems could cause users to use the auction site less and less. Some merchandise purchased by sellers could be used and not noted as used.

PORTAL MODEL

Portal sites are designed to allow visitors a chance to find almost everything they are looking for in one place. Portal sites are designed to provide services. Many offer link descriptions along with some supporting services like mail services, news updates, classifieds, and auctions. They are designed to accumulate a large user group. Fundamentally, they are designed to create as well as serve a community. There are two prominent types of Portals: Web indexers (Yahoo!, LookSmart) and search engines (Alta Vista, Google).

There are two marketing approaches for the Portal Model: Horizontal Portals and Vertical Portals. Horizontal Portals are designed to aggregate or cluster information on a broad range of topics. Therefore a user can search information on anything using the Horizontal Portal. A Vertical Portal is designed to give more specific information within a single area of interest. For example, a user searching for information on computers would search for that information on a Portal with

a technically oriented format, (ie-ZD.Net). Currently, there are several trends in the Portal Model business design. One trend is to provide information to the user at no charge. Another trend is gathering revenue by banner advertising.

The advantages of the Portal Model from a business perspective:

- It is a powerful marketing mechanism because when it provides free, useful services, it gathers a tremendous amount of traffic.
- This traffic can in turn be converted into banner advertisement revenue.
- It is a powerful marketing mechanism with the capability to have worldwide reach.
- It can quickly implement marketing solutions.

And the disadvantages are:

- It acts as a conduit to other web sites; the amount of time stayed within the site (also known as the stickiness of the site) is limited.
- The most important part, the information, is provided for free; therefore the web site's ways of generating revenue are limited.

THE NAME-YOUR-PRICE MODEL

The advantages and disadvantages exist on either side of the deal, from the company's and the customer's point of view. The advantages from the company's point of view are:

- Lots of clients (customers): This is an online-based model. It attracts thousands of people from all over the world daily.
- Larger market: For businesses that offer their services and products through Name-Your-Price model face a larger consumer market. For example, if Delta Airline is to sell their tickets to a destination, they can go through Name-Your-Price models to attract more customers.
- They make commission by bringing buyers and sellers together.
- Sometimes the customer puts down a much higher price than the market value.

The advantages from the customer's point of view are:

- The customer sets the price: From the customer's perspective, this is more appealing than an auction based model. For example, if you want to pay no more than $100 for a flight from Houston to Dallas, Name-Your-Price companies find it for you.

Having considered the advantages, let's take a look at some of the disadvantages.

From the Company side: Low profit margin: due to the low price set by consumers.
From the Customer side: Lots of restrictions on choice of service provider. No refunds or cancellations (all sales/deals are final).

COMPARISON PRICING MODEL

The comparison-pricing model allows customers to poll a variety of merchants and find a desired product or service at the lowest price. These sites often get their revenue from partnerships with particular merchants. Thus, you need to be careful when using these services because you may not necessarily be getting the best price available on the entire web. Other similar sites search the most popular stores on the Internet trying to appeal to the largest audience. (Two popular sites are Internetmall.com and Ebix.com).

These sites allow you to select a product or service. Then the site searches its database and posts all merchants that sell that particular product or service. Then, select the cheapest priced product from the list to purchase. Once you have selected the cheapest product, the site places the product into a shopping cart. The shopping cart leads to the part of the web site that required your credit information.

The advantage of using this kind of model is that you can do this type of comparison-shopping without leaving your home or office. You can be assured that what you are looking for is what you are requesting without having to go to several locations.

The disadvantage is that only merchants giving you the quotes are the ones that are actually registered with that particular portal. This limits your options as a consumer.

B2B MODEL

Business-to-business (B2B) e-commerce is the exchange of goods and services between businesses with the assistance of software, telecommunications and telecommunication-based tools. B2B emphasizes direct marketing of products and services, supply-chain management, customer service and the exchange of ideas and information.

The major advantages are they decrease the amount of time it takes for a business to receive products from a supplier. This relieves the stress placed between the supplier and the business, unlike that of a traditional business model. JIT (just in time inventory) gets the inventory to the manufacturer or the business at the exact time it is needed; reducing inventory expenses for the business. In the traditional business model, a manufacturer or business would have to keep more than enough inventory on hand just in case they would run out of inventory. The organization saves the cost associated with the traditional catalog, such as printing, postage, and updating. The buyers and sellers are not locked into a proprietary system and information is easily and efficiently accessed. Order tracking improves organizational planning and results in less inventory stockpiling.

The advantages of this system allows the suppliers to use the communication line that has been established with their customers to broadcast new or improved products that may be of particular interest to that consumer. Connectivity and communication for global organizations or those organizations with global trading partners can result in reduced telecommunication expenses through the use of the Internet rather than the traditional telephone network. Connectivity allows information to be quickly and broadly disseminated. Further, feedback from the web site, online surveys and e-mail may provide an organization with valuable leads and market data. Internet

e-commerce facilitates business partnerships and the exchange of information, which may result in improved research and development activities and shortened development time. E-commerce will facilitate the increase in productivity by promoting flexible work arrangements like telecommuting and video conferencing. Firms have the ability to compare and locate the least expensive supplier in a real-time marketplace. Further, the information is online and available when the business needs it. There is no waiting for a sales representative or a returned telephone call.

The disadvantage of the B2B model is that regular customers or consumers cannot directly purchase items directly from the supplier in a B2B model. Businesses entering into e-commerce arrangements risk the possibility of losing competitive or proprietary information. As in the case of the automaker's joint venture, one would have to wonder if price fixing might not be a problem. Time and money needed to invest in network security measures. As more businesses use the Internet to expand, the organization will have to remain on the "cutting-edge" to attract and maintain its customer base, which could be expensive. Electronic payment is not something everyone is comfortable with especially businesses, due to security risks that they must undertake. Many businesses simply are afraid of a "hacker" accessing their private information.

SUMMARY

Within the vast field of e-Commerce several Business Models have emerged. In a market with highly differentiated and customized products, prices tend to be determined by the buyers' willingness to pay rather than by the cost of the product.

I propose a model that deals with the demand verses the supply to the customer that is accompany it by support. This method of marketing puts the focus of pricing the value of a product to a buyer, not how much it cost to produce it. Utilizing this approach means that a lot of users will pay more, but it will also mean that some providers will be able to offer products that cost less than most people now pay.

- I propose a strategy that markets directly to the small-scale businesses; those that do not need Internet or Enterprise Resource Planning.
- I propose marketing to companies simply seeking a solid infrastructure that is not complicated to support.
- I propose keeping the product line to a maximum of four options to include high-end, low-end, and intermediate alternatives.
- I would differentiate myself from competitors.
- I would offer a 1-800-quality service, which will get users directly to the department representative of particular areas of concern.

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DATA QUALITY, DATA INTEGRATION AND CRM

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ABSTRACT

The term Customer Relationship Management (CRM) refers to all strategies used by an organization to manage relationships with its customer - from initial contact or casual browsing to post-sale service and long-term partnerships. It takes a lot of resource for a business to acquire a new customer, therefore successful CRM is essential for a sustainable business strategy. Some of the major hurdles in a CRM initiative are poor data quality or incomplete data and lack of integration of customer data on the back-end as data resides in disparate systems and applications.

This paper focuses on data quality and data integration issues along with some of the considerations the management must have before it embarks upon a new CRM initiative.

INTRODUCTION

Customer Relationship Management, or CRM, includes all methodologies, strategies, software, and other technology-based capabilities that help an enterprise organize and manage customer relationships. The focus of CRM is on providing optimal value to customers through pre-sale interactions, sales process and post-sale interactions. Especially for companies doing business online, either completely or partly, CRM is essential for long-term survival and success. A major pre-requisite to efficient CRM is the complete view of the customer, which in turn requires data - a data that is complete, accurate, current and in the right format. This paper focuses on the issues related to poor data quality and difficulties of data integration or migration. It also outlines some of the steps that can be taken prior to implementing a CRM system.

CUSTOMER RELATIONSHIP MANAGEMENT

Several CRM initiatives fail miserably in returning any benefits to a company. Some of the main reasons for such failures include the fact that quite a few of businesses fail to recognize that CRM requires enterprise-wide commitments. CRM is not a marketing or sales department's initiative alone, nor is it just information technology initiative. Therefore, CRM requires total-business commitment to provide any benefit to its customer and thus to the company itself.

There are a wide variety of CRM systems in the market that target to different kind of companies. However, it is a fact that an existing company can not overnight install a CRM system that is ready to run. Every corporation has processed and stored all kinds of data related to financial, marketing, operations and accounting functions for years. These data are processed and used by various types of applications, and therefore may reside on a different type of platform and in a different kind of format that make them difficult to be used by a modern CRM system.

Additionally for the success of a CRM initiative, it is required that a company have complete picture of a customer. The same customer might be shopping in the store, through catalog and

telephone order, and through the use of World Wide Web. How does the company know that it is the same customer? Complete knowledge of the customer is the key to exceptional customer service and helps a company in cross-selling and/or up-selling. Without customer data integration, having the complete view of a customer is impossible. The other important issue is of poor data quality due to age or omission of data. For example, if the company database has incomplete or old mailing address, or an email address that is either invalid or non-operational, it will be impossible to identify or contact the customer.

One of the major changes that have taken place in the age of Internet is that today's information systems are outward-facing instead of inward-facing systems of 1970s and 1980s. The inward-facing information systems were either product-oriented or process-oriented. The outward-facing information systems of today are customer-oriented or customer-centric. The dot-coms of 90s, especially the unsuccessful ones, wrongly assumed that the only promise and obligation of the Internet is to offer products at a lower cost. These businesses soon realized that term 'value' includes a lot more than price alone. The primary distinguishing factors of a successful business are the sales channel, the price, and the quality of customer service (Ryan 1999). What was required is building, developing and maintaining relationships with the good customers throughout the customer life-cycle. There is a major initial cost of acquiring customer and by not providing a valuable experience to a customer will result in unimaginable loss of opportunities.

CUSTOMER DATA INTEGRATION

As depicted in Fig. 1, there are numerous opportunities for customer contact or customer touch-point. And at each such encounter some data of current or future use is exchanged. Unfortunately, that data may end up residing in various unstructured formats or, in worst case, it may never be captured. It is impossible to achieve high-quality Customer Relationship Management without fully integrating all the data received through each interaction with the customer.

During the gold rush of 90s, most major companies adopted CRM technology in some form. However, according to a study performed by the Forrester Research (Gormley 1999), about 40% of the companies that were implementing CRM were doing so without giving any consideration to the issue of scattered customer data. Only 2 percent of the companies in that survey indicated that they do have a single view of customer across various channels of contact. The problem with most companies was that they invested heavily on developing system for the front-end - design of sleek and catchy websites. No attention was paid to how these systems would integrate with other back-end corporate data: the data that was processed and stored at disparate systems - corporate databases and legacy systems. And thus there was no way of having one view of all the data.

Among the major steps that can be followed to implement a successful CRM initiative are:

a) Corporate Vision: The top management must have a customer-centric focus. Without such a focus and vision, CRM will not succeed.
b) Global View: The management must stand back and look at the existing databases, applications and means of customer contact. They must determine what part of data is in structured format and what part is not.
c) Build the view: Find means of building complete view of the customer from various data sources.

CONCLUSIONS

There is no doubt that successful corporation of today and future must use the Internet technology to its greatest potential. One of the greatest hurdles in achieving that has been lack of complete customer view across all the channels of customer contact or touch points. What is required on the part of management is the total commitment to providing best customer experience and manage the complete customer relationship throughout the customer lifecycle. In order to achieve that management must follow a strategy of first analyzing how the data resources can be tied together so that they can provide complete customer view to all individuals involved in managing customer relationships.

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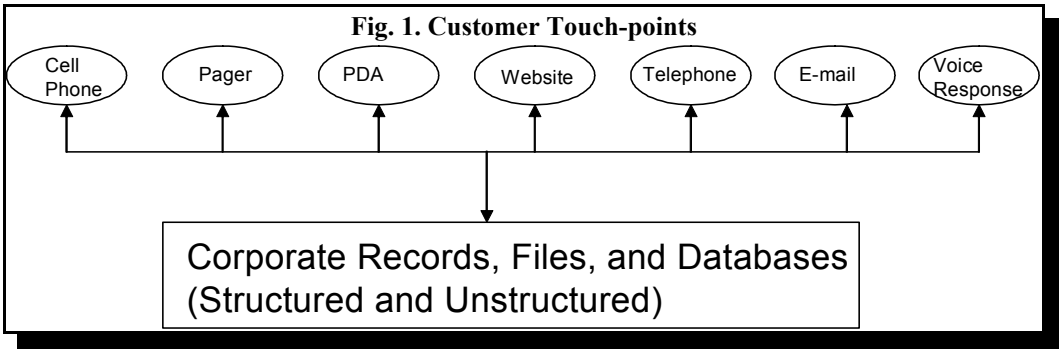
Fig. 1. Customer Touch-points



ARTIFICIAL INTELLIGENCE APPLICATIONS IN E-COMMERCE: CURRENT TRENDS AND FUTURE PROSPECTS

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ABSTRACT

Although there have been some disappointments when it comes to artificial intelligence (AI) applications in business, there are several areas of business decision-making and problem-solving where AI excels, such as, stock market predictions, scheduling, credit worthiness and data mining. The authors believe that one of the areas where AI can make extensive contribution is the Internet and electronic commerce.

This paper first provides a brief introduction to popular AI techniques. This is followed by some of the recent AI applications in the area of electronic commerce. The paper also discusses the application of AI for the purpose of web site customization and personalization.

INTRODUCTION

During 1980s and early 90s, there were several promising applications of AI in business, however, that trend got reversed during the later part of 90s. One reason that can be attributed to the reversal of that trend is all the excitement in the world of e-business and e-commerce. Among the current and possible application of AI in e-commerce are: Target marketing, product customization, personalized campaign management and web personalization, marketing trend analysis, and customer relationship management. The AI tools can be used to understand a customer better, either as a group or as an individual. A second area of AI application is in web security and database security. An AI tool can predict customer behavior and if a visitor sways from the predicted behavior that might raise flag as to a possible intrusion.

