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THE ROLE OF TEACHING, SCHOLARLY ACTIVITIES, AND SERVICE ON TENURE, PROMOTION, AND MERIT PAY DECISIONS: DEANS' PERSPECTIVES

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ABSTRACT

The purpose of this study was to investigate the effect of scholarly activities, teaching, and service upon promotion, tenure, and merit-pay decisions for business faculty at both teaching and research colleges in the USA. A survey questionnaire, which requested opinions regarding the role scholarly activities have on promotion, tenure, and merit pay decisions, was sent to deans of business colleges at accredited or AACSB (The Association to Advance Collegiate Schools of Business) candidate schools. Additionally, information was collected regarding techniques utilized for nonproductive tenured faculty, primary purposes of scholarly activities, and the average number of scholarly contributions each year for total faculty. Results showed that there were significant differences regarding merit allocations between teaching and research institutions, accredited and AACSB candidate schools but not between public and private universities. The study also provided a benchmark for assigning appropriate weights for scholarly activities with respect to promotion, tenure, and merit-pay decisions.

STUDENT PERCEPTIONS OF THE TEACHING EFFECTIVENESS OF A MANAGEMENT SIMULATION IN A BUSINESS POLICY AND STRATEGY COURSE

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ABSTRACT

In this presentation we will present the results of an investigation into student's perceptions of the purpose and effectiveness of a management simulation in a college of business capstone business strategy and policy course. The results show that the students consider the simulation most effective in teaching and illustrating decision making, strategy formulation and financial management and least effective in teaching and illustrating accounting principles, policy formulation and the use of the computers. The students liked the way the simulation showed how a company is run and enjoyed the competitive aspects. They also thought that they needed more practice before playing in order to understand the simulation. The presentation ends with the uses of such investigations and the specific adjustments made in the course.

INTRODUCTION

In this presentation and paper we will present and discuss feedback gathered from students that participated in a management simulation. The simulation was a required component of a mandatory Business Strategy and Policy course taken by all majors in the school of business. The paper will start with a brief overview of the use of simulations in management education. This will be followed by a presentation and evaluation of our findings. The paper concludes with a discussion of the administrative adjustments made to the simulation as a result of the survey and panel interviews, and possibilities for further research.

SIMULATIONS IN MANAGEMENT EDUCATION

The use of simulations in US management education goes back more than four decades. They have been used in different ways in different situations. For example, the American Management Association ran one of the first, called "Top Management Decision Simulation". The AMA said the game was "to make generalists out of specialists" (Macdonald & Ricciardi, 1966). That is, it was to teach mid-level managers to be top level executives.

Games and the use of simulations for training leaders goes back well before the AMA game. The military was the first to use such methods. Chess and similar games were used hundreds or even thousands of years ago to teach strategy development. A game called "The New Kreigspiel" was introduced at Scleswig in 1798 (Cohen & Rhenman, 1961). By the 1870s the game had found its way from Prussia, across Europe, to England and then to the United States where it was used at West Point. During the twentieth century the most widespread use of such games was by the Germans and Japanese in preparation for World War II. Today's Management simulations are direct descendents of those military training games.

Management simulations serve three purposes. First, they are used to research into management problems. Next they are used for familiarization and training in systems operation.

In this regard they are like the 'link trainer' used by pilots. The third use is in management education. They "take the place of spending time with the CEO to get an overall view of the company. Also to take on the responsibilities of top management" ((Fairhead, Pugh & Williams, 1965).

From the introduction of the AMA game to the 1980s the field has steadily grown. In 1964 it was reported that 90% of a sample of 90 leading business schools were using or planning to use a simulation as part of their required curriculum (Boseman. & Schellenberger, 1974). Early management simulations used in business education were simple and illustrated only a few issues (McKenny & Dill, 1966). As the use of computers developed, so did the games both in sophistication and number. By 1973 there were 209 business games listed in "The Guide to Simulations Games for Education and Training" (Greenlaw & Wyman, 1973). The updated 1980 version listed 228 games (Wolfe, 1985). Mainframe run games at the time could involve 50 or more decisions at various levels in the simulated organization and be used to illustrate and teach a wide variety of management concepts (Betts, 1986). The micro-computer revolution of the early 1990s was expected to usher in a great wave of simulations in management training and education (Curry & Moutinho, 1992). It was thought that using the computer for simulations was a good way to train people on the use of the computer (Curry & Moutinho, 1992). Simulations of the time used integrated spreadsheets to simulate a company, teaching the use of such applications (Rao, Stenger & Wu, 1992). Although the computer and information technology has made great differences in education, the great growth of the use of simulations has not happened.

Despite not developing into the dominant method in management education, simulations have found widespread use. Some contemporary training situations are in health care infomatics (Atkinson, Eldabi, Paul & Pouloudi, 2001), e-commerce (Parker & Swatman, 2001) and accounting and restaurant operations (Fawcett, 1996). There are manufacturing plant simulations or 'virtual factories' that simulate the production floor and are used by manufacturing engineering as well as management majors (Dessouky, Verma, Bailey & Rickel, 2001). The pervasiveness of information technology has brought us to the point where it is being used to simulate knowledge management (Chua, 2005). At the societal level there are simulations that model the complex relationships between government, business and non-governmental agencies (Doh, 2004). Modern users of general management simulations have found various behavior patterns playing themselves out in the game, such as both incremental adaptation and escalation of commitment (Lant & Hurley, 1999). Adaptation is a desired response, and as such some advise a continuously evolving business game (Lainema, 2005). To provide benchmarks for decisions and outcomes some simulations use real businesses to set the parameters and relationships, then compare the dynamics of the game with the actual business (Gomes, de Oliveira Lisboa & Yasin, 2001).

In the next section we will report student feedback about participating in a management simulation in a capstone business policy and strategy course. That will be followed by a discussion of the adjustments made as a result of the feedback and suggestions for future research.

FEEDBACK FROM STUDENTS

We surveyed and held open discussions with 54 students enrolled in a capstone business policy and strategy course. The course is required for all majors and concentrations in the college of business. Students worked in groups of four. In the first part of the survey they were asked about learning objectives, learning effectiveness and how the simulation compares to other methods. Later in the survey they were given an opportunity to list what they liked and disliked about the simulation. Table 1 reports the findings from the first part of the survey.

TABLE 1
Students Perceptions of the Objectives and Effectiveness of the Simulation

	Learning Objective		Learning Effectiveness		Comp. to Cases/Exercises	
	mean	sd	mean	sd	mean	sd
Accounting Principles	2.96	1.11	2.96	0.93	3.02	1.20
Business Relationships	1.98	1.10	2.21	0.95	2.23	0.91
Systems View	2.47	1.19	2.38	2.96	2.32	0.94
Decision Making	1.45	0.80	1.81	0.83	1.89	1.01
Economic Models	2.17	0.91	2.23	0.91	2.43	1.05
Policy Formation	2.70	1.15	2.42	1.03	2.47	1.10
Strategy Development	1.58	0.84	1.74	0.90	1.89	1.01
Financial Management	1.87	0.98	2.17	1.05	2.51	1.25
Group Dynamics	1.87	1.00	2.02	0.99	2.15	1.06
Use of the Computer	2.87	1.46	2.57	1.28	2.47	1.15

Learning Objective - 1 = Primary Purpose, 5 = Not a Purpose
Learning Effectiveness - 1 = Very Well, 5 = Very Poorly
Comp. to Cases/Exercises - 1 = Simulation Superior. 5 = Case Studies/ Exercises Superior

The student responses were generally consistent across the categories. The top responses were Decision Making, Strategy Development, Group Dynamics and Financial Management. The bottom responses were Accounting Principles, Policy Formulation and the Use of the Computer. The instructor was also asked to complete the survey. His answers agreed with Strategy and Group Dynamics as primary objectives and being effectively learned, formulation as a primary goal, but differed in comparison of methods. The students thought the simulation was superior to case studies/exercises in teaching and illustrating Decision Making, whereas the instructor thought that case studies/exercises were better.

Two open ended questions were asked. The first was "What did you like about the simulation?". The second op was "What did you dislike about the simulation?". There were four main responses for each question:

What students liked:

- *The students liked how similar it is to managing & running a real company, that it showed a lot of information and how it interrelates*
- *The students found it interesting to see how decisions impacted the outcome, and having the opportunity to make adjustments and learn from round to round*
- *They enjoyed competing against other teams*
- *They though it enabled real team work, and welcomed the opportunity to learn from different students*

What students disliked:

- *It was very hard to understand at first and took several rounds to get the feel for it. They wished there was more preparation or practice rounds.*
- *The output had too much information to handle all at once. The results were confusing.*
- *They were concerned with how heavily their grade depended on it (30%)*
- *Several students mentioned having problems with a bad team member*

These results were corroborated and expanded upon in group discussions with the students after the simulation was over. The comments were not surprising to the instructor.

CONCLUSIONS

The results of the investigation were not surprising, but were informative. The use of a simulation is perceived by the students as a positive learning experience for several reasons. The students reported to have learned about decision making, strategy development and group dynamics – all positive learning outcomes. They also experienced complex decision making, saw the effects of their decisions and worked with other students. Again these are positive outcomes.

The primary student 'dislikes' that the instructor was concerned with were lackof preparation and problematic team members. Upon reflection, the instructor has changed the preparation for the game with several additional demonstrations and practice rounds. He also changed the structure of the group participation feedback mechanisms. The survey and discussions will be held again at the end of the semester to see if the current changes were adequate and to guide further adjustments.

In the future we intend to compare our results with the results of a larger scale survey done about 20 years ago using a very similar survey. We may also wish to investigate the effects of different team compositions, and administrative changes on student perceptions of learning, and perhaps augment the study with objective learning evaluations.

REFERENCES (available on request)

TEACHING METHODOLOGIES IN THE CLASSROOM: A STUDY OF STUDENT PREFERENCES

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ABSTRACT

Student success will often depend upon student ability, motivation, and classroom performance. There are uncontrollable factors such as class size, and factors that may be somewhat controllable such as course delivery method. Student success may also be dependent upon a number of other factors outside the control of the student but rather controlled by the faculty member. This might include whether the instructor determines course grades using tests and quizzes, or research papers and projects. This paper examined various factors affecting student success in business courses and provides results of a survey of student preferences with regard to graded assignments.

Perhaps the most interesting finding of this study is that students and faculty members have differing opinions on the types of graded assignments that provide students with the best learning opportunity. While students recognize the value of developing communication skills, faculty members often assign test essay questions, research papers, and case studies instead of business plan development. Findings from this study might be useful to college instructors and administrators in measuring outcomes assessment to determine educational quality for accreditation purposes.

TOWARD A STAKEHOLDER-FOCUSED CURRICULUM: AN EXAMINATION OF THE INDUSTRIAL DISTRIBUTION PROGRAM AT THE UNIVERSITY OF NEBRASKA AT KEARNEY

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ABSTRACT

Providing students with an education that employers view as relevant and valuable is an ever-increasing challenge for universities. The current study addresses 33 competencies deemed important by the U.S. Department of Labor for success in technical sales. Both faculty and employers of graduates from the Industrial Distribution program at the University of Nebraska at Kearney are surveyed to determine the level of importance each competency is for those wishing to gain employment and also advance in their careers. Results indicate a high level of congruency between faculty and employer opinions. However, some important differences did emerge between the two groups. These results are presented and discussed.

LITERATURE REVIEW

Ever changing demands and shifting opportunities characterize the 21st century workplace. Organizations are fast changing, as is the nature of work within them due to rapid globalization, innovation, and technology. As such, the value of attracting and retaining extremely talented employees is immeasurable. Organizations desire employees who are willing to learn and learn fast, those who can readily transfer their knowledge and skills into the workplace, and those who are willing to earn and re-earn their job every day through performance-based measures.

In response to the demands of the 21st century workplace, universities are not only being held accountable for validating the content of their courses through advisory boards and accrediting bodies, but they must also graduate students who can meet the ever changing needs of business and industry. The University of Luton has responded to this challenge on a university-wide basis and with a curriculum that embraces a varied range of disciplines in an attempt to develop students' skills alongside their subject knowledge to improve graduate employability (Atlay and Harris, 2000).

Dougherty, Knock, Sandas, and Aiken (2002) recognized that information technology holds the promise of increased productivity. However, rapidly evolving tools require that professionals are able to incorporate them into their careers effectively, which signals the need for IT curriculum development initiatives that help students develop the skills needed for this challenge.

One way to meet 21st century challenges is to involve stakeholders, such as employers in the process of developing or redeveloping university program curricula. Hesketh (2000) contends that the future recruitment intentions of employers fall against the backdrop of their perceptions of graduate quality and that the skill requirements of employers are clearly changing.

Even in smaller units such as one class versus an entire program, universities are seeking the advice of stakeholders other than just faculty members. For example, Anderson, Envick, and Roth (2003) surveyed entrepreneurs and financial advisors to determine which are most important to include in entrepreneurial finance courses. As far as the field of industrial distribution is concerned,

involving the help of external stakeholders is not new either. Purdue University implemented a networking partnership between students, faculty, and employers. This partnership includes special project opportunities, workshops, networking placement, faculty presentations, and conference book programs (Newton and Schmidt, 2003).

This paper aims to mirror the efforts made by other universities and programs to prepare students for the challenges of the 21st century workplace, but more specifically to prepare students for careers in technical sales. This is accomplished by analyzing the Industrial Distribution Program curriculum at the University of Nebraska at Kearney through the eyes of both faculty and employers.

METHODOLOGY

Ten faculty members who teach courses in the Industrial Distribution Program at the University of Nebraska at Kearney participated in the survey, along with employers, who actively recruit, provide internships and send representatives to speak to classes at the university. The employers that participated include Applied Industrial Technologies, Molex Incorporated, Crescent Electric Supply, Eaton Electrical, Ferguson Enterprises, Hub City Industrial Supply, Shelter Distribution, SCP Pool Corporation, Shelter Distribution Incorporated, and Pape`. All surveys distributed to both faculty and employers were returned, and all 20 were usable.

The instrument used for the study listed 33 competencies cited by the U.S. Department of Labor as important for success in technical sales (citation). Faculty members chose this instrument because the National Association of Industrial Technology, which is the accrediting body of the program, also recognizes the competencies listed.

The 33 competencies fit into seven categories of knowledge for persons in technical sales careers. These categories include: (1) Sales and Marketing; (2) Mathematics; (3) Economics and Accounting; (4) English Language; (5) Engineering and Technology; (6) Education and Training; and (7) Customer and Personal Service.

Participants used a 7-point Likert scale to determine which of the 33 competencies a graduate of the Industrial Distribution Program needs to both gain employment and advance in their career. The scale used is as follows: 1 = needed to be among the top performers in the field; 2 = needed to be extremely successful; 3 = needed to be very successful; 4 = undecided/unsure; 5 = needed to be moderately successful; 6 = needed to be somewhat successful; 7 = not needed at all.

RESULTS

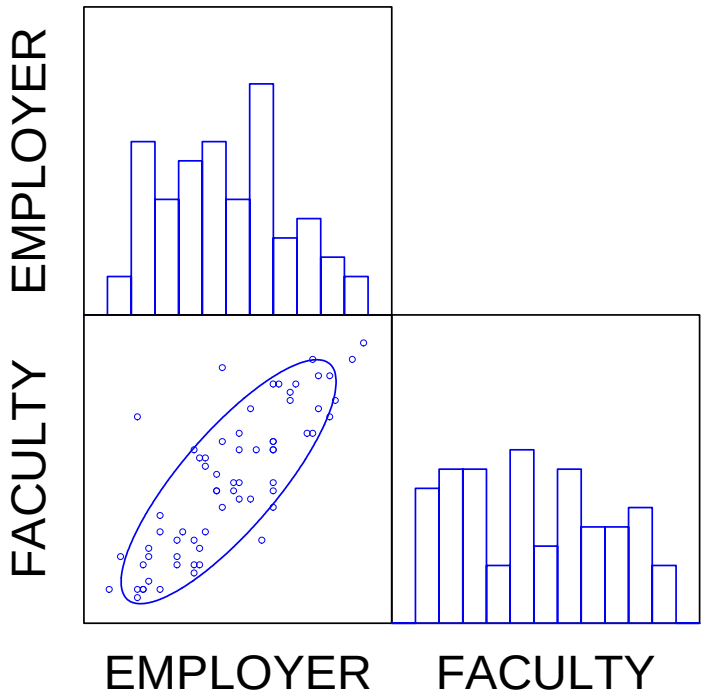
In the full version of this paper, all 33 competencies are presented in four separate tables, which include their rankings by employers to gain employment, rankings by faculty to gain employment, rankings by employers for career advancement, and rankings by faculty for career advancement. These tables illustrate that faculty opinions were much stronger according to the 7-point scale. For example, for gaining employment the lowest mean score provided by faculty on all 33 competencies was a 4.2, while employers provided a mean score of 4.3 or higher (meaning less need) for 19 of these competencies. Likewise, the lowest mean score provided by faculty for career advancement was a 3.5. Employers scored five competencies higher than 3.5, with one being a 5.4.

In order to address the differences between how faculty and employers scored the competencies in both gaining employment and career advancement, a paired t-test was used to determine if this difference is statistically significant. Results indicate there is a significant difference [$t = 12.607$, $p < .01$ (see Table 1)].

TABLE 1: PAIRED T-TEST OF EMPLOYER VERSUS FACULTY RESPONSES	
Mean Employer	3.511
Mean Faculty	2.512
Mean Difference	0.998
95.00% CI	0.840-1.157
SD of Difference	0.643
t	12.607
df	65
p-value	0.00

This difference, however, does not necessarily indicate there is disagreement between the groups of raters. In order to determine the level of agreement, a correlation matrix was computed to measure the linear relationship between opinions of employers compared to the opinions of faculty. The result was a correlation coefficient of .82, indicating strong agreement on which competencies are more important relative to other competencies. The significant difference found from the paired t-test is a result of faculty opinions being significantly stronger than employer opinions, although in the same direction. Figure 1 illustrates the correlation scatterplot matrix.

FIGURE 1: CORRELATION SCATTERPLOT MATRIX OF EMPLOYER & FACULTY RESPONSES



With this level of agreement, it is essential to revisit the seven categories of knowledge and determine which ones appear to be more essential for curriculum development. The average mean scores of all competencies in each knowledge category were used from both employers and faculty

to determine a combined mean score and rank. The rankings for both gaining employment and career advancement are the same (See Table 2).

TABLE 2: OVERALL KNOWLEDGE CATEGORY RANKINGS

Rank	Knowledge Category	GE Mean	Needed to be. . .	CA Mean	Needed to be. . .
1	Customer & Personal Service	3.05	very successful	1.55	among top performers in the field
2	Sales and Marketing	3.12	very successful	1.71	among top performers in the field
3	Economics & Accounting	3.63	very successful	2.02	extremely successful
4	English Language	3.74	very successful	2.49	extremely successful
5	Engineering & Technology	3.77	very successful	2.55	extremely successful
6	Education & Training	4.20	undecided/unsure	2.73	extremely successful
7	Mathematics	4.22	undecided/unsure	3.10	very successful

DISCUSSION AND CONCLUSIONS

Not surprisingly, both faculty and employers rated each and every competency as more important for career advancement than for gaining employment. The relative change in the ratings between gaining employment and career advancement among specific competencies is what proves instructive. For example, employers gave the competency of "conducting training for individuals and groups" a 4.6 for gaining employment, but a 2.3 for career advancement. Likewise, "reading and understanding financial reports" received a score of 5.1 for gaining employment, but jumped to a 2.9 for career advancement. This competency received the largest change among faculty responses as well, moving from a 3.4 for gaining employment to a 1.4 for career advancement.

Another noteworthy change, according to faculty, is the competency of "writing effective sales proposals". This competency scored a 3.1 for gaining employment and a 1.3 for career advancement. Other changes are important to consider as well by comparing Table 1 with Table 3 and comparing Table 2 with Table 4.

Despite the high level of agreement between faculty and employers, it is imperative to examine where differences did occur. The competency of "writing professional business letters and memos" ranked first for gaining employment according to faculty with a score of 1.8. Employers, however, rated this competency much further down the list with a score of 4.1.

"Determining customer wants and needs" ranked first for both gaining employment and career advancement, according to employers. Faculty, however, ranked this competency seventh for gaining employment, although it moved into the second ranked spot for career advancement. Similarly, "promoting value-added services" ranked fourth for both gaining employment and career advancement, according to employers. For gaining employment, faculty ranked this competency ninth. It did, however, rise to the fourth ranked position for career advancement.

These differences, among others, should be the focal point for future discussions between faculty and employers. Determining the reasoning and opinions behind the scores provided by the two groups would prove quite valuable in understanding the requirements of a technical sales career in both gaining employment and career advancement. This deepened understanding could then be translated into further curriculum development, with the end result being graduates who are well prepared to meet the 21st century challenges of a career in the industrial distribution field.

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BLOGGING IN THE ONLINE CLASSROOM: EXPLORING STUDENT ATTITUDES TOWARD AN EMERGING TEACHING METHOD

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ABSTRACT

Blogging has become increasingly popular as an online form of communications. The proliferation of free sites, and the absence of editors and overseers have given people license to write what they will. Blogging is now emerging as a method of instruction, particularly in online courses. This study surveyed two online courses, one an undergraduate course and the other a graduate course. Students were generally in favor of blogging as a method of teaching, with graduate students exhibiting somewhat higher evaluations overall for the method. This exploratory study lends validity to the practice of using blogs in an online course as a means of teaching concepts, apart from more traditional methods such as lectures and case studies.

TRUMAN LEADERSHIP SCHOLAR PROGRAM: A CURRICULAR--CO-CURRICULAR APPROACH TO STUDENT LEADERSHIP DEVELOPMENT

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ABSTRACT

The large number of leadership development programs, seminars, and books on the topics of leadership and leadership development suggest a need for leadership development in many organizations. The university seems like a logical and convenient setting for students to learn and experience leadership, either through curricular and/or co-curricular activities.

The Truman (State University) Leadership Scholar Program (TLSP) seeks to combine curricular and co-curricular learning in a four-year experience. Several of the program objectives are:

1. *To help achieve Truman's mission to cultivate in students the "willingness and ability to exercise personal and intellectual leadership in his or her chosen field of endeavor".*
2. *To provide students with an opportunity to grow and develop as leaders through training, focused experiences, and service opportunities.*
3. *To prepare effective leaders for the roles and challenges they will face in the future.*

The Truman Leadership Scholar Program is scholarship-based. Annually, thirty-five to forty-five first-time freshman receive Truman Leadership Scholarships based on academic performance and the demonstration of leadership during their high school experience. Although the TLSP is a four-year experience, participants may opt out at the end of each year and still retain their scholarship by maintaining academic eligibility and fulfilling scholarship work-study hours each semester. The program proceeds as follows:

First Year: Participation in and completion of Franklin/Covey 7 Habits of Highly Effective People training.
Second Year: Fifty hours of community service under the direction of a community leader/mentor.
Third Year: Participation in and completion of Franklin/Covey 4 Roles of Leadership training and completion of a Private Victory project approved by the Truman Leadership Scholar Committee.
Fourth Year: Completion of a Public Victory project under the direction of a Truman mentor.

Those students who complete the Truman Leadership Scholar Program will be awarded the President's Distinguished Leader Recognition certificate and participate in a leadership banquet held to recognize the Truman Scholars and those who worked with them in completing the program.

LESSONS FROM THE ADVISEMENT PROCESS AT A MEDIUM-SIZED STATE UNIVERSITY

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ABSTRACT

Advisement plays an important role in student retention and timely degree completion. This paper describes many of the relevant processes that are in place at my university. I have been involved with the advisement process at various levels and in various capacities, which allows me to provide information about the interface between several constituencies involved in student advisement.

OVERVIEW

Once a student declares a major, (s)he is assigned a faculty advisor from that area. As such, I have been advising up to 100 students per semester by assisting in their course selection, etc., for the past few years. While in-person meetings are encouraged, time restrictions make it difficult to meet with each advisee. One acceptable alternative is e-mail correspondence since a record of the information that was exchanged is kept.

Typically, a student stays with the same advisor over the course of several semesters. This is not always possible, however, as the number of students (as well as sometimes the number of available advisors) fluctuates from one semester to the next.

THE TRAINING OF NEW ADVISORS

I am one of four faculty advisors who train new advisors at our university. Individual meetings with each new faculty advisor are held in which university procedures and regulations are discussed along with ethical and legal aspects of advising. Subsequently, hands-on training on the computer to access relevant information for advising takes place. Each new advisor also receives the current version of the faculty advisor handbook.

ADVISEMENT OF UNDECLARED STUDENTS

If students who have not yet declared a major are enrolled in First-Year seminar, they are advised by the instructor of that course. Undeclared students who are not currently taking First-Year Seminar are advised by the Advisement Center. Since the number of undeclared students is quite large, faculty advisors are typically asked to volunteer during the priority registration period. The advisement of undeclared students by the Advisement Center has led to following issue that needed to be addressed. The College of Business strictly enforces its academic retention policy. When a student is in violation of that policy, (s)he is afforded one semester of probation to rectify the existing problems. If the student is not successful in that endeavor, (s) he is dismissed from the College of Business and becomes and undeclared student. While such students are officially advised by the Advisement Center, they are strongly encouraged to work with the Associate Dean of the College of Business to plan their course selection, etc. I am currently assisting students in that capacity on an interim basis. We have also been able, in close cooperation with the admissions office, to establish the following procedure: If a student is dismissed from the College of Business, he admissions office notes in the student's records the name of the assigned advisor. If a student gets

readmitted to the College of Business, the previous advisor is then once again assigned to the student.