ARTIFICIAL INTELLIGENCE TOOLS

Given below is a brief introduction to AI techniques currently used in business applications.

An expert system is an AI program that enables a computer to give advice concerning an unstructured or semi-structured decision that is normally made by a human expert. Expert systems or Knowledge-based systems usually operate as consulting experts to give people advice in a small, specialized domain or area. Among the examples of expert systems are the diagnosis of pulmonary diseases in patients, the diagnosis of malfunctions in automotives, and the configuration of computer systems based on a customer's anticipated applications. An expert system can draw conclusions,

make decisions and offer advice base on its collection of knowledge, mostly in the form of rules, and the user's responses to questions.

A fuzzy expert system is a special type of expert system that uses a collection of fuzzy membership functions and rules, instead of traditional logic, to reason about data. Most tools for working with fuzzy expert systems allow more than one conclusion per rule. In a fuzzy expert system the user when providing inputs can also tell his/her confidence in the response. In a similar manner, the conclusions provided by the system also include a confidence level in the decision.

Artificial neural networks are non-linear predictive models that learn through training and resemble biological neural networks in structure. They exploit the massively parallel local processing and distributed representation properties that are believed to exist in the brain. The primary intent of neural networks is to explore and reproduce human information processing tasks such as speech, vision, knowledge processing and motor control. Additionally, they are used for data compression, near-optimal solutions to combinatorial optimization problems, pattern matching, system modeling, and function approximation. Since neural networks utilize an architecture and information processing manner similar to the brain, some of the networks show similar characteristics that are associated with the brain, for example, the ability to learn from examples, to generalize from situations, to classify examples into categories, and to self organize information.

Genetic Algorithms (GAs) are general, domain-independent search and optimization algorithms developed in the 1970's by Holland. GAs are flexible tool that can be used in combination with other techniques, such as classifier systems, or even to optimize artificial neural network parameters. All of these algorithms operate on a population of potential solutions applying genetic/evolutionary principles to produce successively better approximations to a solution. At each generation, a new set of approximations is created by the process of selecting individuals according to their level of fitness in the particular problem domain and reproducing them using operators borrowed from natural genetics theory. This process leads to the evolution of populations of individuals that are better suited to their 'environment' than the individuals from which they were created, just as the case in biological adaptation and evolution.

CURRENT AI APPLICATIONS

There are several current areas of applications of AI tools in e-commerce related areas including market segmentation, customer profiling and data mining (for market strategy, web personalization and customer relationship management), intelligent search and agents to help visitors perform e-business tasks, customer data security and intrusion detection, and fraud detection. Given below is a brief description of a few such applications.

Credit Fraud Detection: AI risk scoring system is used to associate a risk with the visitor to a web site. This is done through development and evolution of profiles related to credit fraud. There are certain characteristics of the people who commit these frauds and companies are able to determine that, for example, fraud rates increase at certain times of the day, and orders coming in from certain countries show a higher percentage of fraud (Klebe 1998)

Data Mining: The purpose of affinity marketing in e-commerce is to increase a site's visibility and increase traffic, which in turn increases sales. Initially, most of the banner exchange was performed rather blindly. However, as e-commerce sites have continued to try to differentiate

their online communities, tools for affinity marketing have also become increasingly sophisticated. Some tools analyze individuals' online behavior or click stream data to provide customized links. For example, Net-Perceptions uses neural networks to help put the banner ads in front of the visitors who would be interested in the advertised site (Emigh 1999).

Another application of AI-based data mining is when marketer wants to determine who its best customers are and how better to market products and services to them. For example, Farmers Insurance has used AI-based automated discovery to extract meaningful and useful information that helps in identifying best customers who they can sell additional services (Lach 1999).

Information Filtering Agent: A user modeling system that uses Expert Systems and Neural Networks is designed to analyze a web surfer's habits and preferences. Based on the user supplied demographic data, and the monitored transactions, it generate a tailored profile that is ultimately used to filter what information is being passed on to the user in an effort to reduce and/or eliminate the time and energy spend in browsing through unwanted data (Moghrabi and Eid, 1998).

Web Personalization: There are two possible approaches that can be used to improve the visitors' experience to a web site:

i) Site Personalization: Based on the collected data from an individual user, the web site is customized or tailored to the needs of the user. This can be achieved in two ways (1) directly asking a user about his/her preferences in a survey and using that information for customization or (2) through collection of data when a visitor makes purchases or browses around the site.

ii) Adaptive Web Site: Based on the information about user-access patterns and use behavior, a designer can improve the site's organization and presentation. Adaptive sites can monitor visitor activity and browsing patterns and learn from them some relevant information about the types of users, relative usage of various areas (pages or folders) - high-impact and low-impact areas, and any problems with the site. All of this information can be used to modify and evolve the site over time.

Each of the two approaches can utilize AI methods based like expert systems, neural networks, fuzzy systems and genetic algorithms. For example, at the heart of both of those approaches is clustering and categorization along with learning. Neural networks excel when it comes to clustering along with learning over time - a major benefit over statistical approaches. Additionally, a personalization technique known as collaborative filtering uses expert system-based rules to determine what content to present to a visitor. Murtaza et al. (2001) have suggested the use of neural networks to cluster the customer profile data and present a customized website based upon a visitor's cluster profile.

CONCLUSIONS

As outlined above, there has been several application of AI tools in the arena of e-business. However, due to complexity of implementing such tools, the visibility of such systems is limited. As the field of e-business matures, there will be need to providing site visitors a secure, customized and fruitful experience and AI tools would certainly assist in providing such experience.

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J2EE PLATFORM: A SINGLE, UNIFIED STANDARD FOR e-BUSINESS APPLICATION INTEGRATION

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ABSTRACT

This research tests the hypothesis "Java 2 Enterprise Edition (J2EE) platform provides a single, unified standard for e-business application integration", theoretically and empirically. Theoretical examination reveals how the J2EE technologies, such as EJB, Java Servlet, JSP, RMI-IIOP, JMS, JTA/JTS, Java IDL/CORBA, JDBC, JNDI, Java Mail, Java-XML, and JCA, enable companies to eliminate their endless struggle for connecting heterogeneous system. For this empirical study, questionnaires were sent nationally and internationally to 120 IT professionals representing various companies. Their responses were analyzed critically in terms of strengths and weaknesses of the J2EE platform. This research tests statistically the hypothesis in question based on the participant's experience in the J2EE. From these theoretical and empirical evaluations, this research concludes that the J2EE platform provides a single, unified standard for successful end-to-end e-business application integration.

INTRODUCTION

If a company is to be successful in its e-business strategy, there must be an integration of its new web-based applications across the network, connecting n-tier client/server systems within the same company and between companies. Application developers have struggled with the integration complexity for a long time. Enterprise Information Systems (EIS) and other vendors have provided their own proprietary interfaces at various levels to minimize integration complexity. Unfortunately, there existed no previous industry standard infrastructure for communicating between disparate systems. Presently, Sun Microsystems and its Java Community Process (JCP) partners are providing an industry standard, called Java 2 Enterprise Edition (J2EE) platform, to solve the integration problem. The objective of this study is to evaluate the effectiveness of the J2EE platform in providing an end-to-end e-business application integration.

RESEARCH METHOD

The hypothesis of this study is "J2EE platform provides a single, unified standard for e-business application integration". This research tests the hypothesis theoretically and empirically. Theoretically, it evaluates the effectiveness of the J2EE platform in providing e-business application integration, by analyzing its technologies. Through a survey, this study empirically evaluates how different companies utilize the J2EE platform for an end-to-end e-business integration solution. Data for this research was collected from companies in the Pittsburgh area along with a few Fortune 500 companies including select businesses in India and Japan. 120 IT professionals representing these national and international companies were contacted and asked to complete questionnaires regarding

the strengths and weaknesses of the J2EE platform. Their responses were evaluated critically. This research conducts a binomial test on the hypothesis in question based on the experience of the survey-respondents. From these theoretical and empirical evaluations, conclusions are derived about the effectiveness of the J2EE platform in providing an end-to-end e-business application integration solution.

THEORETICAL EVALUATION OF THE EFFECTIVENESS OF THE J2EE

J2EE platform and its implementation: J2EE platform (Cattel, 2001) is a single, unified industry standard to support development, deployment and management of distributed transactional applications in the context of middleware containers. J2EE is not merely a Java programming language. It also includes a set of services consisting of technologies, and a set of programming application interfaces (APIs) which support an end-to-end e-business solution. The J2EE also supports the Internet protocols, such as the HTTP, TCP/IP, and SSL. Noteworthy J2EE technologies (Gould, 2000) and their services toward e-business application integration are summarized in Table 1.

Table 1: J2EE technologies and their services

J2EE Technologies	Service
Enterprise Java Beans (EJB)	Provides automatic support for middleware services
Java Servlet/ Java Server Page (JSP)	Links web-server to the thin-client front ends, and back-end systems
Remote Method Invocation- Internet Inter ORB Protocol (RMI-IIOP)	Integrates one Java application with another Java or non-Java application
Java Messaging System (JMS)	Supports asynchronous messaging of business data across the enterprise network
Java Mail	Provides an access to Java Mail Server
Java Transaction Architecture (JTA) / Java Transaction Service (JTS)	Provides support for distributed transactions
Java IDL / CORBA	Integrates new applications with legacy systems through CORBA interface
Java Naming and Directory Interface (JNDI)	Provides connectivity to heterogeneous enterprise naming and directory services
Java Database Connectivity (JDBC)	Supports uniform access to a variety of relational databases
Java-e-Xtensible Markup Language (Java-XML)	Supports the transfer of formatted data between applications or servers, and between businesses
Java Connector Architecture (JCA)	Integrates J2EE platform with existing Enterprise Information Systems (EIS)

Each of the above technologies contributes a certain functionality to the e-business integration solution and all technologies together provide an end-to-end e-business applications integration (Linthicum, 2001). So it is a single, unified standard.

SURVEY AND THE RESULTS

Types of participants: The participants represented in this research are information technology professionals. 120 questionnaires were mailed/emailed to IT professionals of companies in different countries. Thirty-four (28%) companies responded. All participants currently use the J2EE platform, and seven of them use the Microsoft.NET platform in addition to the J2EE platform. The types of companies represented in the survey are listed below in Table 2.

Table 2: Types of Participating Companies

Type of Company	# of Responses	% of Responses
Computer Service	14	41%
Finance	6	17%
Consulting Service	4	12%
Transportation	4	12%
Manufacturing	3	9%
Other	3	9%

"Other" in this table includes e-shopping, media-service, and health-care.

Importance of e-business application integration: All participants responded stating that enterprise application integration is critical to the success of their companies, and 87% of the participants indicated that B2B application integration is critical to the functioning of their companies.

J2EE platform and application servers: The participants in this research use multi-tier client/server systems. Their client tier communicates with the web servers and application server through HTTP (31 responses), RMI-IIOP (7 responses), XML/ HTTP (19 responses). The survey-participants use different application servers to suit their needs as presented in Table 3.

Table 3: J2EE Implementation

Application Servers	J2EE Implementationstatus	# of Responses	% of Responses
BEA WebLogic	Full Implementation	15	44%
IBM WebSphere	Full Implementation	7	21%
Sun iPlanet	Full Implementation	5	15%
Pramati 3.0	Full Implementation	3	9%
Other	Full and partial Implementation	4	12%

"Other" in this table includes JBoss, Secant Extreme Server, Sun's Reference Implementation, and Borland AppServer. Secant Extreme Server is having only a partial implementation of the J2EE currently, but soon it will fully implement the J2EE standard.

Enterprise Application Integration: The main problems that the companies experience in enterprise application integration are a) connecting heterogeneous clients/servers (17 responses), b) connecting heterogeneous back-end systems (29 responses), c) connecting legacy applications written other than in Java (24 responses), d) connecting non-relational database (14 responses), e) connecting mainframe transaction Systems (14 responses), f) building applications quickly and efficiently (33 responses). Though the companies are using all of the J2EE technologies to solve these problems, the most commonly used technologies are listed in Table 4:

Table 4: J2EE Technologies And Their Priorities

	Number of Responses		
Technologies	Priority 1	Priority 2	Priority 3
EJB	8	7	5
JDBC	5	5	3
Java-XML	9	7	7
Servlets	4	4	7
JCA	8	7	8
Other	-	4	4

"Other" in Table 4 includes RMI-IIOP, JMS, Java Mail, and JTA.

Three points are assigned to the first priority, two points to the second, and one point to the third. The total points for each technology are calculated through the multiplication of each response by the number of priority points. Java-XML (48 points) takes first place. The JCA (46 points) follows it at second place even though only 23 survey participants use it. As time progresses, JCA, Java-XML, and EJB will be playing an important role in the enterprise application integration.

B2B application integration: 87% of the participants in this survey face the problem of maintaining a high degree of inter-operability between their applications and the businesses with which they collaborate. 23 (69%) of the participants use Java-XML for B2B application integration. In addition to it, these participants use one or more web services. 6 (18) utilize B2B integration brokers. The most commonly used web service is SOAP (84% of respondents). 24 respondents consider J2EE's capability to bring Java applications from server to mobile devices not sufficient at present. However, Sun is expanding its capabilities to reach out mobile devices, such as cell phone, and PDA.

Current weaknesses of the J2EE: One limitation of the J2EE is associated with JMS and security. 30 (90%) participants desire tighter integration between JMS and security. 24 (72%) require more capabilities of monitoring the delivery of messages. Another limitation is concerned with the Java Connector Architecture. All 23 respondents using the JCA agreed upon its limitations, such as the lack of bi-directional communication, lack of support for asynchronous

transaction, lack of support for metadata, and lack of built-in support for XML. Sun has already planned to correct these limitations in the JCA Version 2.0.

Statistical testing of the hypothesis: Based on their experience, the survey-participants rated the hypothesis that "J2EE platform provides a single, unified standard for e-business application integration". Three respondents(9%) strongly agreed; nineteen (56%) agreed; eleven (32%) moderately agreed; and one (3%) of them abstained. No one disagreed with the hypothesis.

Assuming that if $p>0.5$, the hypothesis is accepted, a binomial test is conducted. The two groups, such as "agree" and "strongly agree' are combined into one, which determines probability of success; and the "moderately agree" group determines the probability of failure. The binomial test results in accepting the hypothesis at a 96% confidence level.

Comparison of the J2EE and Microsoft. NET: The J2EE is a standard while Microsoft. NET is product suite. Both have features that allow companies to accelerate rapid application development, and thereby, to decrease time-to-market. Each possesses its own unique advantages over the other, such as portability of the J2EE, and language neutrality of the Microsoft. NET. In this research survey, 23 participants use the JCA. Others will be using it soon or are waiting for the upcoming JCA Version 2.0. From the 23 respondents using the JCA, 22 (96%) rated it as superior to Microsoft.NET tools for e-business integration solution. On the whole, 33 (97%) favored J2EE technologies "better than" Microsoft.NET in providing e-business application integration.

CONCLUSION

Theoretically, the J2EE is capable of eliminating the long time struggle, which companies experience in bridging the gap between the heterogeneous systems. Empirically, the binomial test reveals the acceptance of the hypothesis - "J2EE platform provides a single, unified standard for e-business application integration" - at a 96% confidence level. The results also indicate that the J2EE needs to be improved with additional capabilities. While comparing the J2EE with the Microsoft.NET platform, this research discovered that 97% of the survey respondents consider the J2EE platform as better than the Microsoft.NET platform for providing e-business application integration. From these theoretical and empirical evaluations resulting in recommendatory support for the hypothesis, this research arrives at a conclusion that the J2EE platform provides a single, unified standard for e-business application integration.

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WHERE ARE WE GOING AND HOW DO WE GET THERE? STRATEGIC MEASUREMENT FOR eBUSINESS

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ABSTRACT

In the eBusiness environment, companies employ rapidly emerging technologies to compete globally. The need for a way to measure the effectiveness of businesses in this digital economic environment was grimly illustrated by the "dot.com debacle." Evidence that traditional accounting measures are inadequate to assess the performance of highly technological businesses is abundant. Measurement plays a critical role in the ability to translate business strategy into results. Without metrics to assess performance, investors and managers continue to be unable to adequately allocate resources and evaluate performance of companies engaging in eBusiness. The balanced scorecard (BSC) is a performance measurement tool tailored to the strategy of the individual company and based on a wide array of financial and non-financial elements requiring both objective and subjective measures. However, research shows that managers fail to incorporate results of subjective measures into the strategic decision-making process because they judge such measures to be unreliable. This paper illustrates a performance measurement framework using the analytic hierarchy process (AHP), a widely acclaimed multi-criteria decision-making technique, to tie the balanced scorecard measures directly to the business strategy using a mathematically rigorous process that not only has been shown to be reliable, but offers measures of internal consistency.

OUTSOURCING WEB SITE DEVELOPMENT

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ABSTRACT

In the past five years, many companies have created Web sites that they use to provide information, sell to customers, buy from vendors, facilitate stakeholder relationships, and conduct a number of other business activities. Information systems development projects in general have always faced the challenges of rapidly changing technology, management expectations, and user preferences. This paper examines and analyzes the outsourcing of web site development.

INTRODUCTION

When companies began establishing their presences on the Web, the typical Web site was a static brochure that was not updated frequently with new information and seldom had any capabilities for helping the company's customers or vendors transact business. As Web sites have become the home not only of transaction processing but also of automated business processes of all kinds, these Web sites have become important parts of companies' information systems infrastructures (Ramsey, 2000). The purposes and scope of Web sites have increased greatly, but few businesses today manage them as the dynamic business applications they have become (Ramsey, 2000).

INTERNAL DEVELOPMENT VS. OUTSOURCING

Although many companies would like to think that they can avoid Web site development problems by outsourcing the entire project, savvy leaders realize that they cannot (Mollison, 2002). No matter what kind of Web initiative a company is contemplating, the initiative's success depends on how well it is integrated into and supports the activities in which the business is already engaged (Kalakota and Robinson, 1999). However, few companies are large enough or have sufficient in-house expertise to launch a Web site project without some external help. Even Wal-Mart, with annual sales of more than $150 billion, did not undertake its 2000 Web site relaunch alone (Kemp, 2000; Zimmerman, 2000). The key to success is finding the right balance between outside and inside support for the project.

MANAGING OUTSOURCED ACTIVITIES

Most companies create an internal team that is responsible for the project, even if most or all of the project is outsourced. This team should include people with enough knowledge about the Internet and its technologies to know what kinds of things are possible. Team members should be creative thinkers who are interested in taking the company beyond its current boundaries. The

internal team should hold ultimate and complete responsibility for the Web initiative, from the setting of objectives to the final implementation and operation of the site.

The internal team will decide which parts of the project to outsource, to whom those parts will be outsourced, and will select the consultants or partners that the company will need to hire for the outsourced activities included in the project. Consultants, outsourcing providers, and partners can be extremely important early in the project because they often develop skills and expertise in new technologies early in the life of those technologies.

APPROACHES TO OUTSOURCING

Companies often outsource initial design and development work on a Web site project to launch it more quickly. The outsourcing team then trains the company's information systems professionals in the new technology before handing the operation of the site over to them. This approach is called early outsourcing. Since operating a Web site can rapidly become a source of competitive advantage for a company, it is best to have the company's own information systems people work closely with the outsourcing team and develop ideas for improvements as early as possible in the life of the project. In late outsourcing, the company's information systems professionals do the initial design and development work, implement the system, and operate the system until it becomes a stable part of the business operation. Once the company has gained all the competitive advantage provided by the system, the maintenance of the Web system can be outsourced so that the company's information systems professionals can turn their attention and talents to developing new technologies that will provide further competitive advantage.

Although late outsourcing has been the standard for allocating scarce information systems talent to projects for many years, Web site development projects lend themselves more to the early outsourcing approach. However, in both early outsourcing and late outsourcing, a single group is responsible for the entire design, development, and operation of a project group. This group might be either inside or outside the company. This typical outsourcing pattern works well for many information systems projects. However, Web site development projects can benefit from a different approach called partial outsourcing (Siebel and House, 1999).

In partial outsourcing, which is also called component outsourcing, the company identifies specific portions of the project that can be completely designed, developed, implemented, and operated by another firm that specializes in a particular function. For example, many smaller Web sites outsource their e-mail handling and response function because customers expect rapid and accurate responses to any e-mail inquiry they make of a Web site with which they are doing business. Other companies send customers automatic order confirmations by e-mail as soon as the order or credit card payment is accepted. A number of companies provide these e-mail auto-response functions on a partial outsourcing basis.

ALTERNATIVES TO OUTSOURCING

In the past seven years, new alternatives have evolved specifically for Web businesses: incubators and fast venturing. An incubator is a company that offers start-up companies a physical location with offices, accounting and legal assistance, computers, and Internet connections at a very

low monthly cost (Wysocki, 2000). Sometimes, the incubator will offer seed money, management advice, and marketing assistance. In exchange, the incubator receives an ownership interest in the company, sometimes significant.

When the company grows to the point that it can obtain venture capital financing or launch a public offering of its stock, the incubator sells all or part of its interest and reinvests the money in a new incubator candidate. One of the first Internet incubators was idealab!, which helped companies such as CarsDirect.com, Overture, and Tickets.com get their starts. Some companies have created internal incubators. A number of companies used internal incubators in the past to develop technologies that the companies planned to use in their main business operations. Most of these programs, such as the Kodak internal venturing program of the 1980s, were unsuccessful and ultimately were shut down.

Other companies have tried an approach called fast venturing to launch new businesses internally. In fast venturing, an existing company that wants to launch a Web business initiative joins external equity partners and operational partners that can offer the experience and skills needed to develop and scale up the project very rapidly (Kambil, Eselius, and Monteiro, 2000). Equity partners are usually banks or venture capitalists that sometimes offer money, but more often offer experience they have gained from participating in funding other start-ups and smaller companies.

MANAGING MULTIPLE PROJECTS

Larger organizations often have many Web site implementation or update projects underway at any one time. Some chief information officers (CIOs) of larger companies now use a portfolio approach to managing these multiple projects (Berinato, 2001). In this approach, each project is monitored as if it were an investment in a financial portfolio. The manager monitors a spreadsheet program or a database management program that includes a regularly updated list of the projects.

Most project management software packages perform a function similar to this for tasks within a project, but few of these software packages do a very good job of consolidating activities across multiple projects because they are designed to manage tasks within a single project. Another, more important reason not to use project management software is that the information used in project portfolio management differs from the information used to manage specific projects. In project portfolio management, a ranking is assigned to each project based on its importance to the strategic goals of the business and its level of risk. To develop these rankings, CIOs can use any of the methods that financial managers use to evaluate the risk of making investments in business assets. Using the tools of financial management helps the CIO to explain Web site development projects as investments in assets using the language that financial managers and the CEO understand.

SUMMARY AND CONCLUSIONS

Web site development is more difficult to manage than most information systems projects because the technology changes even more rapidly than information technologies in general and because the rate of change in expectations of Web site users is extremely high. By judiciously selecting from alternative management options such as outsourcing, incubators, and fast venturing,

information systems managers can obtain better control over the critical elements of these projects. CIOs in larger organizations can use project portfolio management to monitor multiple Web site development projects that are simultaneously underway and manage the risk in those projects using the methods of financial portfolio risk management.

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ROBOTS "R" US

Victor Selman, The American University
Jerry Selman, ERA, Inc.

At its Best, Technology Can Be Virtually
Indistinguishable from Magic.
Ad for Bose Technology [Y2000]

Fuzziness Begins Where Western Logic Ends.
Bart Kosko

The Future Is Bound to Surprise Us, but We
Don't Have to Be Dumbfounded.
Kenneth Boulding

ABSTRACT

Our vision for the world of the future, post Millennium-3 that we entered on 11 September "through a gate of fire," is that the future will be very different than we can imagine it even today; particularly, in the global environments, business and personal relationships with alternative interpersonal connections. With the unpredictable fuzzy future of Hi-Tech science, quantum aberrations, spiritual verities, eternal truths, emerging new paradigms, bioethics decisions, morality controls, and the Damocles sword of global terrorism, affecting all. With short cuts to emerging long-term realities---like cryogenics for immortality gigs, and smart Bots [robots] helping us more and more along the way, like the Search & Rescue Robots at the WTC.

INTRODUCTION

The definition of artificial intelligence is just as controversial today as the definition of human intelligence. Larry Tessler is credited as being the first to suggest that artificial intelligence is "whatever hasn‘t been done yet!" Machine Intelligence Technology that combines advances in artificial Intelligence (AI), computer science, and microelectronics is used by the US Defense Department to develop a new breed of robots that can be used in connection with cruise missiles, underwater robots, and tanks. Questions keep popping up---Are there things robots should not be allowed to do? Will humans remain in control?

The Robot Institute of America offers the following definition of a robot:

> *"A reprogrammable, multifunctional manipulator designed to move material, parts, tools or specialized devices, through variable programmed motions for the performance of a variety of tasks."-*

Robot comes from robota, the Czech word for an annual debt of forced labor. Historically, in 1848, the serfs rose up against their Austro-Hungarian landlords in protest; hence, a robot revolution. Czech writer Karel Capek's 1921 play Rossum's Universal Robots (RUR), brought the word into the English language. In Capek's play, hero-engineer Rossum creates a new breed of robots to do the world's dirty work. The robots eventually rise up and take over the world, like cloned Frankenstein monsters [18].

Mechanical figures of animals and figures were popular in the eighteenth century, performing mechanized actions that imitated real life---.dipping a pen in ink and writing on a pad, a human-sized flutist playing 12 melodies. These "clockwork automation" models, using mechanisms similar to those contained in music boxes, danced and even had mechanical ducks drink and splash in water. The word "automation" and "automatic" can be traced back to 1586. "In the 18th century, some mechanical figures were accused of being the work of witches, and at least one designer of automatic people was arrested on the charge of witchcraft by the Holy Inquisition [10]."

In 1948, W. Grey Walter, a British brain physiologist, invented an appealing type of robot he called a "machina specilatrix," more popularly known as the turtle or tortoise---a metal box on wheels with two sense organs: one, a bank of photocells, and the second organ that detected whenever the turtle bumped into something, and moved it along a random path until it cleared the obstacle, returning to its "hutches" when the batteries needed recharging. One purpose of the turtle was to study the electrical activity of the brain, and to make humans question whether or not they were "beings," as they had senses that could detect a stimuli and respond to it. The Terrapin Turtle [Terrapin, Inc.], a computer turtle, designed by Dan Hillis of MIT's AI Laboratory, had blinking eyes, beeped in two tones, drew with a pen, and moved on two separately controlled wheels---and had a sense of touch.

Our first generation of computer-controlled robots known as universal transfer devices (UTDs) were little more than mechanical arms--deaf, dumb and blind--, used for spot-welding, paint-spraying, loading and stacking. The industrial robots used at the Roundtree Chocolate factory in England had two arms, which give them the ability to pick up two pieces of candy at a time and place them in boxes. At the rate of two pieces per second, every second---without coffee breaks or any absenteeism! In the 1980s, a Japanese robot crushed a human worker to death, causing the world's first high-tech robo-murder. Today Bots retrieve information and respond to events on Usenet, the Web and other corners of cyberspace; some are interactive, such as chatterbots---the kind of bot one can talk to. Eliza was created in 1966 by Professor Joseph Weizenbaum of MIT to study natural communication between man and machine. Eliza parodies a therapist by answering questions with questions. Try a session with Eliza today at <www-ai.ijw.si/eliza/eliza.html>.