ADVISEMENT OF BUSINESS STUDENTS

If a business major is unable to meet with his/her assigned advisor, advisement within the college is available on a walk-in basis. While such a service is valuable to a number of students, we encourage business majors to see their assigned advisor since they have typically known them for a number of semesters and are familiar with their situation.

EXPERIENCES WITH A MENTORING PROGRAM FOR UNDERGRADUATE BUSINESS STUDENTS

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ABSTRACT

d in our College some time ago as a pilot program. This paper describes the processes that are in place and our experiences with them. After a general overview, I provide an evaluation of the program by discussing successful and successful aspects we experienced. Future extensions and recommendations are also included.

INTRODUCTION

The mentoring program in the Christos M. Cotsakos College of Business at William Paterson University started as a pilot program in the Fall 2004 semester. The mentoring committee that was founded consisted of several experienced business professionals, the Dean of the College, two additional College faculty members, and a student representative. The committee's first task was to draft a document that specifies what the mentoring program sets out to achieve, the expectations we have concerning mentor and mentee involvement, etc. After such a document had been established, mentors and mentees needed to be recruited.

IDENTIFYING PROGRAM PARTICIPANTS

In order to promote the new mentoring program among students, faculty members were informed about the pilot program and were asked to disseminate the information in their classes. In addition, we scheduled two "Professional Enrichment" (PE) activities. In our PE program, students attend eight or more PE events during the course of their career to earn partial credit for the course grade in our business core capstone course (see http://www.wpunj.edu/cob/COB_New/professionalenrichment/profenrich.htm for details). The PE information session concerning the mentoring program was led by the student member of the mentoring committee. In our experience, it was very helpful to have a fellow student convey the potential value of the program to his peers rather than a faculty member or business person.

In order to attract mentors to the program, the members of the mentoring committee (assisted by the Office of Alumni Relations) approached individuals whom they felt would be willing and able to be a successful mentor. In this context, the importance of networking and good connections should be stressed. In many instances, the business professionals on the mentoring committee were able to identify a mentor.

ESTABLISHING THE MENTOR-MENTEE RELATIONSHIPS

After interested students have been identified, they fill out a form regarding their major and concentration, desired career path, previous work experience, etc. Potential mentors also provide us with information about their educational and professional background. With this information, the mentoring committee attempts to make the best possible match between mentor and mentee (cp. Murray, 2001). The main criterion is a fit of career choice and interest, but geographical considerations also play a role. The reason for the latter is that, while e-mail and telephone contact

between mentor and mentee are encouraged, the expectation for a mentor-mentee relationship is a face-to-face meeting at least once a month.

MAINTAINING THE MENTOR-MENTEE RELATIONSHIPS

During the semester, the mentor-mentee relationships are allowed to proceed with relatively little intervention from the mentoring committee. However, we wanted to guard against the possibility of an unresponsive mentor (who may be too busy to reply to a mentee's requests despite the best intentions) or mentee (which would not reflect well on our university, which the student represents). Thus, committee members monitor a few relationships each by calling both the mentor and mentee on a roughly monthly basis. If such calls reveal a problem in a relationship, both sides, as applicable, are reminded of our expectations and the value of mentoring.

THE END-OF-YEAR RECEPTION

At the end of the academic year (and sometimes also in January), a reception is held for all mentors, mentees, and the members of the mentoring committee as a gesture of appreciation for their involvement with the program. Additionally, potential mentors and mentees who may consider becoming part of the program are invited. At the reception, current program participants (both mentors and mentees) give short presentation about the value of mentoring in general and positive individual experiences from the past year in particular.

THE END OF THE MENTOR-MENTEE RELATIONSHIPS

Over time, several of the established relationships have ended. The two main reason are the lack of time on the participants' part and the student's graduation. In individual cases, however, the mentor-mentee relationship continued on a less formal basis (and without involvement from the mentoring committee) after s a student's graduation.

WHAT WORKS?

The PE workshops are an effective tool to attract interested students. It was particularly helpful to have the student representative lead those sessions. The previously mentioned end-of-year reception has proven to be remarkably successful in recruiting new students (and to a lesser extent new mentors). Immediately after the reception, we are typically faced with the problem of having more students than available mentors so that a waiting "queue" becomes necessary.

We have been very fortunate in that our student representative has been very active and a wonderful ambassador for our program. Care must be taken in the selection of the representative since (s)he is the almost exclusive contact with potential mentees.

Similarly, businesspeople who serve on the mentoring committee must be committed to the program since it is a fairly involved, hands-on process that requires regular meetings to make new matches between mentors and mentees, discuss possible problems that were discovered in existing relationships, etc.

WHAT DOES NOT WORK?

The biggest obstacle we have faced has been the decrease in enthusiasm on some participants' part. On the part of the mentors, who are well-established and successful professionals, it was often—understandably—a lack of time (e.g., tax season for an accountant) that led to a gradual decrease in participation in the program. As far as the students were concerned, they

typically also cited a lack of time when a mentoring relationship deteriorated over time (typically roughly halfway through the semester when assignments become more difficult and time-consuming), which seems plausible especially since many of our students work part-time or even full-time jobs. However, the committee members felt that some students may not have fully understood the potential and possibilities of a successful relationship with an experienced mentor. The latter may be due to the fact that despite changes in recent years, still a fairly large share of our students are first-generation college students who may not fully grasp the importance of networking and the prominent role that a one-on-one relationship with an accomplished business professional can play in that process.

One of the drawbacks of having fewer mentors than mentees was and still is that the screening process for mentors is not particularly selective. While the overall experience has been overwhelmingly positive, we did receive occasional reports from students that a mentor viewed the assigned student more as an unpaid volunteer worker than a mentee.

FUTURE IMPROVEMENTS

We unfortunately encountered a few cases in which students who had been paired up with a mentor did not respond when the mentor attempted to establish contact with them. Given that we typically have more mentees than available mentors, a more stringent selection process could be implemented. One possibility may be to restrict student eligibility based on GPA. However, it does not appear that the success of the relationship is highly correlated with a student's GPA. A better approach may be to conduct a personal interview with students who express interest of becoming a mentee.

Additionally, attendance of PE workshops on business etiquette could be made mandatory for students who would like to enter the mentoring program.

Alternatively, more than one mentee could be assigned to a mentor to address the problem of a "queue" of students without a mentor. The committee has been reluctant, however, to implement such an approach. It was felt that a smaller number of good relationships is preferable to a larger number of mediocre relationships.

EXTENSIONS

For the future, it is planned to expand the mentoring program to include web-based e-mentoring. Mentors (and possibly other students) would be able to browse a directory of participating mentors. Based on their professional background, students could then select a mentor and fill out a form on the web in which they could pose a question they would like to have answered to the mentor who could reply via e-mail.

Additionally, there is a strategic plan in place to develop a student-to-student mentoring program (cp. Goodlad, 1998). More experienced students would be matched with students who have recently entered the College of Business. They could assist them with course selection, recommendations on internships, etc.

Another extension could involve our MBA program more. While several of our MBA alumni are mentors to undergraduate students, current MBA students have virtually not been included as mentors yet despite their, in many cases, fairly extensive experience in the business world. Additionally, it may be a worthwhile idea to have MBA students as mentees, i.e., assign experienced individuals to them to guide them with career choices, etc.

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SYSTEMS MODEL APPROACH TO DESIGNING TRAINING AND LEARNING: THE CASE OF MENTORING AT ERNST & YOUNG

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ABSTRACT

The training literature affirms a model which views training and development as a system. Most references to such a model indicate that it is a multi-step model which begins with a needs assessment step and ends with a training evaluation step. However, both employers and students struggle with understanding and implementing the steps of the complete model. The case of the mentoring Ernst & Young provides an excellent illustration of training and development using all steps in the acknowledged model. This article identifies this acknowledged training and development model, applies the facts of the Ernst & Young example to the model, and examines implications in today's learning environment.

DIFFERENTIAL PERFORMANCES BETWEEN ONLINE LEARNERS AND OFFLINE LEARNERS ACROSS DIFFERENT TYPES OF TESTS

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INTRODUCTION

A considerable body of research on distance learning suggests that there is no significant difference in achievement levels between online learners and offline learners (E.G., The Institute for Higher Education Policy (1999), Chamberlin (2001) and Yin et. al. (2002)). However, most of these previous studies examined the course grade but not the components of the course grade such as multiple choice questions, assignments, problems, etc. Besides that, online learners may perform differently than offline learners due to differences between online and off line instructions in student perception, available learning tools, use of the learning tools, and other technical issues. (See Barker (2002), Beard et. al. (2002), Dunbar (2004), Kendall (2001), Lightner et. al. (2001), Perreault et. al. (2002), Schulman et. al. (1999), Schwartzman et. al. (2002), and Woods (2002)) Thus, the purpose of this study is to examine student performances in those course grade components (multiple choice and non-multiple choice questions, in particular) to see if there are any differences in their performances between on-line learners and off line learners.

The remainder of the paper is organized as follows: first, sample data descriptions are discussed the next section, which is followed by discussions on data analyses and their results. Concluding remarks are made in the final section.

SAMPLE DESCRIPTIONS

Sample data are collected from students who took undergraduate accounting courses offered through online as well as offline at California State University-San Bernardino during the three years from fall 2003 to spring 2005. Both online and offline classes were taught by the same instructor who used Blackboard as a web-based learning assistance tool. The same textbook was used and the same lecture notes for each chapter developed by the instructor were provided to students in both classes. Exams for on line and off line classes are developed by the instructor in such a way that exams for on line classes are equivalent to those for off line classes. All exams were proctored and graded by the same instructor.

Student performance data such as test scores and GPA are collected from the course instructor or the university database, while student demographic data such as gender, age, and working hours are from survey questionnaires to the student sample. After deleting questionnaires with insufficient responses, data contained in 119 student questionnaires are analyzed in this study.

There are no significant difference in gender compositions, marital status, GPA, the number of courses taking, and class standing between on line learners and their matching off line learners. On the other hand, significant differences exist in age, commuting distance, and working hours between on line learners and off line learners. Thus, it is necessary to control for the effect of these differential factors between the two learner groups on student performances to examine the differential student performances between on line learners and off line learners in this study.

ANALYSIS AND RESULTS

Mean Difference Comparisons.

Preliminary comparisons between online learners and offline learners in their performances in multiple-choice questions and non-multiple choice questions are made. There are significant differences in total scores and multiple choice scores but not in non-multiple choice scores between online learners and offline learners.

As suggested in many previous studies, student performances can be affected by student characteristics such as gender, age, educational experience, and motivation. (E.G., Sullivan (2001), Younger (1999)) Thus, effect of these characteristics on student performances should be controlled for to see the online versus offline difference in the performance. First, comparative static analyses where each of these student characteristics is controlled at a time.

In order to control the effect of GPA, all sample students are divided into two subgroups: i.e., LOW GPA and HIGH GPA. There are significant differences in total scores between online learners and offline learners in LOW GPA group, while no significant differences between online learners and offline learners in HIGH GPA group. Offline learners with low GPA do significantly better than online learners with low GPA by on average of 9.461 points, which is statistically significant at 1%. Offline learners in both LOW GPA and HIGH GPA groups earn higher points in multiple choices than online learners by on average 5.583 points in LOW GPA and 2.207 points in HIGH GPA, which are statistically significant at 1% and 10 %, respectively. However, there are no significant differences in non-multiple choice scores between online and offline learners.

To control for the effect of gender on performances, sample students are divided into female group and male group. There are no significant differences in total scores, multiple choice scores, and non-multiple choice scores between online learners and offline learners in female group as well as male group.

Comparisons between online learners and offline learners after controlling for the age effect are made. Sample students are classified as young if their ages are lower than the sample mean age, or classified as old. Old offline learners earn higher total scores, multiple choice scores, and non-multiple choice scores than old online learners by on average of 10.5972 points, 4.618 points, and 5.4525 points, respectively, all of which are statistically significant at 10%. However, there are no significant differences in any scores between young online learners and young offline learners.

Comparisons between online learners and offline learners after controlling for the effect of working hours are made. Sample students are classified as short working if they work less than the sample mean working hours, or classified as long working. There are no significant differences in any scores between online learners and offline learners in both short working and long working groups.

Regression Analyses.

Coefficients of correlations between influencing factors on student performances are computed to control for the interaction effect of those related factors. There is a significant positive correlation between working hours and commuting distance. Age, commuting distance, and working hours have significant positive correlations with online-offline identifier, indicating that online learners are older, live further away from the campus, and work longer hours. Thus, product terms of these interrelated factors are included in the following regression model to control for their interaction effects on student performances (GPA in not included as an independent variable in the regression model because there is no significant difference in GPA between online learners and offline learners as shown in Table 1).

$$\text{Scores} = \alpha_0 + \alpha_1 \text{ Gender} + \alpha_2 \text{ Age} + \alpha_3 \text{ Distance} + \alpha_4 \text{ Hour} + \alpha_5 \text{ On-Off} + \alpha_6 \text{ Distance*Hour} + \alpha_7 \text{ On-Off *Age} + \alpha_8 \text{ On-Off *Distance} + \alpha_9 \text{ On-Off *Hour} + \varepsilon \quad (1)$$

Where Scores = total score, multiple choice scores, or non-multiple choice scores,
Distance = the distance from a student's residence to the campus,
Hour = the number of working hours,
On-Off = 0 if offline or 1,
α_i = the partial regression coefficients of variable 'i',
ε = the error term.

The regression coefficients of On-Off are -0.616, -0.508, and -0.639 for total scores, multiple-choice scores, and non-multiple choice scores, respectively, all of which are not statistically significant. These results indicate that there are no significant differences in total scores, multiple scores, and non-multiple scores between online learners and offline learners.

Mann-Whitney Test

To mitigate the problem of skewness and outliers in Scores, a non-parametric method called Mann-Whitney test is conducted for the performance difference between online learners and offline learners. Z-values are -0.881, -1.343, and –0.332 for total scores, multiple scores, and non-multiple scores, respectively, all of which are not statistically significant at 10%. This confirms that there are no significant differences in total scores, multiple scores, and non-multiple scores between online learners and offline learners, again.

In sum, although some comparative static analyses on mean differences show significant differences total scores and multiple choice scores between online learners and offline learners, those differences disappear when all influencing factors of student performances are examined, simultaneously. Thus, the results in this study suggest that there are no significant differences in testing performances between online learners and offline learners, which is robust across different performance measures and testing methodologies.

CONCLUSIONS

Student performances in multiple choice and non-multiple choice questions are examined to see if there is any difference in the performance between on-line learners and off line learners in this study. Academic and demographic data of 119 students who took undergraduate accounting courses offered through online as well as offline at California State University-San Bernardino during a three-year period extending from fall 2003 to spring 2005 are examined. Overall, results from the analyses suggest that there are no significant differences in testing performances such as total scores, multiple scores, and non-multiple choice scores between online learners and offline learners, which are robust across different performance measures and testing methodologies.

* References will be available upon requests.

GENDER DIFFERENCES IN TEACHING EFFECTIVENESS RATINGS OF FACULTY

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ABSTRACT

This paper examines the role of gender and it's influence on the ratings of faculty teaching effectiveness. The study recorded professor effectiveness ratings for 930 undergraduate students consisting of 472 females and 458 males. Gender differences are examined using an integrated model for student rating behavior. Theories of motivation, grade leniency/stringency, and construct validity have been integrated into a structural equation model to determine the role each of the competing theories plays. Previous research generally treated these theories independently. However, recent investigations have shown that these theories operate in concert with one another. Our results reveal several gender differences. Females consistently rate faculty effectiveness higher than males. In addition, females seem to exhibit lower academic expectations than males. These results, in conjunction with previous studies, continue to show that significant bias exists in student ratings of faculty teaching effectiveness.

LITERATURE REVIEW

Many studies have been conducted to study the various factors that influence student ratings of professor effectiveness. Those that have focused on gender differences have revealed inconsistencies related to faculty evaluations. Some studies have shown higher ratings for instructors by females, though in some instances same sex preferences were found (Ferber & Huber, 1975, Tieman & Rankin-Ullock, 1985). Others studies have shown little or no gender interactions (Elmore & LaPoint 1974, 1975, Wilson & Doyle 1976). Hancock, Shannon & Trentham (1993) considered gender and college disciplines (human sciences, liberal arts, etc) and found no uniform patterns. They did find female students rated instructors higher than did males. Fernandez (1997) reviewed the literature and concluded that gender differences were minimal with regard to rating of faculty. His own study supported these conclusions, stating "…that the effect of student and faculty gender on teaching quality assessment is slight to non-existent".

Other factors also impact teaching evaluations. Academic success expectancy has been studied and found that there were small gender differences with females expectancy slightly less than males (Gigliotti & Seacrest, 1988). The effects of motivation on professor ratings are probably the most agreed upon systematic influence in student ratings of faculty. It has been demonstrated that student motivation, represented by student interest and course type (elective/required), plays a significant role in student ratings of professor effectiveness (Howard & Maxwell, 1980; Hoyt 1973; Marsh, 1984; Marsh & Duncan, 1992). Howard and Maxwell (1980, 1982) modeled the relationship between student motivation, student learning, expected grades, and student satisfaction with the instructor and field of study. The authors conclude that student motivation drives the correlation between grades and student satisfaction with the instructor. Using path analysis, Marsh (1984) also concluded that prior subject interest had a stronger impact on student ratings of various professor effectiveness characteristics than did grades. Additionally, simple classifications (required versus elective) and expanded categories of course type have been found to be significantly

correlated with ratings of professor effectiveness (Aleamoni, 1981; Centra, 1993; Feldman, 1978; Marsh & Dunkin, 1992).

Construct validity theory proposes that student ratings reflect student learning and, therefore, measure professor teaching effectiveness. Many studies have provided the foundation for validity theory (Cashin 1988; Feldman 1989; Howard, Conway, & Maxwell 1985; Marsh 1984; Marsh & Duncan 1992). Using SEM, Greenwald and Gilmore (1997a&b) found support for grade leniency theory by suggesting that only grade leniency allows for a negative workload→grade relationship. This relationship is explained by students' willingness to work harder in order to avoid very low grades. This negative relationship between workload and grades has been observed in other studies (Marsh, 1980). In an effort to integrate the competing theories, SEM analysis was conducted Hatfield and Kohn, 2004, which confirmed the presence of all the competing theories and their interactions.

HYPOTHESES

Based on the literature and the findings of several studies, we propose that there are differences in the way male and female students rate faculty.

H_1: Female students rate faculty higher than male students.

Several theories have been offered in explanation of the positive relationship between grades and ratings of faculty (Greenwald & Gilmore, 1997a). Grade leniency, construct validity and motivation all play a role in explaining student rating behavior of faculty. Hypotheses are developed for each of these theories. While these theories have been studied, the effect of gender has not been studied when all three theories are present simultaneously.

Grade Leniency/Stringency. This theory suggests praise induces liking for the individual giving the praise which translates in to higher ratings for higher grades (Aronson & Linder, 1965; Hatfield & Kohn, 2003). Further, Greenwald and Gilmore (1997a) suggest that there is a negative relationship (grade stringency) between students working hard and expected grades. These premises suggest the following hypotheses:

H_2: The higher the expected grade, the higher the professor effectiveness rating.
H_3: The higher the student effort (worked harder), the lower the expected grade.

Construct Validity. This theory suggests that high instructional quality induces high student learning, which results in higher grades and higher professor ratings (Cashin & Downey, 1992; Cohen, 1981; Feldman, 1976 & 1989; Marsh, 1984). Therefore, the following hypotheses are provided to evaluate construct validity:

H_4: The higher the student learning, the higher the professor effectiveness rating.
H_5: The higher the student learning, the higher the expected grade.
H_6: The higher the professor effectiveness rating, the higher the student learning.
H_7: The higher the worked hard rating, the higher the student learning.
H_8: Professor effectiveness rating and expected grades are not causally related.

Student Motivation. This theory suggests that student motivation positively affects both grades and ratings of faculty, through student learning, thereby resulting in a positive correlation between grades and ratings of faculty (Aleamoni, 1981; Braskamp & Ory, 1994; Centra, 1993; Kohn & Hatfield, 2001; Marsh, 1984; Marsh & Dunkin, 1992). Student motivation results in more student learning and appreciation for the course and instructor, which leads to higher grades and higher

professor effectiveness ratings. Researchers have identified two measures of student motivation: student interest in the subject matter of the rated course and course type (major or elective, versus required or core course). Student interest is a course-specific measure, whereas course type is a general measure. The following hypotheses are designed to test the impact of student motivation in student rating behavior:

H_9: The higher the student interest, the higher the student learning.
H_{10}: Lack of choice in course (required or core courses) results in lower student learning.
H_{11}: The higher the student learning, the higher the expected grade.
H_{12}: The higher the student learning, the higher the professor effectiveness rating.
H_{13}: Professor effectiveness rating and expected grades are not causally related.

RESEARCH METHODS

The student rating survey contained eight items, which students rated on a six-point Likert scale: (1) strongly agree, (2) agree, (3), slightly agree, (4) slightly disagree, (5) disagree, (6) strongly disagree. The first six items were designed to examine professor effectiveness, with the sixth item being a global item. Student learning was assessed by item 7 and course specific student interest by item 8.

1. The course requirements, including grading system, were explained at the beginning of the semester.
2. The professor provides feedback on exams and assignments.
3. The professor is willing to answer questions and assist students upon request.
4. The professor uses examples and practical applications in class, which aid in my understanding of the material.
5. The professor encourages students to analyze, interpret, and apply concepts.
6. The professor was effective teaching this course.
7. I learned a significant amount in this course
8. I am interested in the subject matter of this course

These items were selected based on past research, which suggests the desirability of global items that address professor effectiveness (#6) and student learning (#7) factors, and the need to control for student interest (#8) (Cashin, 1995). Items one thru five address commonly used dimensions of professor effectiveness in student rating research (Braskamp & Ory, 1994; Cashin, 1995; Centra, 1993; Feldman, 1989; Marsh, 1991). Students completed a student data sheet that contained demographic items, two grade-related items, and one general student motivation item: (1) The grade I expect to achieve in this course, (2) I worked harder in this course than in most of my other courses, and (3) course type. These items reflect commonly used measures in testing for grade leniency and motivation effects on student ratings of faculty (Greenwald & Gilmore, 1997a&b; Howard & Maxwell, 1980; Marsh, 1984).

SAMPLE AND PROCEDURES

Data were collected from students and professors in the three colleges (business, arts and science, and education) at Shippensburg University at the end of the first semester of the 1997-1998 academic year. Nine hundred and thirty students (472 females and 458 males) and 45 professors were included in the sample, with the largest percentage (51) of faculty in Arts and Sciences, and equal percentages in Business and Education. The largest percentage (36) of students were seniors,

followed by sophomores at 19 percent, juniors at 18 percent, freshmen at 14 percent, and graduate at 13 percent.

ANALYSIS AND RESULTS

Descriptive statistics (means, standard deviations, and correlations) for all the variables used in this study are available upon request. The professor effectiveness dependent variable is a composite measure, developed by averaging the ratings of the six professor effectiveness items. The reliability coefficient, alpha, for the composite professor effectiveness measure is 0.84. The hypotheses will be tested on the within-class data using structural equation modeling (SEM) and the Amos 5.0 modeling software. While there are many goodness-of-fit statistics in SEM, this study will report three of the most popular measures (CFI, NFI, Chi-square/df), with Comparative Fit Index (CFI) being the primary fit-statistic used in this study. Path coefficients are tested for significance using Critical Ratios (CR). Amos 5.0 reports both the CR's and the P values for each path so that level significance can be determined.

Finally, comparisons will be made among the entire male and female sample, male only, and female only groups for professor effectiveness rating behavior. Average scores will be tested to see if there are differences among the groups using a difference of means test.

NEW PERSPECTIVES ON STUDENT RATINGS

A comparison was performed to contrast average professor effectiveness rating scores among male and females combined, females only, and males only. Tables 1 & 2 (available upon request) contain the results of these analyses. A test for the difference of means was performed (assuming unequal variances) and the only highly significant difference that was found ($Z = 3.453$, $P < .000$) was between Females only and Males only. Thus H_1 is supported.

One of the problems with testing each of the above theories in isolation from each other is that intervening and moderating effects on the predicted relationships are not taken into account. Such effects may suppress or reinforce the predicted relationships. Thus, to accurately assess the presence of the theorized relationships, all the variables of interest need to be included in the same model. This section will integrate the findings predicted by the various theories, using structural equation modeling. Following similar methodology of Hatfield and Kohn 2004, all of the predicted direct relationships proposed in the grade leniency/stringency, construct validity, and motivation theories were used to construct integrated structural models for males and females combined, males only, and females only. The results of the analysis of these models are presented in Figure 1 (available upon request). Analysis of the model reveals that the fit for all three models was very good (CFI = .94 for all 3 models) and resulted in R^2 s of .35 (M & F), .41 (F), and .28 (M) for professor effectiveness. However, several path coefficients were not significant. For each model, removal of these paths was evaluated by iteratively removing the path with the highest P value (> .05), re-running the model with the path deleted, and then inspecting the P values of the remaining paths for those > .05.