ALICE (Artificial Linguistic Internet Computer Entity), a more sophisticated program that creates the illusion of natural conversation, as ALICE can even tell lies, spread gossip, etc., as you will find out in www.alicebot.org.

The Science of Robotics has been called the marriage of man and machine, or computer and machine. The late Isaac Asimov's Three Laws of Robotics (c .1950), [see his I, Robot] which states that robots can protect themselves as long as they don't disobey human orders or harm people. According to new computer scientists, that definition of functioning in the "real World" is also changing. They believe that cyberspace and artificial reality are as real as the physical world. If the electronic world is "real," than robot controller brains could contain the computer programs of

artificial life behaving like living organisms---mating (interacting with other programs), reproducing (creating new programs), passing on characteristics according to the rules of genetics, competing with other programs, and evolving into very different programs. Ellen Thro [21] states: "Some artificial life programs use computer graphics to draw pictures of the creatures. Each new generation appears on the screen, showing new characteristics and mutations. Some of them even evolve into different species. They become predators and prey. Some species become dominant; others die out. Some scientists say these organisms are very close to being alive. They fit the biological definition of life, erasing gradually the line between living organisms and non-living matter."

MIT roboticist Cynthia Breazeal talks about the social interaction needs of their robot Kismet, with Groucho Marx eyebrows and licorice-whip lips, programmed to seek sensory stimulation---voices, movement, brightness, color—which it attracts with beguiling expressions and a sort of babbling baby talk. If an expression works, and a passing human stays to play, Kismet's internal "social drive" is satisfied. If not, the levels sink and Kismet tries a new strategy to connect. Basic movements are programmed into Kismet's behavior, but its handlers hope human feedback will help it learn new gestures and vocalizations by imitating people and storing successful attempts in its memory. "It helps the robot learn the social meaning of its action," Breazeal says. "The whole point is that the robot is trying to get you to interact with it in ways that can benefit its ability to learn." The goal for Kismet to learn is not just to "think" for itself, but also, as every child must, to understand that its actions have consequences.

According to the International Federation of Robotics [Sweden], there will be nearly 900,000 robots of all types installed around the world by 2003. In 1995, there were 615,000, mostly in Japan, welding cars, assembling electronics and constructing other robots.

In North America robots have had terrible PR. We normally associate robots with herky-jerky movements, brutish strength and a personality limited to grim, remorseless logic---a kind of anti-robot prejudice. Not all robots, however, are like the delightful R2-D2 from Star Wars. RB5X, a barrel-chested 'bot that could be one of R2-D2's ancestors comes with various sensor kits (video, light, temperature, sound) and other add-ons like robotic arms and extra memory to speak any language with its universal phonemes dictionary. [$3,495, includes recharging station and phoneme dictionary from General Robotics.]

Recently, at the Comedy Central's Battlebots competition in Las Vegas, Tonight Show host Jay Leno created the strategy for his robot "Chin-Killa" [to ram the other guy], and easily won over "Ginsu," a combination of saw blades on wheels. About 140 robots entered the competition, in different weight classes ("super heavyweight robots" can max out at 488 pounds) and can be fueled by battery or by internal combustion engines---featuring alligator-style jaws, spikes, spinning buzz saws. Pairs fight three-minute duels inside a 48-foot square arena encased in a shatterproof Plexiglas "BattleBox," where booby traps (such as buzz saws, and automated aluminum sledgehammers) add to the excitement. The first Battlebots competition was in 1999, which was broadcast on the Internet. Comedy Central picked up the show in 2000, after a pay-per-view event. Launched in August 2000, Battlebots with its omnipresent heavy metal soundtrack is now the station's third most popular show. In it "techies" (mainly male) operate remote-controlled robots (which they designed) to beat the rivets out of an opponent's robot (for bragging rights, prizes and money. BattleBots has recently signed a deal with Fox TV to air a Saturday show called BattleBots

IQ, where youngsters will learn about robots as they clobber each other's 'bot, says Greg Munson, co-creator of the show.. Tiger Electronics is releasing a series of video games based on the show. A toy line is also in the works. NEC's personal 15-inch robot is a step up in sophistication with 5 sensors, recognizing up to 650 phrases, speaking more than 3,000 words, dancing, and alerting you of e-mail and home security. Before the actual fight above in Las Vegas, Jay Leno had "Chin-Killa" destroy a mock Florida stylus-punching ballot-counting obsolete voting machine [6]—now being disposed of on eBay.

As we enter the Age of Robots, making succeeding-generation robots more humanlike and more conscious, we realize the enormity of the task that still faces us: how to program logic and problem-solving into robots at the same time as teaching robots perceptual and intuitive things that any child can do, like running, listening, recognizing friendly faces---which cannot be done by even the most advanced robot today. The elaborate computerized problem-solving programs that researchers installed in robots in the late twentieth century assumed initially that the sequence of facts, physical laws and logical relationships would somehow add up to thinking (machine consciousness) and real world smarts.

Starting Summer 2001, an interactive 6-foot-tall robot designed by Mobot, Inc. designated as "Adam 40-80" has interacted with travelers passing through Pittsburgh International Airport, roaming the airline hub at the escalators that link the four concourses, offering information ranging from flight schedules to Pittsburgh's coming attractions. Mobot's robots are also stationed at the Carnegie Museum of Natural History and the Sen. John Heinz Pittsburgh Regional History Museum.

SEARCH AND RESCUE ROBOTS

Amid the rubble of the twin towers of the WTC in New York, four teams of roboticists initially responded---Foster-Miller (a robot manufacturer), iRobot (a robot manufacturer), University of South Florida (robot research on smart bots), and SPAWAR (a Navy lab that develops robots). Their small experimental urban robots —now 40 in existence, developed after the Oklahoma City bombing---searched for 9/11 victims within six hours of the attacks, and remained onsite through 2 October---moved through broken glass and twisted steel to reach areas too dangerous for human rescue workers or search dogs. Shoe box size, hand-operated robots developed by computer scientists under Dr. Robin Murphy at the University of South Florida carried cameras and specialized sensors that detect body heat or colored clothing against the grey dust that coated the debris.

There are three species of rescue robots now: 1) Tethered with a long cable or umbilical cord connecting the robot to a computer and power supply outside the site [$8K-13K], 2) Untethered, tactical mobile robots which have an onboard computer and battery to be autonomous [$33K-$40K], 3) Snakes or serpentine robots that look and move like snakes. [A miniature FLIR camera (that sees body heat) costs about $15K.] The Center for Robot Assisted Search and Rescue (CRASAR) exploits new technology development in robotics and unmanned systems for humanitarian purposes worldwide. In the future robots will be able to deliver food and medicines to injured persons and send back pictures of their exact location. The four major tasks that robots could help in this type of emergency situation are listed in Appendix A.

RoboCup is an international joint project to promote Artificial Intelligence (AI), robotics and related fields. It is an attempt to foster AI and intelligent robotic research by providing a standard problem where wide range technologies can be integrated and examined. RoboCup initiated ROBOTCUP RESCUE project to specifically promote research in socially significant issues. RoboCup chose to use soccer game as a central topic of its research, aiming at innovations to be applied for socially significant problems and industries. The ultimate goal of the RoboCup project is---By 2050, develop a team of fully autonomous humanoid robots that can win against the human world champion team in soccer. In order for a robot team to actually perform a soccer game, various technologies must be incorporated including: design principles of autonomous agents, multi-agent collaboration, strategy acquisition, real-time reasoning, robotics and sensor-fusion. RoboCup is a task for a team of multiple, fast-moving robots under a dynamic environment.

In previous years, the Annual AAAI Mobile Robot Competition and Exhibition had attracted both local and national news media---the 1996 contest resulted in a segment in Alan Alda's "Scientific American Frontiers" program on the Discovery Channel. A RoboCup Rescue competition is dedicated to encouraging researchers to develop intelligent robots, as well as software decision tools. In the next time period, it is anticipated that the RoboCup/AAAI Rescue Robot League will use the NIST Urban Ruin Test Course for Search-And-Rescue Robots---housed by Washington State Convention and Trade Center. The Rescue Robot Symposium was held in Kobe and Tokyo (Japan) in January 2002. The Sixth Robot World Cup Soccer Games and Conference is being held this June in Fukuoka/Busan---www.robocup2002.org/---

Microsoft's chairman Bill Gates (1999) stated in his Business @The Speed of Thought, his Twelve New Rules for success in the digital universe: velocity is the key---when the increase in velocity is great enough, the very nature of business changes. If the 1980s were about quality, and the 1990s were about reengineering, then the 2000s will be about velocity: Quality improvements and business-process improvements will occur far faster. "To function in the digital age, we have developed a new digital infrastructure---it is the human nervous system. Companies need to have that same kind of nervous system---the ability to run smoothly and efficiently, to respond quickly to emergencies and opportunities, to quickly get valuable information to the interested people in the company who need it, and the ability to quickly make decisions and interact with customers. The successful companies of the next decade will be the ones that use digital tools to reinvent the way they work." The millennial robots must also have this capability of high velocity changes. As Lewis Thomas so aptly states:

> *we are, quite literally, in a new world, a much more peculiar place than it seemed a few centuries back, harder to make sense of, riskier to speculate about, and alive with information which is becoming more accessible and bewildering at the same time. It sometimes seems that there is not just more to be learned, there is everything to be learned.*

SUMMARY

New age managers--that is, managers who are or will be successful in the digital future are a different breed of managers, an evolutionary mutant, not necessarily begot in the ivory towers of academia, nor from the robber barons of the recent past, nor from Japanese ritualistic approaches, nor developed in industrial training laboratories, nor on skunk work farms, but who, somehow, have integrated right-brain/left-brain/mixed-brain harmony and conflict, the whole and its parts, creative stress and senses of security, have natural inherent talent for functioning successfully on the boundary, the frontier, the fence, the cutting edge of corporate survivability over time, in a semiotic relationship with smart robots that fluctuates from day to day. The "excellent" corporations of the past are-not/may-not-be those survivors into the future [9]. Of the corporations in the Fortune 500 rankings in 1984, 143 are missing in 1989. Yet, in the twenty-five year period 1955-1980, only 238 companies dropped out. Toffler, in his The Third Wave [22] touches upon these new concepts that are essential for survival into a millennium of chaos:

> *... a new civilization is forming. So profoundly revolutionary is this new civilization that it challenges all our old assumptions. Old ways of thinking, old formulations, dogmas and ideologies, no matter how cherished or how useful in the past, no longer fit the facts. The world that is fast emerging from the clash of new values and technologies, new geopolitical relationships, new life styles and modes of communication, demand wholly new ideas and analogies, classifications and concepts. We cannot cram the embryonic world of tomorrow into yesterday's conventional cubby-holes.*

Bots have served such functions on IRC (Internet Relay Chat) as greeting new participants, searching the Internet, monitoring the use of offensive language, gathering relevant information, and presenting it on a daily or other periodic basis, etc.

Ray Kurzweil, an AI pioneer, has given humans, in his The Age of Spiritual Machines, about 20 more years of intellectual superiority over computerized robots. By that time, he argues computers will not only be "intelligent," they will be conscious feeling beings deserving all the same rights, privileges and considerations we give each other.

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Available from the authors upon request.

APPENDIX A
The Four Major Tasks that Rescue Robots could Help with:
Reconnaissance and site assessment.
Rescuer Safety.
Victim detection in rubble.
Mapping and characterizing the structure.

SHIFTING TRENDS IN INTERNET DEMOGRAPHICS: CAPTURING WOMEN ON-LINE

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ABSTRACT

Historically, men have dominated the Internet. However, over the past five years, there has been a shift in Internet demographics. Men no longer hold a majority position on the Internet (O'Leary, 2000). Women have emerged as the new online majority, making up over 50 percent of the online population and their influence extends simply user numbers (O'Leary, 2000). Women now control 80 percent of all spending and are beginning to gain stronger holds in traditionally male dominated areas (Pastore, 1999c; Pastore , 2000b, Peacock, 2001). Thus corporations are beginning to study the impact of women web users on their e-commerce strategies. Companies realize that they must specifically target women in their existing e-business strategies as well as creating new strategies focused on women customers in order to maximize their market share. The purpose of this paper is to examine the shifting trend in Internet demographics and explore the implications of those trends. Finally, I present a non-aggressive strategy for capturing the female audience online.

INTRODUCTION

In August 2000 the U.S. Census Bureau found that 42 % of U.S. households had at least one member who had Internet access at home, a dramatic increase from only 18% in 1997 (U.S. Department of Commerce, 2001). For some time, this phenomenon caused a lot of brouhaha over the speculation that the Internet would replace bricks-and-mortar locations. However, corporations today, especially after the fall of the dot-com empire, realize that the Internet lacks the power to replace bricks-and-mortar stores entirely. Despite this realization, it is clear that the Internet is a rich channel of distribution to move products to consumers, changing the competitive landscape dramatically. Since corporate America realizes that the Internet is just another medium or channel through which business can be conducted, the real challenge in the Internet medium becomes understanding who the customer is, what they look like, and how to reach them.

For years companies have been studying their traditional customers in an attempt to target specific markets. As the Internet age has exploded, firms are attempting now to interpret their analysis and determine if they are applicable to the web environment. Researchers suggest that the actual Internet user profile has been changing and evolving over the life of the Internet. The results show that women are emerging as the new online majority making up over half of the online population (Shop.org, 2001). The implications of this phenomenon are significant and will affect the way companies consider many issues to include Internet advertising techniques and web design. The purpose of this paper is to examine the trends in Internet demographics, suggest the implications of those trends and propose a corporate strategy for addressing the trends.

THE EVOLUTION OF THE "AVERAGE" INTERNET USER

From early on men dominated the world of the Internet. The early ARPANET and NSFNET users, who were generally computer science graduates and professors, were predominantly male (World Almanac & Book of Facts, 2001). In 1984 less than 33 % of computer science graduates were women (Camp, 2001). Even a decade later, the typical Internet user was described as a male, between 25 and 46 years of age, married, possessing a college degree with an above average income (Komando, 1995). In a series of surveys conducted in 1996, 67.5 % of the U.S. Internet population was made up of men despite that the gender ratio of the general U.S. population in 1995 was 52 % female and 48 % male (Kehoe and Pitkow, 1996). Although studies were beginning to show that women were starting to adopt the Internet, the adoption rates remained slower than men's.

In the late 1990s, a shift in Internet demographic began to emerge. The Internet population began to more closely resemble America's diverse population. A 1999 poll showed that women made up 46% of Internet users (Crocket, 1999). By the dawn of the new millennium women had overtaken men as the new online majority. Women now comprised 51% of the Internet population (O'Leary, 2000). The ramifications of this shift are complex and hold serious implications for e-commerce strategists and marketers.

THE DIFFERENCES BETWEEN MEN AND WOMEN

Men were the early adopters of the Internet and managed to retain a majority hold through the Internet's formative years. However, women have taken over the lead. Women and men have very different online behaviors. In a marketing research paper from 2001, online populations of men and women are divided into five distinguishable segments (Smith & Whitlark, 2001). These segments help to define and determine some different characteristics and interests within the genders. The segments presented are not industry-specific segments, but they serve as descriptive classifications. These segments for both men and women are discussed in the following sections.

Men

The five segments within the male population are Bits and Bytes, Practical Pete, Viking Gamer, Sensitive Sam and World Citizen. Bits and Bytes are men that use the Internet as a tool. This segment of male Internet users has hobbies revolving around computers (Smith & Whitlark, 2001). The Practical Pete segment are interested in making practical use of the Internet. These men want to use Internet gained knowledge in real life. This segment can be impatient because they expect immediate results. (Smith & Whitlark, 2001). The Viking Gamer is a fierce competitor, spends extensive time exploring the Internet and visits chat rooms associated with gaming. The Viking Gamer is purely interested in the entertainment aspects of the Internet. This segment is also likely to be involved in an online community (Smith & Whitlark, 2001). Sensitive Sam is the most social within the male population. Sensitive Sam is interested in the social element of e-mail and he is result oriented. Sensitive Sam uses the Internet to its fullest in helping his family (Smith & Whitlark, 2001). Finally, there is the World Citizen. The World Citizen is cultured and interested in fine art (Smith & Whitlark, 2001).

Men are critical Internet users. Men are less likely than women to click on a banner ad (Pastore, 1999b). They are very critical of anything that might deter them from their designated online task. Men seek information, and they are easily distracted if that information is not readily available (Smith & Whitlark, 2001). The major differences in men and women are the type of information being sought and the purpose for seeking the information. Men tend to seek information that satisfies personal interests or hobbies such as sports, entertainment, gaming, and computers.

Women

Women have entered the online market with specific expectations, goals and needs. Women are gatherers of online information and tend to be less self-centered and more goal-oriented in their time spent online. For example, women are more likely to research health information on the Internet. Women are using the Internet to gather information that will help a family member or friend (Women Online Seek Health, 2001).

The five female Internet population segments identified by Smith and Whitlark (2001) are Social Sally, New Age Crusader, Cautious Mom, Playful Pretender, and Master Producer. Social Sally participates in chats, has a personal Web page, and does considerable research on the Internet. This segment has a mild interest in participating in online communities through chat rooms (Smith & Whitlark, 2001). The New Age Crusader is very familiar with the Internet and computers (Smith & Whitlark, 2001). For the Cautious Mom the Internet is used as a tool for entertaining and educating her family. "Most of all she looks to the Internet to provide information and answers that meet specific family needs" (Smith & Whitlark, 2001). In a study conducted in 2001, 53% of mothers said that the Internet brings their family closer (Pastore, 2001a). The Internet has become a tool of entertainment, education and convenience for the online Mom. For the Playful Pretender the Internet is purely a tool for entertainment through online community (Smith & Whitlark, 2001). The Master Producer is motivated by the Internet's capabilities. To a Master Producer the Internet is a tool to get ahead both inside and outside of her company (Smith & Whitlark, 2001).

Women are interested in using the Internet as a tool, whether it is a tool in parenting and family or a tool for advancing in her profession. The unselfish nature of women's online habits are demonstrated through willingness to perform research for family members or friends. Women gather information through simple to complex searches or through chat rooms and forums. Women have an inclination towards the communication and community aspects of the Internet such as e-mail, chat rooms and forums. In a recent study, 10% more women than men stated that e-mail has helped to improve communication between friends and family (Pew Internet & American Life, 2002).

Regardless of differences, both men and women are information seekers. The key is that the genders seek different information. This is important to note because the online habits and interests of men and women carry over into online spending habits.

ONLINE SPENDING

Although men spend more time on the Internet, women are more influential as an online spender. Only 53% of women classify themselves as the heads of their households, but 87% of women classify themselves as their household's primary shopper (Women Still do Most, 2000). That

is a powerful statement when considering that total spending on online sales alone reached $3.5 billion in March of 2001.

Women control 80% of all purchasing decisions (Pastore, 1999c; Pastore , 2000b). It is important to note that women do not make-up 80% of purchases, but rather they influence or control 80% all of purchases. When considering the female power of influence it is interesting to note that only 45% of the online shopping population consists of women (Regan, 2000). One of the main factors leading to a lower percentage of female online shoppers is security. Women are little more cautious in their acceptance of online spending than men (Pastore, 2000c). Women are influencers because of the way they use the Internet. Men surf the Internet; women are interested in getting something out of the online experience, making women a powerful voice on the Internet. Additionally, women are extremely loyal to products and sites that they are actively involved in within communities (Peacock, 2001).

Some studies show specific product purchasing trends by gender. For example, books, CDs and computer all rank within the top three categories for both genders although they represent different levels of significance (Pastore, 2000a). Airline tickets, hotel reservations and travel are also of common interest between the genders (Mahoney, 2000). Men still retain the lead in computer purchases, but women are quickly gaining speed. Women are now purchasing 51 percent of the on-line consumer electronics (Peacock, 2001). The online shopping trends around women should not be shocking considering the momentum at which women are storming the Internet. Women are more likely to seek health related information online, that translates into women 23 percent more health and beauty related online purchases (Pastore, 2000a). Women also dominate online purchases in children's clothing and toys (Pastore, 2000a). "More men than women shop for insurance online, but women are more likely to buy coverage over the Internet" (Thomas, 1999). Women now buy 51% of all auto purchases and influence 85 percent of all auto purchases. (Peacock, 2001) Women are approaching a majority lead in business travel, home computers and stocks (Peacock, 2001).

Women possess the online numbers, and women possess the online and offline influence. Women are now associated with $3.7 trillion in purchases (Peacock, 2001). This is significant and e-retailers must recognize their power. With the kind of influence and power that women have, it is essential for any online retailer to develop e-commerce marketing strategy to tap into this market.

INTERNET STRATEGY

Understanding the power and influence of women online is barely the tip of the iceberg. Corporate America must proactively address women online through an Internet business strategy. Specific aspects of online business must be addressed in order to win over the female population.

Women, like men, want easy access to online information. The first step in winning the female population is making information readily accessible. Web site should be designed with easy access to information. Site-specific search engines are one tool in that can be used to make information easily accessible.

Women have great concern over web site security when making online purchases. Security has been one factor that has held back the female population from overtaking men as the majority of online purchasers. A study of women who have made online purchases showed that 40 percent said they were concerned about the security of the information they give online (Pastore, 2000c).

"Nearly 90 percent of online women say that guaranteed transaction security influences their repeat visits to online shopping sites" (Pastore, 2000c). Additionally, 67 percent of women reported that published privacy policies encourage return visits (Pastore, 2000c). Security policies and privacy need to be clearly and prominently displayed on the web site. Verisign, a provider of digital trust services, is one vendor that provides a secure online purchasing experience.

Easy access to information, aggressive security and privacy policies are three simple ways to specifically address women online. Companies strive to make their sites flow and to make information and products easy to find. This is not an unrealistic expectation for a corporate web site. Most commercial web sites will have aggressive security policies and a clearly stated privacy policy. Security and privacy are concerns of most online consumers, but the difference comes in how they are addressed within the context of the web site.

CONCLUSION

The Internet has become an indispensable tool in everyday life. Consumers can buy everything from cars, clothes and food to software, information and technology. With all of these products and services available it makes sense to target the appropriate audience or audiences. Women are an online presence whether as the actual purchaser or as a influencing factor in the purchase.

Corporate America cannot afford to neglect a segment that has 80 percent of the purchasing power in the United States. Companies must begin to actively pursue the female shop online. The Internet is no longer a man's domain and corporate America must wake up to that fact.

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SOLVING OPTIMIZATION PROBLEMS USING GENERAL-PURPOSE HEURISTICS

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ABSTRACT

In a competitive global business environment, managers must make decisions in production planning, inventory management, transportation, and other areas using various analytical tools including optimization models. However, managers tend to use mainly "standard" optimization models such as linear programming. It is relatively easy to find optimal solutions for standard models by using traditional optimization programs. Recently, new heuristic-based programs have been introduced in the market. These heuristics are "general-purpose" programs that can be used for solving many types of optimization models.

This study has two main purposes. First, it will show how basic optimization models can be made more realistic by certain enhancements. However, the enhanced models become too "complex" to be solved by traditional algorithms. Second, this study will demonstrate how heuristic programs can produce near-optimal (or even optimal) solutions for relatively complex models. The capabilities of two general-purpose heuristics for Microsoft Excel will also be explored. The results of this study will contribute to a better understanding of the usefulness of heuristics in optimization.

INTRODUCTION

While the basic outlook of spreadsheet programs have not changed in the past ten years, their power have been increased tremendously. Spreadsheets have become one of the most popular tools in the business environment. For example, Microsoft Excel is not only equipped with hundreds of functions, it has also an optimization program named Solver. Although limited in size, Solver can find optimal solutions for linear programming, integer programming, and smooth nonlinear programming models. Recently, Frontline Systems, Inc, the developer of Microsoft Solver, has expanded the capabilities of Solver. Frontline has introduced two new heuristic optimizers named Evolutionary and OptQuest. These programs are not available as part of the standard Excel Solver, but they must be used in conjunction with the commercial version of Solver called the Premium Solver Platform 3.5.

Evolutionary and OptQuest are not traditional optimization programs. They are constructed using heuristic algorithms. Evolutionary has been developed using genetic-algorithms, while OptQuest has been built using scatter search and tabu search algorithms. The technical details about these algorithms can be found elsewhere (Glover, 1990; Laguna, 1997). As we know heuristics usually do not produce optimal solutions but they may be able to give good or "near-optimal" solutions. In fact, heuristics never recognize the true optimal solutions. In any step, they identify the best solution that is only "better" in comparison to other known solutions. As a typical weakness of any heuristic, Evolutionary and OptQuest do not know when to stop the solution search process.

They must be run long enough to increase their chances of finding good solutions. Nevertheless, both programs can give solutions when other algorithms may not work at all. It is important to note that many heuristics have proposed by researchers in the past twenty years, but almost all of them were special-purpose algorithms. They were developed for solving only specific problems. On the other hand, Frontline Systems has designed Evolutionary and OptQuest as "general purpose" optimizers. These programs can be used for solving various types of problems. Frontline has also included some proprietary algorithms to improve the performance of both programs (Frontline Systems, Inc., 2000).

This study has two main purposes. First, it will show how basic optimization models can be made more realistic by certain enhancements. But, the enhanced models typically become too "complex". These models are complex because they have nonlinear functions or even discontinuous functions. Therefore, they cannot be solved using standard linear or nonlinear programming algorithms. However, these models can be transformed conveniently into spreadsheet models. Second, this study will demonstrate that heuristics can be used for solving these complex spreadsheet models. Two heuristic programs will be used in the study. The first one is Evolutionary version 3.5. This program is designed to handle up to 500 decision variables (all of them may be integer variables), 250 constraints, and 1,000 simple bounds. The second one is OptQuest 3.5, which is designed to handle models with up to 5,000 decision variables (all of them may be integer variables), 1,000 constraints, and 10,000 simple bounds.

For illustrations, the study will concentrate on three popular lot-sizing models. The discussion starts with the simpler case of lot sizing with quantity discount and ends with the more difficult case of multi-product lot-sizing models. These models have relatively complicated mathematical forms. But, their corresponding spreadsheet models are intuitively simple. Evolutionary and OptQuest can solve these models effortlessly.

LOT SIZING WITH ALL-UNIT QUANTITY DISCOUNT

This problem is one of the basic business optimization models and it is also called the Economic Order Quantity inventory model with all-unit quantity discount. The main objective is finding the optimal order quantity that yields the lowest total annual cost, which is the sum of annual setup cost, annual holding cost, and annual purchase cost. The algebraic form of the total annual cost is shown below.

$$Total\ \ Annual\ \ Cost = DS_o / Q + QIC_Q / 2 + DC_Q$$

The problem involves a nonlinear optimization model with only one decision variable and no constraints. Nevertheless, the presence of price discount makes the objective function discontinuous. As a consequence, traditional nonlinear programming algorithms, such as GRG algorithm in Solver, generally will not find the optimal order quantity. From the theoretically point of view, this problem is difficult to solve. However, there is a well-known procedure that can produce the optimal solution. Unfortunately, this procedure cannot be generalized easily. For example, if there is an upper limit on the inventory level, then the procedure cannot be used for

solving the problem. On the contrary, the enhanced problem can be translated into a spreadsheet model. There are no complicated formulas in the spreadsheet with the exception of VLOOKUP function. Both Evolutionary and OptQuest produce the optimal solution for the spreadsheet model at an instance.