As a result of these procedures, both Course Type → Student Learning (Motivation H_9) and Professor Effectiveness → Student Learning (Construct Validity H_5) were deleted from all three models (M & F, M, F). In addition, Worked Harder → Student Learning (Construct Validity H6) was deleted from the female model. These results are presented in the right hand column of Figure 1. All paths of the final models are significant, the fit is very good: all Chi square/df ratios are less than 3, CFI = 1.00 (F) and .999 (M & F, M)), and R^2 s are .35 (M & F), .41 (F) and .29 (M). While the R^2 s of the final models remained at their original levels, the fit indices of both models improved significantly. All three of these R^2 values are much higher than usually reported in many studies.

In addition, there is a high degree of consistency in the structural nature of both models with only Worked Harder → Student Learning linkage being omitted from the female only model.

Thus, 9 of the original 12 hypotheses were strongly supported, lending considerable support to the three theories of student rating behavior, regardless of gender. Interestingly, both grade leniency (H_1) and grade stringency (H_2) are supported. While grade leniency is commonly understood and generally accepted, grade stringency (negative workload, expected grade relationship) has been rarely observed (Gilmore and Greenwald – 1997a & b). In this analysis, it is not only observed in the combined sample of males and females but in both sub-groups of male only and females only. In all final models, the Professor Effectiveness → Student Learning (H_5) was removed. This hypothesis is part of Construct Validity theory and may indicate that the feedback loop between student learning and ratings of professor effectiveness may not be as well defined as assumed. A possible explanation for this weakness is that higher effectiveness ratings may not be a good measure of teaching ability and thus does not lead to greater student learning.

Although found in other studies, the Course Type (H9) variable was dropped from all final models. It is generally assumed that students are more motivated in electives or courses in their major and less so in required courses. This facet of motivational theory then leads to higher professor effectiveness ratings. Our results do not indicate this to be so. Course Type is an indirect effect, influencing student learning which, in turn, effects professor effectiveness ratings. In an integrated model, Student Interest has a major impact (path coefficient - .70 (M&F), .81(F) and .64(M)), eliminating the role of Course Type component of Motivation theory.

CONCLUSIONS

Student-rating behavior is a complex phenomenon. Using an integrated approach based on SEM analysis, we have found surprisingly consistent results among all the models. Except for the removal of one path for females (Worked Harder → Student Learning, H_6, Construct Validity), the three models are identical. All exhibit the identical simultaneous effects of Construct validity, Grade leniency and Stringency, and Motivational theories. All models fit the data very well and have much higher coefficients of determinations than previously reported. These high values continue to lend support for the significant bias that exists in rating of professor effectiveness that continues to be ignored by many schools. However, it was found that females consistently rate professor effectiveness significantly higher than males. Finally, females experience the negative workload expected grade effect to a much higher degree than males. Some studies have found that females have lower expectancy of success (Gigliotti and Seacrest 1988). The results of our study tend to support these findings. Faced with a difficult course, females are less likely to have the confidence in themselves and thus expect a lower grade though they will continue to work harder.

This study found bias in student ratings of faculty. In order to more accurately evaluate professor effectiveness, administrators and faculty need to control for, or at least acknowledge, the complexity of student rating behavior.

SELECTED REFERENCES (complete listing furnished upon request)

A WELL-ROUNDED STUDENT CURRICULUM– DO THEY (OR WE) GET IT?

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ABSTRACT

This paper explores the conflict between employers' and students' perceptions regarding the need for a well-rounded education. Although a college education does include a balanced curriculum, students are still entering the work force without the requisite broad-based knowledge. To determine the cause of this dichotomy, a study of undergraduate students and their perceptions regarding the desirability of a well-rounded collegiate education was conducted in 2005-2006. The results of the study are detailed in this paper explaining a wide disconnect with how unimportant students consider courses outside their majors. Due to the small size of the survey groups, plans for further studies are planned to permit a broader extrapolation of the findings.

USING A MARKETING APPROACH TO IMPROVE RECRUITMENT RETENTION OF AFRICAN AMERICAN STUDENTS IN A BBA PROGRAM

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ABSTRACT

In an era of dynamic challenges facing business education in the USA, one challenge stands out prominently. That challenge is the retention of students. As the USA population becomes more diverse, college age students are becoming more diverse. This paper examines some of the research on the recruitment and retention of African American students. In particular, one university's experience is analyzed in how it followed a broad marketing plan to recruit and retain African Americans in its BBA programs.

REVIEWING AN INTEGRATED MBA CORE COURSE

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ABSTRACT

A team of educators at Northern Arizona University redesigned its MBA program to be team taught, functionally integrated, cross-disciplinary, more rigorous and outcome-oriented. In this paper we briefly describe these design and implementation efforts, and provide more detail by focusing on one integrated MBA core course: Individuals, Teams, and Careers, to illustrate lessons learned. Course content and delivery are presented as well as its multiple foci and outcome orientation. We hope others will benefit from our response to the dramatically changing environment of business education.

DETERMINING FACULTY ATTITUDES TOWARD ASSESSMENT AS PART OF AN ASSESSMENT AUDIT

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ABSTRACT

As part of an assessment audit prior to a college's restructuring of its assessment practices, the authors developed and used an attitudinal survey to gauge faculty perceptions about assessment. If faculty buy-in is an important factor in successful assessment efforts, knowing faculty attitudes before a change is attempted would appear to be a prudent step. Knowing the potential resistance can also assist assessment leaders to modify their methods, thereby helping to achieve a more successful change effort.

Analyses of the survey results indicate that among our faculty there is a relationship between attitudes toward assessment and both willingness to learn about assessment and to participate in assessment activities. The results also suggest that, in any initial training on assessment, the perceived value of assessment in improving educational outcomes should be stressed.

The authors recommend, as part of an overall assessment audit, using a scale such as the one developed for this study before an assessment change effort is attempted.

INTRODUCTION AND BACKGROUND

Assessment is currently generating a "surge of interest" (Martell & Calderon, 2005, p. 2) in colleges and universities. Calls for accountability are coming from governmental bodies, the business community, and other concerned stakeholders. Because of heightened concerns about students' inability to compete in the global marketplace, educators are now being asked to prove, not "what they teach," but what students are learning. In addition, accrediting agencies such as The Association to Advance Collegiate Schools of Business (AACSB International) and regional accrediting agencies such as the Southern Association of Colleges and Schools (SACS) have recently instituted standards placing increased emphasis upon direct assessment of student learning (Mundhenk, 2005, p. 39).

Having been accustomed to using surveys and "what we taught" approaches to showing academic quality, our college now sees itself needing to develop a coherent assessment plan that focuses on what our students learn and to "close the assessment loop" in ways that we have not been doing in a systematic manner previously. Although the college has been gathering student performance and satisfaction survey data for years through ETS, EBI, and its own locally developed major-specific exams, a coherent, systematic plan focusing on direct assessment of student learning is still being formulated. While the college has gathered useful data through its instruments, the data had been used only sporadically to make curricular or program changes.

ASSESSMENT AUDITS

To discover where it currently stands with respect to assessment, a teaching institution can conduct what Walvoord (2004) calls an assessment audit. This involves a systematic review to

determine whether and to what degree (1) student learning outcomes have been established; (2) appropriate instruments have been created to measure the outcomes; (3) the measures are used to gather assessment data; and (4) improvements have been made as a result of the assessment data. An audit of this type could be performed at any stage of an organization's assessment efforts, but it is especially helpful when developing new ideas and approaches, as is the case with our college. We are likely at an early awareness stage of the new assessment paradigm being espoused by accrediting agencies such as AACSB. One indicator of this is the college's administration has just this year begun asking faculty to include assessment statements in their annual evaluation portfolios. In addition, only two faculty members indicated in a course survey that they used rubrics or scoring guides in their courses. Given the importance recent authors on assessment (Martell & Calderon, 2005; Suskie, 2004; Walvoord, 2004; Arter & McTighe, 2001) have placed on rubrics, that small number supports the notion that our college is in a relatively early stage of development.

To make the assessment audit recommended by Walvoord more useful in our situation, the authors decided to add a survey component to gauge faculty potential resistance to, and willingness to participate in, the new assessment plan currently being developed. If strong resistance were present, additional methods to encourage faculty commitment would probably need to be found.

METHODS AND MEASURES

This survey was administered to the entire business college of 24 full-time faculty of a medium-sized public university in the Southeastern US. Of the 24 members of this college, 12 responded, for a response rate of 50%. While this sample size is very small, this study is exploratory, and was intended not only to gather information about faculty resistance but also to test the survey instrument and help in the development of initial hypotheses for use in larger scale testing.

As this area is largely un-researched, we developed our own scale to measure attitudes toward assessment. A twenty-two-item questionnaire was developed, asking questions regarding the value or assessment, and related topics, such as difficulty of assessment, time required to conduct assessment, and willingness to conduct course-embedded measures. The respondents were asked to rank their responses on a Likert scale, with *5 = Strongly Agree* and *1 = Strongly Disagree*.

A correlational analysis of the collected data indicated that these questions clustered into two subscales. The first, a three-item measure, we have titled "value of assessment." This subscale measures the degree to which respondents believed that assessment could be used to improve course quality and program outcomes. The second scale, consisting of five items, is the "resistance to assessment" scale. This scale measures the degree to which respondents believe that assessment is too time consuming, is a hidden form of faculty evaluation, or is useful only for accreditation purposes. The internal reliabilities of each of these scales was measured using Cronbach's alpha, and were well above the .70 considered acceptable for social science research (Nunnally, 1978). Cronbach's alpha's for each scale, as well as summary statistics, are reported in table 1.

Table 1
Summary statistics and reliabilities for the assessment attitudes questionnaire

Scale	Min	max	mean	std dev.	Cronbach's alpha
Value of assessment	2.0	4.75	3.93	0.85	.897
Resistance to assessment	1.0	2.80	2.44	8.82	.825

In addition to the measurement of attitudes toward assessment, we measured a number of behavioral variables and behavioral intentions. Questions were asked regarding the current use of classroom assessment, willingness to learn more about assessment, willingness to help others with

assessment, and perceived value of an assessment center on campus. Each of these was measured with single item measures.

Furthermore, as a manipulation check, we included a question that is unrelated to assessment, in order to test for common method variance. This question did not correlate significantly with any other question on the survey, indicating that common method variance was not causing the other correlations that we found.

RESULTS

Preliminary analysis included creating a regression table to see which questions correlated with one another to determine whether there was an underlying attitude variable regarding assessment. The correlation instead indicated two separate underlying constructs, one relating to the value of assessment, and the other to resistance or negative attitudes toward assessment. As indicated in the previous section, the internal reliability of these two subscales was high.

We then conducted several ANOVAs to see whether these two attitude variables had any impact on a number of outcome variables, such as willingness to learn, current use of assessment, perceived value of an assessment center on campus, and willingness to help others. Two of these were significant for their overall model, using a .10 alpha. This level of significance was chosen due to the low statistical power involved in a sample size of 12.

We found significant relationships between attitudes toward assessment and the following two items: willingness to learn more about assessment, and willingness to help others with assessment. There was no relationship between attitudes toward assessment and current use of assessment or the perceived value of an assessment center. ANOVA results are reported in Table 2.

Table 2
ANOVA Analyses

Independent Variable	F	Sig
Willingness to learn	1.697	.001*
Willingness to help	4.144	.053*
Assessment center	0.792	.482
Use assessment	0.788	.484
Use rubrics	.260	.777

Coefficients for significant models

Independent Variable	Dependent Variables	t.	Sig
Willingness to learn			
	Value of assessment	3.556	.006*
	Resistance to assessment	.021	.984
Willingness to help			
	Value of assessment	1.248	.244
	Resistance to assessment	-0.749	.473

* significant at alpha=.10

The above results indicate that there is a relationship between attitudes toward assessment and both willingness to learn about assessment and to participate in assessment activities. At the

univariate level, there is a relationship between the perceived value of assessment and the willingness to learn more about it. The implications of these findings are discussed below.

DISCUSSION

The first finding of interest in our study was that attitudes toward assessment are a multidimensional construct. We found two dimensions, the perception of VALUE of assessment, and the RESISTANCE to assessment. While these two scales were not completely non-correlated, they were distinct enough to be clearly separate dimensions. Furthermore, while the value scale had a significant impact on willingness to learn about assessment, the resistance variable was not significant in any of our analyses. This further bolsters our contention that they are separate constructs.

The second finding of interest is that the value dimension of attitudes largely shapes faculty intentions regarding learning about assessment. High values on the resistance variable did not seem to block this effect, and faculty were willing to learn regardless of perceptions that assessment is too time consuming or difficult. This would suggest that, in any initial training on assessment, the perceived value of assessment in improving educational outcomes should be stressed. This would in turn maximize the likelihood that faculty would be willing to participate in further learning activities.

It is worth noting that none of the attitudes toward assessment had any impact on current use of assessment. We speculate that this is due to the relatively low current levels of knowledge about assessment among this specific faculty group. As mentioned earlier, assessment as it is currently being promoted by accrediting agencies such as AACSB is a recent focus of this specific college of business, and not much training has been provided to date. We also believe that lack of knowledge explains the non-significance of findings between assessment attitudes and the perceived value of an assessment center. Anecdotal evidence suggests that most faculty may not be clear about what an assessment center is.

Finally, at least for this specific faculty group, it is notable that the perceived value of assessment was high (mean = 3.93 out of 5) while the resistance to assessment was relatively low (mean =2.44 out of 5). This would indicate a relatively high likelihood that this group will participate in assessment learning activities, an important step in implementing a successful assessment program.

LIMITATIONS

Limitations of the current study are primarily sample-based. First, the sample consists of the faculty of only one university, and therefore may not reflect the full diversity of faculty attitudes. Second, the group surveyed (24 faculty) was small to begin with, and the group that responded (12) was an even smaller sample. This greatly limited the type of data analysis we could conduct. Furthermore, some relationships which may be small but significant may not have been found to be so in this study, due to lack of statistical power. Lastly, with a 50% response rate, there is a significant chance of self-selection bias. It is quite possible that those with the most negative attitudes failed to participate. In spite of these limitations, however, all of which have the effect of reducing statistical power, our findings of statistically significant relationships suggests that a larger study, with a more diverse sample, could produce stronger results.

SUGGESTIONS FOR FUTURE RESEARCH

One avenue for future research would be to replicate the current study across several universities. In addition, research could be conducted on samples of faculty with varying levels of

experience with assessment to see whether these relationships change as participants become involved in assessment. Another avenue would be to continue refining the survey instrument. The three-item scale which measures perceived value of assessment could be expanded and confirmatory factor analyses could be conducted to test the dimensions we found to assessment attitudes. We believe this area of research is valuable and fertile ground for future study. In addition, better understanding of the relationship between faculty attitudes and assessment-related intentions and behaviors could lead to greater faculty commitment, less resistance, and more effective assessment practices and programs.

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A CONFIRMATORY FACTOR ANALYSIS OF THE SCHOOL ADMINISTRATOR EFFICACY SCALE (SAES)

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SELF AND TEACHER EFFICACY

Research supports the claim that self-efficacy is a key construct in education. Self-efficacy is related to persistence, effort, and success on tasks (Bandura, 1986). Covington (1984) asserts that one's successes can lead to greater efforts to accomplish and persevere through difficult assignments. Thereby, achievement on tasks brings about self-efficacy, which in turn leads to greater success. In addition, self-efficacy can be increased through vicarious experiences (Bandura). That is, seeing the successful actions of others in their field can influence persons' beliefs that they too can master similar tasks (Bandura). Therefore, observing their mentors' effective performances can work to build up protégés' self-efficacy.

The importance of the efficacy construct has been made apparent as it relates to students and increasingly as it applies to teachers (e.g., Tschannen-Moran, Woolfolk-Hoy & Hoy, 1998). Henson, Kogan, and Vacha-Haase (2001) have concluded that several positive behaviors of teachers (e.g., ability to deal more effectively with failing students, persistence when difficulties arise) are linked to teacher efficacy, which positively impact student outcomes. Self-efficacy research, however, has mostly surrounded teachers and students, with little knowledge of the construct's use to understand the actions of school administrators, e.g., principals. Given the benefits of being efficacious (e.g., greater effort, persistence, and success), this construct may have extensive promise in the study of administrators who work in schools.

SCHOOL ADMINISTRATOR EFFICACY

More study is needed about the implications of efficacy on school administrators. For instance, do efficacious principals more effectively handle job stress, as well as relationships with staff, students, and parents? Do school administrators, who demonstrate high efficacy, employ more effective management practices, e.g., organizational planning, problem solving, and community building? These issues are critical in the face of the changing roles of school administrators and recent changes in their preparation.

Compared to the traditional approaches to school administrator preparation, five major shifts seem to have occurred for the current preparation of school administrators, including an emphasis on (a) interpersonal skills, (b) consensus development, (c) accountability processes, (d) integration of community and school needs and resources, and (e) policy development (NPBEA, 2002). It is understandable that communication has become a major focus since principals can spend up to 80 percent of their time on communicating with students, campus staff, parents, and the larger community (Green, 2001). The necessity to have school administrators who can demonstrate effective communication and social skills to address conflict resolution and consensus building situations in the school and larger community is supported by field research on principals (Kajs,

Decman, Cox, Willman, & Alaniz, 2002). Because of the added attention to state and national accountability mandates, e.g., No Child Left Behind (NCLB), the shift to have principals more thoroughly prepared in accountability processes is also understandable.

Research needs to be developed about how to determine efficacy levels in potential school administrators as well as in current ones. Two studies on principal efficacy include Dimmock and Hattie (1996) who found efficacy as a valued element for principals in a school restructuring process, and Smith, Guarino, Strom and Adams (2006) who concluded that the quality of teaching and learning is influenced by principal efficacy. Some principal efficacy measures that have been developed include the (1) Principal Self-Efficacy Survey (PSES) (Smith et al.); (2) Principal Sense of Efficacy Scale (PSES) (Tschannen-Moran & Gareis, 2004); (3) principal efficacy vignettes (Dimmock & Hattie); and (4) School Administrator Efficacy Scale (SAES) (McCollum, Kajs, & Minter, 2006). Smith et al. measured efficacy in Instructional Leadership and efficacy in Management. Those authors offered construct validity evidence in the form of factor analysis. Though their measure may be promising in terms of validity, it only captures two dimensions of the principal's job. More thorough in their investigation were Tschannen-Moran and Gareis (2004) who tested multiple measures of principals' efficacy. Those authors concluded that Dimmock and Hattie's (1996) measure was neither valid nor reliable, and, therefore, could not be used in further studies or in practice. However, Tschannen-Moran and Gareis found some factorial validity and reliability for the scale they created – the Principal Sense of Efficacy Scale (PSES). Those authors captured three dimensions of the principal's job (i.e., management, instructional leadership, and moral leadership). Though their instrument is promising in terms of its psychometric properties and it expands beyond the work of Smith et al., there may be potential to further capture the administrator efficacy construct by identifying additional dimensions of the job. McCollum, Kajs, and Minter developed a scale to measure school administrators' (e.g., principals') efficacy. Those authors noted the construct (factorial) validity of the scale and high reliability coefficients for its subscales. Through exploratory factor analysis, eight dimensions of school administrator efficacy were derived. These items included (1) Instructional Leadership and Staff Development, (2) School Climate Development, (3) Community Collaboration, (4) Data-based Decision Making Aligned with Legal and Ethical Principles, (5) Resource and Facility Management, (6) Use of Community Resources, (7) Communication in a Diverse Environment, and (8) Development of School Vision (McCollum, Kajs, & Minter).

The scale created by McCollum, Kajs, and Minter (2006) was based on the ELCC national standards. These standards incorporate the well-known Interstate School Leaders Licensure Consortium (ISLLC) standards (Murphy, 2005). ELCC's leadership framework provides a roadmap for university-based educational administrator preparation programs regarding specific knowledge, skills and dispositions related to key themes in the development of school principals and superintendents (NPBEA, 2002). The work of Kaplan, Owings, and Nunnery (2005) noted the link between principal quality and ISLLC (ELCC) standards. Results indicated that principals who demonstrated higher ratings on these standards were leaders of schools with higher achievement among students; in contrast to school administrators who scored lower (Kaplan, Owings, & Nunnery, 2005). Their study noted that competent teachers want to work with effective principals, not ineffective ones; thus, the quality of leadership can directly impact teacher retention levels (Kaplan, Owings, & Nunnery).

The current ELCC Standards consists of seven standards which guide the preparation of school administrators. Standards one through six (1-6) address the chief components of school administration (e.g., community communications and collaboration), while standard seven (7) focuses on applying and synthesizing content, skills, and dispositions outlined in standards one through six (1-6) through an internship experience.

The SAES and its eight dimensions provide the model and measure for the present study. McCollum, Kajs, and Minter (2006) cite that this scale can serve as a useful tool in the development

of future and current school leaders since subscales address knowledge, skills, and dispositions incorporated in the ELCC Standards, especially since there are a few studies related to principals' efficacy and its measurement.

PURPOSE

Previous research has established initial evidence regarding the reliability and construct validity of the SAES (i.e., McCollum, Kajs, & Minter, 2006). Still, further evidence is needed to support the scale's construct validity; in previous work only exploratory factor analytic techniques were used. This study tests the SAES model using a confirmatory factor analysis and hypothesizing the eight dimensions of the scale posited by its original researchers. This study is being conducted to determine the construct validity of the SAES, and will lead to improvements in the measurement of school administrators' efficacy. In addition, the internal consistency of the scale will be re-evaluated in this new sample, using Cronbach's Alpha. This study serves to advance knowledge and measurement of school administrator efficacy.

METHOD

PARTICIPANTS

The study participants were early career principals and principal trainees (n = 559). The participants were teaching in school districts or carrying out principal functions in the Houston, Texas area.

INSTRUMENTATION

The SAES uses 51 items (see Appendix for items) and is purported to measure eight dimensions of school administrators' efficacy, using a seven-point Likert-type scale (1 = not at all true of me, 7 = completely true of me). The eight dimensions and their reliability coefficients (Cronbach's Alpha) based on McCollum, Kajs, and Minter (2006) are (1) Instructional Leadership and Staff Development (.93), (2) School Climate Development (.93), (3) Community Collaboration (.91), (4) Data-based Decision Making Aligned with Legal and Ethical Principles (.93), (5) Resource and Facility Management (.89), (6) Use of Community Resources (.95), (7) Communication in a Diverse Environment (.81), and (8) Development of School Vision (.86).

PROCEDURE

The SAES was given in group administrations to the 559 principals and principal trainees in the sample. Participants filled out a consent form, acknowledging their participation, and were provided a set of instructions for completing the SAES and a copy of the instrument. The SAES took approximately 20 minutes to finish.

RESULTS

The hypothesized model for the school administrator efficacy was tested using confirmatory factor analysis in EQS 6.1. The NNFI of .90 and RCFI of .90 were at the .90 standard for acceptable fit given by Bentler (1992). The SRMR of .06 was in a good range for fit, below the acceptable point for model fit of .08 (seeking values less than .08). As well, the RMSEA of .05 was in a good range for fit, given the standard of less than or equal to .08. Hu and Bentler (1998, 1999) gave the standard for SRMR, and Browne and Cudeck (1993) gave the standard for RMSEA. All four criteria – NNFI,

RCFI, SRMR and RMSEA – suggest that the model fits. Therefore, the evidence in support of the model is strong. SPSS 12.0 was used to calculate reliability coefficients (Cronbach's Alpha) for the SAES subscales and the correlations among the subscales. All of the correlations are statistically significant at the p = .01 level; however, they are low enough to warrant the conclusion that the subscales are separate.

CONCLUSIONS

The null hypothesis of non-model fit is appropriately rejected based on the criterion typically used with confirmatory factor analysis. Therefore, the research hypothesis that the eight-factor model of the SAES fits is accepted. Thus, there exists strong evidence of the construct validity of the SAES. Additionally, the correlations among the subscales are low enough to warrant a conclusion that discriminant validity exists (e.g., the subscales are separate). The reliability coefficients of the eight subscales of the SAES were found to range from good (.81) to excellent (.94). These are important steps in the successful measurement of school administrators' efficacy. The findings regarding the construct validity and reliability of the SAES are consistent with and a significant addition to past findings (e.g., McCollum, Kajs, & Minter, 2006). With these new findings, researchers and practitioners can confidently rely on the validity and reliability of the SAES in their work.

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USING EMOTIONAL INTELLIGENCE TO ASSESS STUDENT BEHAVIOR

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ABSTRACT

School, which is generally recognized as a place for adolescents to learn socially appropriate behavior, has become an institution whereby interpersonal disputes between teachers and students have increasingly resulted in aggravated assault and the use of lethal weapons. Surveys of high school students reported that a startlingly high proportion of them are unaware of effective methods for solving social conflict.

Emotional intelligence, according to Goleman (1995), is the ability one has to monitor and regulate emotions effectively and appropriately, including the emotions displayed by others. Emotion management, a component of emotional intelligence, is the ability one has to handle feelings so they are socially appropriate (Goleman, 1996).