Gupta (2002) proposed a different improvement on the lot sizing with discount problem. He said that each order could be sent using several non-consecutive shipments. This practice reduces the annual holding cost but it increases the annual delivery cost. The total annual cost is shown below.

$$Total\ \ Annual\ \ Cost = DS_o/Q + QIC_Q/2N + DC_Q + DNS_t/Q$$

There are two setup costs in the model. One is the ordering cost and the other one is the fixed cost for each delivery. Gupta developed a procedure for finding the optimal lot size and the optimal number of delivery. But, his procedure will not work if there is a constraint on the inventory level. On the other hand, Evolutionary and OptQuest can solve the enhanced case without difficulty.

ECONOMIC PRODUCTION LOT SIZING WITH PERIODIC FIXED COSTS

Robinson and Sahin (2001) developed this model as an improvement of the economic production lot sizing (EPLS) model. In the basic EPLS model, there is only one fixed cost that is usually called setup or order cost. In the improved model, there are equipment setup cost and periodic fixed cost. The function of the total annual cost is shown below.

$$Total\ \ Annual\ \ Cost = DS_o/Q + QIC(P-U)/2P + DMS_t/Q$$

From the above function, we can see that the total periodic fixed cost in a cycle (i.e., the third term) depends on the integer number M, the number of successive production periods in a cycle. Although the annual cost is discontinuous and nonlinear, the exact procedure for finding the optimal solution has been derived. But, this procedure is also a special purpose procedure and it cannot be expanded conveniently.

The problem can be formulated as a spreadsheet model with production quantity and number of successive production periods as decision variables. There are no fancy formulas in the spreadsheet. Both OptQuest and Evolutionary can find the optimal solution for this problem. Moreover, both heuristics work well even if there is an additional constraint on the inventory level.

LOT SIZING WITH MULTIPLE PRODUCTS

So far we have discussed lot-sizing problems with one product. Now we are going to review the multiple products case. We will present the model proposed by Chopra and Meindl (2001). Assume that a store must order multiple products from a single supplier. The store would like to reduce total cost by combining products to be ordered jointly. It is apparent because combining

orders will yield lower annual order cost. The logical choice is to order low-demand products less frequently than high-demand products. The annual cost function is shown below.

$$Total\ Annual\ Cost = \left(\max_j n_j \right) S_o + \sum_{all\ j} n_j S_j + \sum_{all\ j} D_j IC_j / 2n_j + \sum_{all\ j} D_j C_j$$

There are two types of order costs. First, the common order cost which is incurred each time an order is placed regardless of the variety of products included in the order. Second, the product specific cost which is an additional order cost if a particular product is included in the order. Chopra and Meindl developed a heuristic procedure for solving the problem. This procedure may not produce optimal solutions but it is relatively intuitive.

Apparently, the problem is a smooth nonlinear programming problem. The Standard Nonlinear GRG program in Solver can find the optimal solution effortlessly. OptQuest and Evolutionary produce solutions that are very closed to the optimal solution. The problem surely can be enhanced by taking into consideration price discount and inventory limits. OptQuest and Evolutionary are able to produce good (hopefully optimal) solutions for this enhanced model. Theoretically speaking, it is difficult to argue that these heuristics' solutions are optimal because there is not known exact solution. However, multiple different runs always converge to the same results. This situation may indicate that the obtained solutions are probably optimal.

It is interesting to note that Chopra and Sahin used order frequencies as decision variables. Other authors commonly use order quantities as decision variables. For OptQuest and Evolutionary, searching for the optimal values of order frequencies is relatively easier than searching for the optimal values of order quantities. Compare to order quantities, order frequencies typically have narrower range of possible values. This condition facilitates faster searching process for OptQuest and Evolutionary.

CONCLUDING REMARKS

Several practical lot-sizing problems have been reviewed in this study. Possible enhancements on these problems have also been proposed. It has been shown that simple enhancements make the problems more realistic but much more difficult to solve. Although optimization experts may be able to developed solution procedures for these problems, these procedures will be "special-purpose" algorithms only. Even worse, these special algorithms may be difficult to use and understand. Managers (non-expert optimization users) in the business environment are facing with much more complex problems. They need access to general-purpose and easy-to use optimizers that can generate good (hopefully, optimal) solutions for a variety of practical problems.

This study explores the features of two heuristic optimizers called Evolutionary and OptQuest. These programs are somewhat user friendly because they use similar problem setup as the one being used in Microsoft Excel Solver. Users that are familiar with Excel Solver will not have much difficulty in using the programs. However, the parameter setting is not really intuitive. For small problems, these details are perhaps not important. But, for larger problems, the parameter values may affect the quality of the solutions.

Users of Evolutionary and OptQuest must realize that these programs generally do not produce optimal solutions, especially for larger problems. However, these programs may yield good solutions when other programs may fail to do so. This is a common trade-off in optimization environment: getting the true optimal solution for a simplistic (and not so realistic) problem or accepting a (potentially poor) solution for a complex (but more realistic) problem.
Both OptQuest and Evolutionary are designed as general-purpose optimizers. They enlarge the power of spreadsheet optimization modeling considerably. However, their performance in solving other types of models should be studied further.

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DEVELOPING A MODEL OF THE EFFECTS OF INFORMATION TECHNOLOGY INFRASTRUCTURE FLEXIBILITY AND IT INVESTMENT ON FIRM PERFORMANCE: AN EXPLORATORY APPROACH

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ABSTRACT

In the past decade as organizations have faced the pressures of a highly competitive, dynamic environment, IT has become an integral part of the organization's activities. Thus, as information technology continues to change rapidly in this highly competitive environment, the flexibility of the IT infrastructure has become a critical issue. This study explores the construct of IT infrastructure flexibility and examines its underlying factors. Employing exploratory factor analysis, four key factors of ITIF are identified: IT integration, IT modularity, IT personnel, and IT investment. Structural equation modeling is used to develop a model of the relationship of these factors to each other and their impact on firm performance. IT investments are found to have an impact on the other factors of ITIF. Only IT investment is found to have a direct effect on firm performance.

INTRODUCTION

Information technology is one of the most significant drivers in organizational studies today, and IT has become more than a player. IT has become a strategic weapon (Porter and Millar, 1985), providing a competitive advantage when properly employed (Porter and Millar, 1985; McFarlan, 1984). Yet despite, or perhaps because of, the tremendous advantages of information technology, the current business landscape creates intense market pressure forcing organizations to constantly learn to adapt (Weiss and Birnbaum, 1989). And as better hardware, software, and communications technologies are developed, firms must react to remain competitive (Rockart and Morton, 1984).

These dynamic issues make the need for serious examination of a firm's IT infrastructure a criticality, and it brings the degree of flexibility and responsiveness of the IT infrastructure to the top of the list of concerns for IT professionals. While researchers have begun to look at IT infrastructure flexibility (Byrd and Turner, 2000; Duncan, 1995), research in this area is still in its formative stages, and no one has begun to empirically examine performance consequences within the ITIF framework. This is an important research domain that deserves attention. Thus, the purpose of this paper is to further explore IT infrastructure flexibility factors and propose a model that examines the effect ITIF has on firm performance.

DIMENSIONS OF IT INFRASTRUCTURE

In general, an infrastructure is the basic, underlying framework or features of some entity, usually something technologically oriented. Thus, an information technology infrastructure is the basic, underlying framework the computer hardware and software combined with the telecommunications technology and the "choices pertaining to applications, data, and technology configurations" (Byrd & Turner, 2000). Researchers agree that IT infrastructure can be broken into two different components (Broadbent & Weill, 1997; Byrd & Turner, 2000; Henderson & Venkatraman, 1994): the technical infrastructure and the human IT infrastructure. The technical component refers to the hardware, software and telecommunications configuration, while the human infrastructure refers to the underlying framework of "the knowledge and capabilities required to manage effectively the IT resources within the organization" (Byrd & Turner, 2000).

IT INFRASTRUCTURE FLEXIBILITY DEFINED

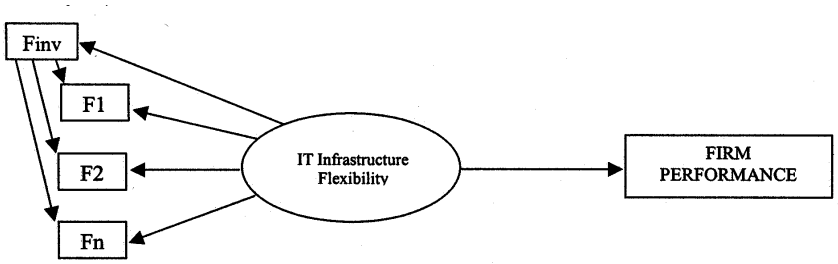
Two decades ago, researchers began to recognize the importance of firms opening "the avenues of strategic flexibility" in order to combat the dynamic, uncertain environments facing them (Aaker and Mascarenhas, 1984). In strategy, flexibility is "a set of capabilities firms use to respond to various demands and opportunities that are part of dynamic and uncertain competitive environments" (Hitt, et. al., 1999). This implies the ability to adapt in a way that allows the firm to maintain or achieve sustained competitive advantage. The concept of IT infrastructure flexibility is similar to strategic flexibility. Thus ITIF is an IT infrastructure that allows a firm to "respond to various and opportunities that are part of dynamic and uncertain competitive environments" (Hitt et. al., 1999). This flexibility, we argue, allows a firm to be successful.

Byrd & Turner (2000), suggest a number of factors that underlie IT infrastructure flexibility construct. Among those factors are the connectivity, compatibility, and the modularity of IT resources. These factors concern the technical side of the IT infrastructure that were identified in a study conducted by Duncan 1995. Duncan argued that an organization that has high connectivity, compatibility and modularity is viewed as having a technical IT infrastructure that is highly flexible. Based on work done by Byrd & Turner (2000), these factors can be defined as follows: (1) modularity is the ease in which hardware, software and data components can be add to, removed from, or changed in a given IT system without major overall effects; (2) connectivity is the ability of different technological components to attach to each other internally or externally; and (3) compatibility is the ability to share any type of data across the system.

On the human (management) side of the IT infrastructure, IT personnel and their degree of responsiveness and flexibility are major issues. As well, the level of investment in IT that management is willing and able to make is significant. It is from these concepts and definitions that the measurement instrument for this study was developed (Turner & Byrd, 2000).

THE MODEL

The literature implies that the characteristics of ITIF may affect firm performance. The model presented in Figure 1 illustrates the general relationships of interest in this study. In addition, the literature supports the assertion that a number of key underlying factors comprise the ITIF construct. Because the nature of this study is to develop a model based on exploratory techniques, the exact number of factors was not known going into this study (represented in the model by Fn).



In addition, academics agree that returns on IT investments go way beyond the bottom line (Boynton et.al., 1994), and although scholars have long speculated the impact IT investment has on the bottom line, they have also recognized the difficulty in tracing a direct effect from IT investment to firm performance (Barua and Mukhopadhyay, 2000; Weill and Olson, 1989). However, no one has attempted structural equation modeling to explore that potential effect. Thus, this research not only explores ITIF factors and examines their relationship to each other and to firm performance, but it also looks closely at the effects of the IT investment factor.

THE RESEARCH QUESTIONS

Based on the theoretical underpinnings discussed earlier, the following research questions were developed: 1) What factors underlie IT infrastructure flexibility? 2) What direct and indirect effects exist among the factors? 3) Specifically, what effect does a firm's investment in IT have on other factors of ITIF? 4) What effects do each of the ITIF factors have on firm performance? 5) What model best explains the relationships among ITIF factors and firm performance?

RESEARCH METHODOLOGY

In order to explore the relationships among the ITIF factors and firm performance, we collected data that measured each of our constructs. The data for this project were collected from senior IT managers at Fortune 500 companies. A survey using a 5-point Likert scale was sent to 500 companies. Responses received totaled 101, providing a 20.2% response rate. After examining the responses, 10 observations were dropped from the sample due to incomplete answers from the respondents, yielding a final sample size of 91.

The questionnaire contained two series of measurements. The first set of questions were designed to assess various factors of the IT infrastructure construct. The second included measures of firm performance. The firm performance measures consisted of three qualitative, self-reported questions measuring the firm's performance against that of its closest competitors.

To analyze this data, we used several statistical techniques to include reliability analysis, factor analysis, structural equation modeling, and nested model testing. We deemed it appropriate to use multivariate analysis since the factors in the data collect could plausibly be correlated (Loehlin, 1998; Mbarika et al., 2000; Newman, 1988; Schumacker et al., 1996).

RESULTS

To perform data reduction techniques for our 22 ITIF indicator, we conducted an exploratory factor analysis using the Principal Components Analysis (PCA) extraction method. After carefully evaluating the results of a number of criteria (eigenvalue-greater-than-1, scree plot, and goodness of fit measures), we determined that four factors comprise the ITIF construct.

The four factors explain 57.655 percent of the total variance and are clearly supported by the literature. Based on the theoretical foundation for the model and the intent of the various indictors, the four factors were named IT Integration, IT Modularity, IT Personnel, and IT Investment. Six indictors were dropped due to failure to load or cross loading.

Next, we tested reliability of the factors of ITIF and firm performance. Cronbach's alphas were calculated for the variables within each factor. All alphas were at acceptable values with the results of .8642 for IT integration, .7412 for IT modularity, .7432 for IT personnel, and .8045 for IT Investment. We then ran a Cronbach's alpha for Firm Performance, which resulted in a solid and respectable .8426.

STRUCTURAL EQUATION MODELING TECHNIQUE TO DETERMINE EFFECTS

To determine the effects of each of the relationships under investigation in this study, we employed structural equation modeling techniques. Structural equation modeling is a viable method to examine the relative strength of each predictor variable in the model (Marcoulides and Heck, 1993). Since we were interested in both the IT investment factor's effect on the other ITIF factors and the full model of the effects of the factors on firm performance, we ran the model in two phases.