Many students grow up with below average interpersonal skills for dealing with others in a socially appropriate manner that puts them at risk for social functioning. The purpose of this study was to identify the percent of male students (n=50), 12 to 14 years of age, who may be deficient in their ability to manage emotion strategically in various social contexts.

The Juvenile Emotion Management Scale (JEMS), a twenty-five item self-report measure of the emotion management construct, was used to assess students' ability to manage emotion. The results of the JEMS identified 48 percent of the sample scored 105 and below. A score of 105 and below suggest deficiencies in one's ability to manage emotional reactions to stressors or problems found in various social contexts. The areas of deficiencies for students who scored 105 and below in this sample were in their ability to: alter their emotional response to provocative situations; manage feelings concerning what is or isn't appropriate to a given social situation; and acknowledge an inappropriate feeling and repair it. These findings could be instrumental in designing interventions for those students who need to either reduce socially inappropriate emotion or induce socially appropriate emotions in themselves for social success

INTRODUCTION

We find violence to be a major social and health problem in this twenty-first century that is affecting large numbers of children and families. Society still witness outbreaks of school violence, both in the United States and in other countries, giving schools the image that they are far more dangerous than the streets. Teachers are face with the challenge of training and educating U.S. children and youth who demonstrate aggressive and antisocial behaviors.

Are our schools prepared and equipped to take on the role of socializing these students to the standards of behavior that our American society consider civil and acceptable? Unfortunately, it appears that we are losing ground to safely raise and socialize our children. Although students have been taught conflict-resolutions skills precept by precept, their behavior often demonstrates little improvement. It appears that today's students are just not good at avoiding disputes.

According to the data, collected from observations and interviews by the author, from school age children who school officials identified as having behavioral problems, exhibited the following behaviors:

- inability to manage anger appropriately;
- inability to interact appropriately with peers;

- inability to calm down when angry;
- inability to bounce back emotionally when things don't go their way.

Many of these students did not understand the consequences of their behavior nor the ability to plan appropriate actions, which seriously limits their ability to make intelligent social decisions.

Emotional intelligence, according to Goleman (1995), is the ability one has to monitor and regulate emotions effectively and appropriately, including the emotions displayed by others. Emotion management, a component of emotional intelligence, is the ability one has to handle feelings so they are socially appropriate (Goleman, 1996).

The events that precede a student's use of aggression or violence can be an intense emotional state in which the student has to use some type of cognitive thinking to control his/her emotions (e.g., "I was very angry at those boys for taking my coat. The more I thought about it the angrier I became until finally, I just picked up a book and slammed it into his face."). If a student is limited in their ability to alter their emotional response, as in the student in the above example, then their ability to repair their negative emotional state is inadequate, leaving the student at-risk to manage the intensity of his/her emotional state.

Emotion and the role it plays in interpersonal problems raise the possibility that emotion management can be use to restructure thinking (correct or appropriate behavior through emotion management skills), thereby reducing one's risk for inappropriate social functioning. Because schools provide an important setting for assessing those students who demonstrate antisocial behaviors, identifying one's ability to alter their emotional response to provocative situations could be useful information. The data from the assessment identifying students' skill level in responding to emotional stimuli could provide interventions for those students who need to either reduce socially inappropriate emotion or induce socially appropriate emotions in themselves for social success.

The researcher, in a previous study demonstrated that there was a significant difference in emotion management scores between middle school male students who were assigned to either a High Group or a Low Group by their teacher or counselor according to the following criteria:

1. High Group (N=11) – positive feelings about self and school; no suspensions and expulsions; able to express anger appropriately; sensitive to others' feelings; shares, cooperative, and helpful; and friendly and involved with peers; or
2. Low Group (N=11) – negative feelings about self and school; history of suspensions and expulsions; problems controlling anger; aggressive or self-destructive behavior; problems in peer relations; impulsive; and not sensitive to others' feelings.

Using the independent-samples *t*-test procedure, the following hypothesis was tested.

H_1 There should be a significant difference between the mean score of the High Group and Low Group of male students ages 12 to 14 with respect to emotion management ability.

The result of the t-test demonstrated that the scores of the High Group and the scores of the Low Group were significantly different: t(22) = t3.12, p=.005, which affirmed that emotion management ability was a factor in male middle school students' behavior.

The assessment of students' ability to manage emotion could be instrumental in designing interventions for those students who need emotion management skills training as an educational enrichment to either reduce socially inappropriate emotion or to induce socially appropriate emotions in themselves. Assessing students' ability to manage emotion also identifies those students who need to develop their capacity to make intelligent social decisions.

The purpose of this study was to identify the percent of 12 to 14 years old male students whose emotion management ability would be considered as possibly needing social skills intervention. The study will identify the percentage of sample scores that demonstrate an at-risk level of emotion management functioning. Students' emotion management scores that fall below

seventy percent (104 and below) of the maximum score (150) are considered at-risk for managing socially appropriate emotions.

The Juvenile Emotion Management Scale (JEMS) was administered to 12 to 14 years old male students to assess their emotion management ability in responding to emotional arousal. The JEMS, a twenty-five item paper and pencil test, has demonstrated to be both a valid and reliable instrument: internal reliability (a = .86); correlation coefficient (r = .40 to .59) in measuring the emotion management construct. The sample was comprised of male middle school students (N = 50), ages 12 to 14 years old, who attended a local middle school located in the Arkansas Delta. Students were assessed their emotion management ability according to the six scales that comprise the JEMS:

1. The degree to which individuals alter one's emotional response to provocative situations.
2. The degree to which individuals manage feelings concerning what is or isn't appropriate to a given social setting.
3. The degree to which individuals acknowledge an inappropriate feeling and repair it.
4. The degree to which individuals act helpfully to others as a way of terminating negative moods.
5. The degree to which individuals recognize emotions in self and others.
6. The degree to which individuals respond to emotional arousal.

The 50 students who were administered the JEMS, 48 percent of sample scored below 104 out of a possible 150 (Table 1) which meant their skill at managing their emotion was limited and could possibly benefit from social skills training. Table 2 shows the group statistics according to age, mean, standard deviation, and standard error of mean.

The areas of deficiencies for students who scored 105 and below in this sample (Table 3) were in their ability to: alter their emotional response to provocative situations; manage feelings concerning what is or isn't appropriate to a given social situation; and acknowledge an inappropriate feeling and repair it.

CONCLUSION

These findings could be instrumental in designing interventions for those students who need to either reduce socially inappropriate emotion or induce socially appropriate emotions in themselves for social success. Further research, building from this model, must investigate the aspect of validating the scoring range of the instrument (high, medium, low) in defining one's level of emotion management ability.

A manual should be developed using emotion management techniques and strategies, as an intervention or as social curriculum training. Emotion management abilities should be assess across gender, social economics status, age, and ethnicity to find out how individuals, across all segments of society, engage their ability to manage emotion when emotionally aroused.

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Table 1
JEMS Scores of Middle School Males

Score		Frequency	Percent	Cumulative Percent
Valid	72.00	1	2.0	2.0
	74.00	1	2.0	4.0
	77.00	1	2.0	6.0
	79.00	1	2.0	8.0
	80.00	1	2.0	10.0
	81.00	1	2.0	12.0
	86.00	2	4.0	16.0
	87.00	1	2.0	18.0
	90.00	1	2.0	20.0
	92.00	4	8.0	28.0
	93.00	3	6.0	34.0
	98.00	1	2.0	36.0
	99.00	1	2.0	38.0
	100.00	1	2.0	40.0
	101.00	1	2.0	42.0
	103.00	2	4.0	46.0
	104.00	1	2.0	48.0
	105.00	1	2.0	50.0
	107.00	3	6.0	56.0
	109.00	2	4.0	60.0
	112.00	1	2.0	62.0
	114.00	1	2.0	64.0
	115.00	2	4.0	68.0
	118.00	1	2.0	70.0
	121.00	1	2.0	72.0
	122.00	2	4.0	76.0
	123.00	1	2.0	78.0
	130.00	2	4.0	82.0
	131.00	1	2.0	84.0
	132.00	1	2.0	86.0

134.00	3	6.0	92.0
135.00	1	2.0	94.0
136.00	3	6.0	100.0

Note. Maximum score = 150. Students' scores that are in bold are considered at-risk level for managing socially appropriate emotions.

Table 2
Group Statistic

Age	N	Mean	Standard Deviation	Standard Error Mean
12	7	112.42	20.54	7.76
13	24	104.08	17.34	3.54
14	19	108.21	20.85	4.78

Table 3
Student Emotion Management Responses

	Scale	Item	Percent of Respondents Showing Disagreement
1.		Walking away from trouble helps me stay out of trouble	20%
		I felt myself getting mad at the teacher and realized that it wasn't the right thing to do	22%
		I wanted to hit that boy but realized that it wasn't the right thing to do	**42%**
		I try to keep from getting mad by taking deep breaths or by counting to myself	**46%**
		I enjoy making people laugh	26%
2.		You've got to walk away from trouble	16%
		W hen my friends began to argue, I immediately try to calm them down	30%
		If someone is trying to cause problems, I just ignore them	**40%**
		I don't let other people control me	32%
3.		I try to think of good thoughts no matter how mad I am	**38%**
		When I'm angry, I try to think of something else besides my anger	**38%**
		It feels good to help people	.02%
		I feel sad when I hear people making fun of old people	24%
4.		**Although I don't like Jimmy, I would still help him**	**34%**
		I enjoy seeing other people happy	16%
		It's important to me to recognize how others are feeling	26%
		I try to say I'm sorry when I've hurt someone's feelings	18%
		One should stop their friends from doing something bad	20%
5.		I need to apologize when hurting someone's feelings	26%
		It's important for to know how I'm feeling	12%
		When someone is sad I try to cheer them up	28%
6.		I know how to control my temper	26%
		I usually think before I react	28%
		I'm glad they decided not to fight	**36%**

Note. The items in bold are the areas of concern for this sample of 12 to 14 years old male middle school students.

IMPROVING PERFORMANCE THROUGH THE BALDRIGE ORGANIZATIONAL PROFILE: AN APPLICATION IN BUSINESS EDUCATION

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ABSTRACT

In recent years, business education has come under attack. CEOs, recent graduates, and business school faculty themselves are complaining that the Academy is not preparing students to deal with the complex, unquantifiable aspects of leading and managing organizations. The relevance of the business curriculum is being questioned.

At the same time, in the last couple of decades, a number for formal systems and frameworks for improving organizational performance have been developed and deployed. These include the ISO series of standards for quality and environmental standards, principles of lean production, Six Sigma and the criteria framework of the quality awards. Of these, the use of quality award frameworks is of particular interest because it is motivated by the organization's desire to improve performance on a voluntary basis, unlike other systems which are often mandated by customers. In this paper, we discuss the use of a specific aspect (the Organizational Profile) of a quality award, i.e., the Malcolm Baldrige National Quality Award of the U.S.A. in a specific context, i.e., in business education. The paper highlights an innovative instructional approach in which business students develop organizational diagnostic and consulting skills through the application of the Baldrige Organizational Profile (OP) as a performance improvement tool. It demonstrates how students translate the OP and apply it to a real life organization. It describes the process and the outcomes in terms of learning and benefits for both the students and their client organizations.

Key words: Performance Improvement; Baldrige Award; Baldrige Organizational Profile; Critique of Business Education; Relevance of Business Curriculum; Organizational Learning; Interventions for Performance Improvements

FROM ONLINE COURSE TO ONLINE DEGREE PROGRAMS: ONE COLLEGE'S JOURNEY

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ABSTRACT

Much has been written about all aspects of teaching a single online class – from getting started to managing the workload to communicating with students to assessment methods. Far less is available, however, regarding starting a complete degree program online. In this paper, the development history of two online programs in the College of Business in a regional public university is detailed. Various distance education issues such as marketing, student advising and retention, faculty training and support and appropriate technology are explored, along with some pitfalls, challenges and opportunities that may be encountered along the way.

INTRODUCTION

That distance education (DE) is experiencing an enormous increase in enrollment and popularity is no secret; there are countless websites and journals devoted to the subject and more articles and news briefs appear every day. Estimates of the number of classes and students vary, but statistics from 2001 – the most recent year from which any statistics are available from the Department of Education -- indicate that in the 2000-01 academic year, nearly 3 million students were enrolled in an estimated 118,000 different DE courses in 2 and 4 year credit-granting institutions. Student enrollments at the undergraduate level accounted for 82% of the total enrollment, and courses at the undergraduate level made up 76% of the total number of courses offered. (NCES, 2003)

Only 15% of the above institutions offered more than one hundred DE courses, and 34% had degree or certificate programs designed to be completed totally through DE, with public 4-year institutions being the most likely to offer degree programs designed to be completed totally online (NCES, 2003).