In the first phase, we ran a structural model consisting of the four factors of ITIF as identified in the exploratory factor analysis with IT Investment as a source variable. The model produced a good fit resulting in a C2 (CMIN) of 166.523 with 202 degrees of freedom. This indicates a good fit at a probability level of 0.05. Because C2 alone does not take into account other factors that could explain good fit, we also examined the measures that adjust for parsimony (e.g., CMIN/DF, AIC, PRatio, PGFI, and AGFI) and those that measure a comparison to some baseline model (e.g., NFI and GFI). (Loehlin, 1998) These values also fell within acceptable range, suggesting that the model we have tested is the appropriate model. Our provided resulted in the following values: CMIN/DF of 1.649, AIC of 236.523, PRatio of 0.842, PGIF of 0.607, and AGFI of 0.754. In comparison to the baseline independence model, our model had an acceptable NFI and GFI with values of 0.7529 and 0.818, respectively.

Next we ran nested model testing with all combinations of paths removed and testing the difference in C2 between each new model and the original model. All paths were determined to be significant at a 0.01 level.

The final phase of the analysis was to examine the full structural model. This model consisted of the four ITIF factors with causality from IT investment to the other three factors and causality from each factor to firm performance. The model produced a good fit resulting in a C2 (CMIN) of 178.702 with 202 degrees of freedom. This indicates a good fit at a probability level of 0.05. The other goodness of fit criteria (CMIN/DF, AIC, PRatio, PGFI, and AGFI) and those that measure a comparison to some baseline model (e.g., NFI and GFI) also fell within acceptable range, suggesting that the model we have tested is the appropriate model. The results were CMIN/DF of 1.581, AIC of 258.702, PRatio of 0.831, PGIF of 0.603, AGFI of 0.752, NFI of 0.7510, and GFI of 0.816.

Finally, we conducted nested model testing with our full model to determine if all of the paths included in the full model are significant. The nested model testing revealed that the only causality path needed from the factors to firm performance was the path from IT investment to firm performance. Thus the best model (see Figure 2) suggests the IT Investment has a direct effect on firm performance and an indirect effect through the other factors of ITIF.

CONCLUSIONS

From this study we can conclude that the factors of IT investment, IT personnel, IT modularity, and IT integration underlie the construct of IT infrastructure flexibility. In examining the relationships among these factors, we found that IT investment has a direct effect on each of the other ITIF factors and subsequently has a direct effect on firm performance. The other ITIF factors have no such effect. This is an important finding as IT infrastructure investments are a high priority for corporations, and as Grover et. al. (1998) suggest, "making good investment decisions for information systems and technology is as critical and difficult as ever." Since the results of our study also suggest that there may be a direct positive effect of IT Investment on ITIF and firm performance, this study will be useful to both the academic and the practitioner since IT investments play in important role in "bridging the gap between more effective processes and more effective organizations" (Grover et.al., 1998). The more we understand the relationships that exist, the better we can determine the appropriate investments to make and predict their payoffs more accurately.

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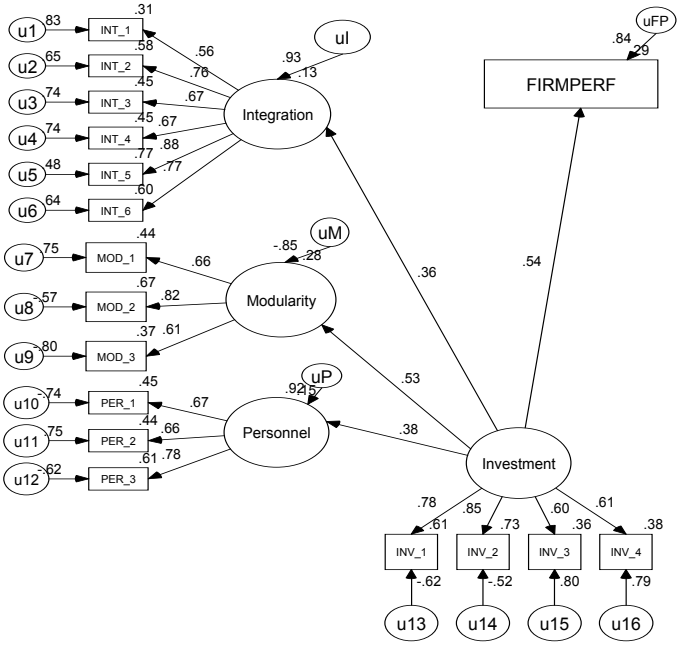
Best Model: ITIF & Firm Performance



ENVIRONMENTAL MANUFACTURING: RECONCILING LEAN MANUFACTURING AND ENTERPRISE RESOURCE PLANNING THROUGH TECHNOLOGY

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ABSTRACT

Users of lean manufacturing are just beginning to benefit from the implementation of the process to minimize waste while at the same time adding flexibility and maximizing production. This paper presents aviation safety in context of a lean manufacturing framework of information technology, cell manufacturing, continuous process improvement, total quality management, enterprise resource planning, and six sigma. Cutting costs does not mean having to reduce safety. Nevertheless, safety is no accident. It is not a coincidence that this slogan appears often in FAA literature, correspondence and advisory circulars. FAA directives are a frequent reminder to all that reliability and safety in aviation is a team effort. Each part of the value stream is responsible for their part toward the assurance of a safe flying environment. Lean manufacturing is part of the evolution in manufacturing that strives to increase quality, reduce costs through waste minimization which in turn improves our stewardship of the environment.

INTRODUCTION

Captain John Butler was sitting in the jump seat on American United Flight 607 waiting for takeoff at Dallas-Fort Worth Airport. It was a typical August afternoon with temperatures hovering at 104 degrees. On the tarmac, the temperature was closer to 130. It still amazed him how approximately 400,000 pounds of aluminum, carbon fiber, and titanium could take this heat, be subjected to 116,000 pounds of thrust being hurled down a runway, and within minutes be flying at altitude in air temperatures potentially as low as -60 degrees Fahrenheit. The fatigue stress on the metals must be enormous and the engineering to accomplish such a feet equally impressive. What amazed him more was what he had just read in preparation for his E-MBA Production - Operations Management class the night before.

It was hard for him to believe that when this jet took off, that it represented only thirty percent of the total material used in building this plane. The remaining 70 percent was left for the scrap bin back at the factory. That meant that for this plane which weighs 400,000 pounds, twice as much went to the scrap yard or enough to build two other planes. Waste means disposal, and disposal means pollution (Kunes, 2001). However, dramatic changes are occurring in the manufacturing industry. Companies implementing lean manufacturing methods are seeing cost and

material reductions as high as forty percent and significant improvement of the physical environment (Muller, 2000). Of course this is good for the companies, but will they cut corners and will it affect safety? When turbulence hits at 25,000 feet, it is comforting to think about the quality standards that have helped today's aircraft manufacturing industry achieve a strong safety record (Hunt 1995). But safety in lean manufacturing is not only an end goal it is built in as part of the process.

ADOPTION OF ENVIRONMENTAL MANUFACTURING

There are several variations in the way quality is defined, but they all point to the strategic definition of *meeting the needs of the customer*. Philip B. Crosby, former Director of Quality for the Martin Marietta Pershing Missile Program, said that quality is "conformance to requirements, not elegance" (Tenner and Detoro 1995). Overall, quality is whatever the customer says it is.

So, how is quality defined in the aviation sector? To answer this, most passengers would quickly answer "to survive the flight." Secondary to survival, but still very important, are reliability, relative comfort, efficiency, timeliness and convenience (Lawrence and Hume 1992). The definition has become more complicated with internationalization, European deregulation, and changes in the way the airlines change the financing of newer fleets (Kyle, Strickland, and Bichaka 1992).

Aviation is rife with safety sensitive and critical job positions, and requires extremely high levels of quality, reliability in hardware, and personnel's skills. Therefore, quality in each part of the manufacturing process is an integral part of the aviation sector. Lean manufacturing starts with the design of both the aircraft and the facilities of the equipment (McClenahen, 2001). For lean manufacturing to be beneficial to a manufacturer, proper equipment that is designed specifically to minimize waste must be purchased. Each of these constraints; aircraft design, facilities design, and equipment purchase only provide the foundation for the adoption of lean manufacturing (Kandebo, 2000; Sahin, 2000).

The next phase of lean manufacturing requires changes in management, staffing, and labor internal to the corporation as well as suppliers external to the corporation (Mickey, 2000). Management must allow labor a larger say in how and when assembly occurs. Classically, Joan Woodward would have classified aircraft manufacturing as a batch process whereby each unit would be treated as a batch going through the system (Sheridan, 2000; Emiliani, 1998). Lean manufacturing works best when the batch can be made to flow as a process whereby sub-assembly steps can be eliminated or included as part of larger steps (Alderson and Pitman, 1999). Sub-assembly enables the movement from batch to process flow and this is typically accomplished by stronger relations with suppliers (Cook, 2001 Kisiel, 2000).

Enterprise resource planning at the outset appears to contradict the principles of lean manufacturing which is to allow the assembly personnel to pull supplies as they are needed. No wasted effort is the goal of lean manufacturing (Strozniak, 2001; Bartholomew, 1999). Enterprise resource planning in comparison requires that laborers monitor through one means or another the flow of supplies through the assembly process. The one mitigating factor is that technology now allows the simultaneous monitoring of material used by each work station or cell while at the same time allowing the workers to spend more time assembling than tracking the work process (Witcher and Butterworth, 2001). Information technology now allows management to see through layers of

the organization as they are made transparent by access to live logistics (Reinhardt, 1999; Frazelle, 1998). Live logistics is made possible by the use of corporate information infrastructure similar to finding information on the internet. Many managers, engineers, and operators now have the ability to access any point in the production process and at some facilities even make on-line adjustments to smooth assembly flow. This is not too dissimilar to what process industries have enjoyed for the last two decades or so.

Information technology is the primary driver behind many successful lean manufacturing systems. Nevertheless, suppliers have to be brought on-board to accomplish this (Christopher, 2000). Many firms now (as in Japan) want supplies and materials delivered pre-assembled, in certain quantities, and on-demand rather than in bulk and placed into inventory. Lean necessarily forces the organization and its suppliers to adjust itself to an inventory less, just-in-time system (Greengard, 2000; Prizinsky, 2001). Sometimes only moderate effort is required for the assembler to adopt the lean manufacturing model, however, getting suppliers to adopt the new way of thinking, service, supply, and process is entirely a different matter.

COMPLEX MANUFACTURING MODEL

Tenner and Detoro (1995) define quality as a strategy utilized to completely satisfy both internal and external customers by meeting their explicit and implicit expectations. The lean manufacturing model builds on three fundamental principles of quality: information technology, continuous process improvement, and total quality management. It calls for utilizing the know-how, ideas and talents of all the employees, empowering the employees to improve their outputs, and creating flexibility through process modification (Sheridan, 2000).

Vital to environmental manufacturing model of TQM, lean manufacturing, enterprise resource planning, and continuous improvement are the concepts of process ownership and feedback. The "owner" is the person at the lowest level responsible for the operation of a process, and for its improvement. In environmental manufacturing the process becomes the "organism's" responsibility. The organism, is the amalgamation of the assembling plant and suppliers each utilizing a combination of JIT, TQM, ERP, Six Sigma, Information Technology and lean manufacturing techniques in concert through effective business to business software for sharing interdependent information (Bradford, Mayfield, and Toney, 2001; Avery, 2000).

CONCLUSION

Today, air travel still remains the safest viable alternative to meet the ever-growing travel needs of the business world and ever-changing society. Agencies such as FAA and the NTSB (National Transportation Safety Board), should be commended for maintaining a safe flying environment. Nevertheless, environmental manufacturing methods which include, total quality management, lean manufacturing, six-sigma, enterprise resource planning, contribute greatly to building quality and safety into the product long before it is used. Equally important in a finite resource constrained world is our obligation to manage resources in such a way that minimizes waste. Other industries should consider adopting the environmental manufacturing framework as found in a few world class companies.

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RETURNS ON AUCTIONS: THE QUESTION OF METRICS FOR REVERSE AUCTIONS IN B2B E-PROCUREMENT

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INTRODUCTION

I don't think there is a new economy. I think there are new tools for the economy" (emphasis in the original) ----- Michael Bloomberg (quoted in Canabou and Overholt, 2001, p. 109).

Suddenly, the realm of B2B (business-to-business) e-commerce has become "a scary place to be" (Ante and Weintraub, 2000). In the "post-Internet bubble" environment of today, the new reality is that "e" has a stigma attached to it. No longer is "e" regarded as inevitable or best. Today, Internet technology is not being bought just because it is available, and there is a newfound demand for return on investment to come quickly. In the words of Cleary (2001), buyers of e-commerce applications are increasingly focusing on the question - "Tell me what I get out of this" -especially as actual returns have often been mere fractions of those promised by B2B vendors and analysts.

Still, if only with a bit less thrust than it previously had, B2B e-commerce and the push towards e-procurement still appear to be on what has been described as a "rocket-ship ride" trajectory (Sostrom, 2001). After all, as Charles E. Phillips, a Managing Director at Morgan Stanley Dean Witter, observed, the move toward e-commerce is not likely to be deterred by the downturn in the economy. As he stated: "Even in hard times, I don't think that a single big company is prepared to say, 'Paper is fine. Let's keep doing it the old way'" (quoted in Canabou, 2001, p. 90). As LaMonica (2001a) observed, the Internet Economy - if not many of the companies who pioneered it - is clearly here to stay, as the "flameout" of the "dot-coms" "will not end the allure of the Internet for businesses and customers" (p. 5). Clearly then, the B2B concept, and the processes and technology supporting it, will be key to all organizations' success - both public and private - in the coming years.

In this paper, we will look at reverse auctions - one of the primary tools being employed in the realm of e-procurement. Auctioning is as old as civilization itself, and with reverse auctioning, companies large and small are seeking to employ dynamic pricing to streamline their procurement systems and save on their total acquisition costs. However, how are these savings being measured and are they comparable across various settings? More importantly, are these replicable savings, or are they merely anomalies, caused by market forces outside of the auction arena itself. This paper examines both the basics of the use of reverse auctions and the metrics that should be developed and employed to assess their utility in today's post "dot-com" era. Cleary (2001) astutely observed that buyers of e-commerce applications are increasingly focusing on the question - "Tell me what I get out of this" -especially as actual returns have often been mere fractions of those promised by B2B vendors and analysts. Reverse auctions, noted for their quick successes and often Texas-sized

savings claims, will thus be subject to great scrutiny as the practice takes hold not only in American industry, but worldwide. Thus, this paper has significance to both academic and practitioner audiences.

REVERSE AUCTIONS

According to the Institute for Supply-Chain Management (2001, 2002), the use of reverse auctions for e-procurement is quickly taking hold as an accepted e-procurement tool. Led by the largest manufacturers, organizations of all sizes are accelerating in their use of this acquisition method. According to their quarterly Reports on eBusiness, well over a third of those firms with annual purchasing volume of over $100 million are employing such auctions. Thus, reverse auctions are fast becoming an integral part of the acquisition landscape.

According to Bodow (2000), dynamic pricing represents "systems that adjust the value of goods in response to short-term changes in the market…(and) the stock market is a prime example of it" (p. 16). Stock exchanges are often referred to as being the "most perfect markets," as buyers and sellers on the stock exchange should have the same access to information. Therefore, the matching of their respective bid and ask prices represents an "ideal market price" for the security being auctioned. Likewise, the futures exchanges have served as auction marketplaces for the most basic of commodities for many, many years - long before the Internet made online exchanges possible in many other areas of the economy (Tully, 2000). The challenge is to extend this market model to create liquid trading exchanges in all areas of business (Bayers, 2000). In a dynamic pricing environment, not simply stocks or futures, but a wide-range of goods - and services - can be "priced according to what the market will bear, instantly, constantly" (Hof, Green, and Judge, 1999, p. 30). Miller (1999) labeled this phenomenon "real-time pricing" (p.4).

What is a reverse auction? Formally, a reverse auction can be defined as "a supply-aggregating event that lowers the price of goods for a buyer" (Mattick and Brousseau, 2001, p. 133). At their core, reverse auctions are used to produce descending prices by having multiple potential sellers of vendors competing for the business of a single buyer. An example of a reverse auction would be where a buyer was seeking to purchase a specified quantity of office furniture, say 350 desk chairs. The buyer would set the necessary specifications and then invited, interested (and most often qualified) bidders compete for the right to supply the furnishings - at the best price.

In a reverse auction, the identities of bidders are unknown to all, and bid prices are immediately known to all. Through the pre-qualification process, all issues are generally settled between the procuring organization and potential suppliers before the time of the auction, with the only remaining issue to be settled being the price (Marinello and Daher, 2001). In most, but not necessarily all reverse auctions, the buying organization is not bound - under the terms of the auction - to necessarily choose the lowest bidder (Kalin, 2001).

What are the benefits of using reverse auctions? According to Marinello and Daher (2001), the three main benefits of reverse auctions are: increased numbers of potential suppliers; reduced procurement cycle time; and lowered purchase prices. Beyond the actual cost savings experienced in online B2B auctions, buying organizations also save through the greatly reduced time spent dealing with suppliers and actually negotiating prices and terms on transactions (King, 2000). Glen Meakem, CEO of FreeMarkets.com, observed that with online B2B auctions, negotiations with multiple competing suppliers that might take weeks or even months can be compressed into less than

an hour (cited in Vigoroso, 1999). In the view of FreeMarkets (2000, p. 1), the leading auction service provider (ASP), online auctions for e-procurement offer three principal benefits: financial savings versus traditional, manual sourcing; improved efficiency of the procurement process; and enhanced transparency of the procurement process. The benefits of the auctioning process, however, cannot be simply unidimensional. In fact, as Appell and Brousseau (2000) observed, potential vendors actually stand to benefit from their participating in online procurement auctions by providing: access to new customers; new and timely information on state of the market; and new demand management capabilities.

Reverse auctions have been accurately termed "accelerated Darwinism" by e-Breviate co-founder and President Niul Burton, in that they enable organizations to "find out much more quickly who are the most competitive suppliers and who is going to win your business" (quoted in Waxer, 2001). In the area of reverse auctions, perhaps none has gained more attention than Covisint, the marketplace established by major automakers. In fact, in May, Covisint hosted the largest online auction to date for DaimlerChrysler, in which the automaker procured $2.6 billion in parts in a single transaction, saving an estimated tens of millions of dollars in this event (Barlas, 2001). To put this in perspective, the total value of all goods auctioned on eBay in the fourth-quarter of 2001 was approximately $2.4 billion (Loftus, 2002). There have been countless other examples cited in the business press about the savings generated for companies by shifting to online procurement auctions with their suppliers. For instance, General Motors saved almost $150 million in one single online auction event for rubber parts. Likewise, Quaker Oats reported saving over $8.5 million in online auctions for necessary transportation services and raw ingredients (King, 2000).

The issue must be raised, however, just as with all aspects of e-commerce, how do you measure the value of reverse auctioning? The questions are multifaceted and complex. In the next section of this article, we will turn our attention to the question of metrics for B2B e-commerce in general. Then, we will apply these concepts to reverse auctioning to develop a framework for gauging the true value of this e-procurement method in practice?

THE ISSUE OF METRICS

ROI (return on investment) and metrics have been huge issues in the broad realm of e-business. With so much money having been expended on e-commerce projects, both in the public and private sectors, there is a need to assess the worth of these investments. As Heath (2001) commented: "Traditional methods for calculating return on investment have been, for the most part, ill-suited to measuring the strategic impact of e-business" (p. 1). Indeed, gauging the return on investment for e-commerce projects and applications, in the view of Goldberg (2001) presents decision makers with a "Gordian knot," as "the benefits are the new processes they bring. Yet, because the processes are new, existing measurement tools may miss those benefits" (p. 1). Yet, even with the new methods come controversy, as what is a "hit" or a "page view" can be open for debate in the New Economy (Goldberg, 2001).

According to analysts, very few companies have adequately measured the impact of e-commerce applications before, during or after their implementation (Heath, 2001). Today, however, after "the go-go years of the dot-com demi-decade," return on investment is at the top of all factors in e-business decision making (LaMonica, 2001a).

Making the "business case" for e-commerce applications can be a difficult - if not impossible - task, requiring the tallying of both tangible benefits (such as reduced printing and postage costs and shortened cycle time) and intangible benefits (such as increased customer - or supplier - satisfaction and improved communications and accountability) (Harreld, 2000). William Joplin, Director of Procurement Policy and e-Commerce for the State of Washington, emphasized the need "to build a business case for e-procurement policy" (opinion cited in Dizard, 2001, p. 3). In making the business case, having all the numbers be valid, defensible, standards-based and meaningful will be critical. As Goldberg (2001) emphasized, there is a great need for baseline data to establish effective e-commerce metrics, along with consistency in the data collection process. However, all of this is vital in laying the groundwork for being able to demonstrate the return on such investments is a vital part of both proving their necessity and viability.

RECOMMENDATIONS: REVERSE AUCTION METRICS

Most experts agree that one of the primary benefits of reverse auctions - beyond the cost and procedural savings - will be the automated analysis that will be enabled through the conduct of the auction process itself. This should lead to greater understanding and better, more informed awards in the future (Schwartz, 2000). This data can be used by both the procuring company and by the vendors - even data mined - to produce greater understanding of the auction process itself and the savings derived from it.

The author believes that reverse auctions can be measured accurately to give decision makers on both sides of the equation better metrics to guide their judgment. Thus, he proposes a new framework - the 3 P's of reverse auctions - that can be utilized to analyze the benefits that reverse auctions can bring: (1) price benefits; (2) process benefits; and precision benefits.

CONCLUSION

In the full version of this paper, the author will give details on the development of not only appropriate metrics, but new, second and third generation forms of "price-plus" multiparametric auctions that can better serve both buyers and vendors. You are urged to contact the author, David C. Wyld, for a full version of this work. He can be reached via email at dwyld@selu.edu or at 985-549-3972.

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Provided upon request.

BRICOLEUR FORECASTING

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ABSTRACT

The task of developing useful in-house statistical models for forecasting important measures such as costs of selected outputs of individual going concerns can be somewhat daunting. The reasons for this being the case are at least two. First, when one develops such models at, e.g., an industry level, the idiosyncratic behavior of individual going concerns is lost in the aggregation. However, when dealing with the individual going concern, no dampening of its idiosyncrasies occurs. They must be taken into account if the ends attempts at statistical modeling pursue are to be of much use.

Second, the identification of these idiosyncrasies is often elusive. There is therefore, no "cookbook" procedure for developing such statistical models because of the uniqueness of the objects being analyzed. Yet, are there some generalizations that can be made that will prove useful to the practitioner if he or she should choose to undertake the task of developing useful in-house statistical models of the activities of unique entities? As a result of our work modeling the production costs of Caterpillar Precision Seals of Franklin, NC, we think that there might be. Such generalizations seem somewhat similar to what we know about the bricoleur, a concept used lend imagery to the intellectual movement commonly referred to as French Structuralism.

SUPPLY CHAIN MANAGEMENT PRACTICES OF FIRMS: A FUNCTION OF IT CAPABILITY

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ABSTRACT

Firm collaboration and information sharing have been thematic in the supply chain management (SCM) literature, assuming the existence of a supporting information technology (IT) structure. However, the exact relationship between IT use and SCM practices has been primarily anecdotal in nature. The purpose of this research is to add to this understanding by profiling differences in SCM practices of firms based on their IT capability. We also evaluate the impact IT usage has on a range of organizational performance measures. Our findings show that firms with high IT capability engage in both intra and inter-organizational SCM practices to a greater degree than other firms, and perform higher on most organizational performance measures. This research contributes to the literature by helping document the role IT plays as an enabler of SCM activities. This research also suggests that the relationship between SCM practices and organizational performance measures is supported through a strong IT capability.

Keywords: Supply chain management; Information technology; Empirical research; interdisciplinary

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SELECTING THE APPROPRIATE ARTIFICIAL NEURAL NETWORK TO MINIMIZE AUDIT COSTS WHEN ASSESSING THE FINANCIAL VIABILITY OF AUDIT CLIENTS

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ABSTRACT

Auditors are required by generally accepted auditing standards (GAAS) to evaluate the financial viability of audit clients when conducting an audit. GAAS also require that auditors supplement their professional judgment with analytical techniques during audits. Consequently, auditors have turned to decision tools such as artificial neural networks (ANNs) when evaluating client financial viability to ensure compliance with GAAS. However, auditors may not be aware that different types of ANNs may not be appropriate for use when evaluating the financial health of audit clients. This study examines the performance of different ANNs, categorical learning ANNs, probabilistic neural networks, and backpropagation ANNs, in evaluating firm financial viability. The study also explains why the rates of type I and type II errors and their relative costs must be considered when selecting an ANN to use in audit engagements.

The results of the study indicate that estimated cost to use categorical learning ANNs is less than that of either probabilistic neural networks or backpropagation ANNs when examining the financial health of firms. This is the case even though the categorical learning ANN used in the study had the highest overall error rate of the three ANNs used in the study.

CONSONANCE APPROACH TO IS SUCCESS

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ABSTRACT

Consonance is defined as a general understanding and goal congruence between stakeholders. In order to achieve this harmony, one must have some understanding of human behavior, the thought processes, and the needs. The motivating force to create consonance between IS personnel and IS end users is the desire to improve the success rate for IS projects. The dollars lost and the forfeited potential for unsatisfactory IS projects has become very important to organizations. Research has identified these problems and stresses the importance of changing this lack of success (Ginzberg, 1981;Saarinen, 1996; Linberg, 1999; Jiang et al., 2000).

To create consonance between stakeholders (IS personnel and IS users), one must consider several areas of research that offer many solutions or options to assist in obtaining this state of understanding between stakeholders. Social perception theory is an important building block for the consonance process and is a major area for exploration to help find some of the solutions and options that might assist the organization in reaching a satisfactory level of consonance. Social perception theory helps one to understand how people understand and react to specific situations and provides answers to many inherent questions. Research in this area covers the cognitive process and how thinking patterns differ among all individuals. This cognitive process is based on current knowledge and knowledge from past experience and is used for recognizing, encoding, and storing information to be used in the future. Each person's cognitive process has recognized, encoded, and stored different bits of information, thus, using their own personal schema they have a unique way of analyzing and understanding any situation they encounter. Due to the personal nature of their own cognitive process their particular understanding of a situation will not always match that of other observers unless procedures or processes have been developed to bring those different cognitive processes to the same conclusion (Ross and Fletcher, 1985; Ainley, Becker, and Coleman, 1986; Baron and Byrne, 1991).

Another area that needs attention in creating the consonance process is goal setting and the ability to maintain agreement between the stakeholders. Maintaining agreement between two groups is essential for success in many situations (George and Jones, 1999). Inconsistencies in this area will lead to pursuance of different goals, which will create different outcomes. The need for maintaining a focus on common interests between the IS personnel and IS end user when creating or maintaining information systems is imperative to the creation of that common goal of highest possible satisfaction for which both stakeholders should strive. This commonality between stakeholders is difficult to reach because of the different perspectives that each group maintains (Adelman, 1992). Each group's goals may differ because of the perceived importance of different parameters involved in defining the work to be undertaken. Without a common goal to direct both stakeholders, the two groups can make inconsistent decisions (Abdel-Hamid, 1999).

By using a new set of performance constructs (Jiang, Sobol, Klein, 2000) to measure the importance perceptions of the two stakeholder groups (expected outcomes) and well established

satisfaction constructs (Baroudi and Orlikowski, 1988; Mobley, Horner, and Hollingsworth, 1978) to measure perceived final outcomes, the differences between stakeholder perceptions can be identified with the use of discrepancy theory tools. Creating an awareness of the specific problems for management can start the process of consonance. Consonance can be achieved through better communication techniques and more direct influence in the goal setting process for projects that encompass more than one group of stakeholders. The evaluation system for the organization can be improved through the concepts found in 360 degree evaluations.

Authors' Index