An online course may be described by the proportion of its content delivered online, with traditional courses being taught 100% in person and an online class being taught at less than 20% in person as illustrated in Table 1 (Allen and Seaman, 2004). For the purposes of this paper, a distance education course is defined as having most or all content delivered online, and thus being in the last classification.

Table 1
Course Classifications - Adapted from Allen and Seaman, 2004

Column1	Column 2	Column 3
Proportion of content delivered online	Type of Course	Description
0%	Traditional	No online technology used content is delivered in writing or orally
1 – 29%	Web facilitated	Face-to-face course uses a course management system (CMS) or web pages to post course-related information.
30 – 79%	Blended / Hybrid	Online and face-to-face are blended.

		Substantial proportion is delivered online typically uses online discussions but has some face-to-face meetings.
80+%	Online	Most or all content is delivered online. Typically has no face-to-face meetings

This paper proceeds as follows. First, a detailed description of the program is provided. Next, the extent and type of faculty pedagogical and technology support are described. Support available for student is discussed next, followed by some pitfalls and challenges encountered in program development. The paper concludes with some directions for future online programs and research.

ONLINE PROGRAM HISTORY AND DESCRIPTION

As early as 1998, two faculty members in the college were teaching online classes. At that time, no formal plan existed for doing so; interested faculty simply created a web page or downloaded a shareware course management system (CMS) and posted their materials there for the select group of student who chose to take the class in that manner.

In 2000, the university purchased s site license for the Blackboard CMS, and made the system available to any interested faculty members. Many instructors began using Blackboard immediately and in the two years that followed, more and more content from classes was posted therein. Some classes blended face-to-face (FTF) and online activities, but the vast majority of classes continued to hold traditional, in-person classes.

During the spring of 2001, the Director of the MBA program approached several faculty teaching the first year MBA classes and asked them to teach one online class in Fall 2001. That semester, another eight graduate classes were available online, and by spring 2003, there were about a dozen graduate classes being taught online. That semester, an additional stipend became available to those teaching online to encourage improvement of the class from semester to semester.

In fall 2004, an undergraduate degree completion program was started for students who attended the community college for two years and then transferred into the university. The DE Bachelor of Science in Business Administration degree has a concentration in General Business; this concentration is not available in a FTF mode. Concentrations at the undergraduate level available in FTF mode are not currently available online.

Also in fall 2004, the entire MBA program was made available online. Realizing that the online portion of our program was growing rapidly, the college formed an ad hoc committee to discover and explore major issues in online education. Consisting of representatives from each department who taught online, the committee began by determining what issues were the most critical.

In spring 2005, the Office of Online Programs was established, and two new positions were created. The assistant dean (AD) for online programs would administer the online program, including activities to maintain and grow the program within the college. The AD would work to assure course and program quality and continuous improvement, arrange for faculty training, work with department chairs to schedule online class sections and develop new online courses and programs, and oversee online student advising. The online computing specialist would support those teaching online by teaching appropriate use of technologies and exploring new technologies.

In summer 2005, the ad hoc committee became a standing committee mandated in the college code and an increased emphasis was placed on quality, teacher training and assessment. In fall 2005, the number of credit hours being taken online exceeded the number of FTF hours for the first time, and the number of undergraduate general business majors had risen to twenty. Two

concentrations within the MBA program – in Securities Studies and Finance were also added. These events are summarized in Table 2.

Table 2
Stages of program development 1996 – present

Column 1 Stage	Column 2 Time Period	Column 3 Description
1	pre 2001	two faculty members explore the possibilities and two classes are offered online
2	2001 – 2002	Eight more faculty are asked to offer a class online – all in graduate classes
3	2003 – 2004	Stipend paid to develop / continuously improve online classes; online steering committee formed to examine online issues
4	2005 – present	Steering committee becomes part of college code; assistant dean position formed; faculty training formalized.

FACULTY PEDAGOGICAL AND TECHNOLOGY SUPPORT

Faculty who requested an online class assignment are matched to available courses based on college needs. To prepare the class, faculty were given a stipend the semester before they were to begin teaching, with the understanding that this stipend would continue for each semester the course was taught to encourage continuous improvement of the courses. For the first three years of online classes, faculty learned by doing, with little formalized support. While funding and technology were generally readily available, training was not.

While first movers into the online arena were generally technologically savvy, later instructors were less comfortable with technology. Given the increased workload an online class brings, and the pressure on junior faculty to complete research sufficient to obtain tenure, and the lack of comfort with technology, many junior faculty experienced difficulty and stress in converting their classes.

Faculty support now includes bi-monthly seminars on both pedagogical and technology issues, a newsletter published twice each semester to inform all faculty in the college of events involving online programs, and an office staff to assist with exam scheduling and proctoring. In addition to the online computing specialist position, all faculty teaching online classes receive additional graduate assistantship hours and a tablet PC. An assessment instrument specific to online classes is currently being developed as are various policies and procedures to ensure quality online classes.

STUDENT SUPPORT

Although the attrition rate for online students has dropped in recent years, it is still quite high, with some estimate running to twice that of FTF classes, and others ranging as high as 40% (Carr and Ledwith, 2000). Attrition rates can be confusing, however, as they can be applied to single courses or entire programs. Anecdotally, we have found that in the MBA program, while the individual drop rates for online classes is higher than for FTF classes, the rate of students dropping out of the program (i.e. not completing their degree) is only slightly higher than that of FTF students. For the undergraduate degree completion program, the attrition rate is considerable higher for FTF students who switch to the online degree program and for students who begin their program as

online students. Students in the latter group are typically older and maturity may be a factor in their retention rates.

Advising is critical for online students, especially the undergraduates. Oftentimes these students simply slip below the radar and disappear first from their classes and eventually from the degree program. In an effort to stave off this exodus, the advisor sends monthly emails to check on student progress. Students not responding to the emails are emailed again and the third attempt at contact is via telephone.

To develop a sense of community among the undergraduate online students, a course is being created for them within the Blackboard CMS that will allow them access to each other and to their advisor on a regular basis. When students to log in to Blackboard to check their coursework, they will automatically see the advising class and have easy access to announcements and other useful information, as well as a simple method in which to contact their advisor. Contacting fellow students in a non-academic setting will simulate contact typical of the dormitory or student center on campus.

MARKETING CAMPAIGNS

A major effort has been made this year to increase enrollment in both the undergraduate and graduate programs. Billboards on major state highways, print ads in business journals, advertisements on radio, TV and the Internet have all been used to attract students. Currently, there is more interest in the MBA program than the undergraduate one, but that is expected to change as we target military bases in the state. Campaigns focus primarily on three aspects of the program: its flexibility, its low cost and the college's AACSB and SACS accreditation.

PITFALLS AND CHALLENGES

As our program developed from two online classes to more than one hundred, there have been some challenges and pitfalls along the way. After five years of freedom regarding the manner in which the classes are taught, faculty this year for the first time have been given policies and procedures with which they must comply. While none of these is drastic, there has been some resistance to standardizing the programs. Some examples follow.

While the class each faculty member creates seems to that instructor to be clearly organized and easy to use, when students are faced with five different online classes, slight differences in each class can mean huge amounts of time spent deciphering the course outline. Thus, one policy states that the syllabus, course schedule, and staff information (office hours, office telephone, etc) will be located in the same Blackboard areas for all classes.

Various accrediting bodies (in our case AACSB and SACS) require that there be some interaction – both faculty to student and student to student – in each class. We have recently begun to emphasize this requirement in our online classes, and this has not been universally accepted. It is felt this is due more because of lack of understanding of the various ways in which interaction can occur rather than lack of interest in interaction.

CONCLUSION

Creating an online degree program is a much larger challenge that making one or two courses online. Once the online degree program becomes an option, issues such as accreditation, quality, and faculty training all come to the fore. Addressing these areas before the program is up and running can avoid the more serious problems.

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TEACHING AND MANAGING AN ONLINE COURSE

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ABSTRACT

This workshop will be of interest to those who have little or no experience teaching an online course. The basic aspects of teaching an online course will be covered. The workshop will begin with an introduction to online teaching (definitions, differences and similarities between face-to-face and online teaching, etc.). Tips and helpful hints for managing an online class as well as some significant policies and procedures (AACSB and SACS) will be presented next. Finally, an introduction to various technologies that may be used in online classes will be provided.

As time and audience interest permit, topics such as online learning communities, synchronous and asynchronous discussions and assessment will be discussed. Although the workshop will use the Blackboard Course Management System (CMS) to demonstrate certain topics, the concepts presented will be applicable to all CMSs.

AND THE WINNER IS . . . : DEVELOPING A NATIONALLY-RANKED STUDENT ORGANIZATION

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ABSTRACT

Much has been written on how the quality of higher education can be enhanced for college students. Recent studies have focused on the role that student organizations play in this process.

This manuscript extends past work by focusing on the development of a nationally-ranked business student organization. Benefits to both the student as well as the university will be discussed. The manuscript will discuss specific practical suggestions for developing a top-ranked organization including a committed faculty advisor, committed student officers, effective recruiting, link to profession, support from dean and department head, beneficial activities, clear goals and strategies, effective marketing of meetings and events, and effective funding. Accompanying challenges will also be discussed.

LESSONS FROM KATRINA

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ABSTRACT

Many professors strive constantly to find ways for students to apply what they are learning in the classroom. Such application can make acquired knowledge seem more "real," reinforce the principles being taught, and increase student interest and involvement in the learning process.

Hurricane Katrina's devastating impact on the Gulf Coast had wide-ranging consequences. Its aftermath affected – indeed, continues to affect – aspects of citizens' existence in both predictable and surprising ways. Even communities only tangentially influenced by the actual storm experienced challenges to and changes in their daily routines that will not soon be forgotten. Many individuals experienced emotions and behaviors characteristic of post-traumatic stress disorder. An event of this magnitude quite naturally found its way into many classroom lessons and discussions.

This manuscript presents examples of classroom exercises developed to take advantage of the tremendous learning opportunity presented by certain circumstances following this natural disaster. It concentrates specifically on two business classes, Principles of Management and Leadership, being taught during the fall semester of 2005 at a university in an area impacted by Katrina. Essentially the entire student population was directly affected, and making dealing with the aftermath part of the learning experience seemed advantageous to both learning and healing. Student participation in and reaction to the exercises will be discussed.

INTRODUCTION

In an ongoing effort to engage students in the learning process, professors often incorporate examples and applications from current events. Indeed, research has shown that this enhances students' opinions of both courses and professors (Hudak & Anderson, 1984; Phillips, Phillips, & Cappel, 1994), making course material seem more relevant.

Classes at most universities had barely begun when Hurricane Katrina swept over coastal areas of Louisiana, Mississippi, and Alabama in August of 2005. Loss of property, loss of lives, and loss of jobs lead to vast disruptions in almost every aspect of everyday existence. Once essential infrastructure elements were restored, businesses and communities resumed activities as they were able. Universities reopened, despite uncertainty as to which faculty, staff, and students would be returning, and what impact the storm would have on funding. The pervasive nature of the storm's aftermath had a serendipitous effect in some respects. In a variety of academic areas, we found ourselves living in a laboratory, as it were, full of real examples and applications of concepts being taught in our classes. Poised to take full advantage of this wonderful learning opportunity, we concentrated on developing exercises and discussions to do just that.

COMPOSITION OF EXERCISES

As mentioned above, numerous situations existed which provided opportunities for classroom exercises and discussions. We focused on creating exercises for two Management classes, Principles of Management and Leadership.

Because the semester was barely underway, students in the Principles of Management classes had little topical knowledge. Our strategy with these exercises was to use them to reinforce what was being taught by having students generate examples in discussion groups after the topics were presented in class. Thus, the directions below were not used in a single class period; rather, they were assigned for group discussion following coverage of relevant chapter material.

Give examples of how managing area businesses has been affected by circumstances after the hurricane. Where possible, identify the management function (i.e., planning, organizing, leading, controlling) primarily affected by each of your examples.

Give examples from your experience/observation of ways in which organizations' policies, procedures, or rules have been impacted by situations resulting from the hurricane.

Give examples of ways in which organizations' decision-making parameters have been affected by post-hurricane circumstances.

Give examples of ways in which the various aspects of human resource management (e.g., hiring, training, compensating, etc.) have been affected for area organizations by situations resulting from the hurricane.

Give examples of ways in which organizations were affected by communication systems failures following the hurricane.

Give examples of ways in which organizations have helped their constituents deal with negative impacts of the hurricane.

Although no one could possibly have predicted or planned for the extent of Katrina's devastation, how are organizations that have active planning processes and stay current with environmental scanning better off now than those that don't?

For the Leadership class, virtually each day presented relevant new topics worthy of discussion. Leaders at all levels (city, parish/county, state, federal) were at the same time criticized and lauded. Many substantive class discussions evolved from tackling leadership aspects of situations such as evacuating New Orleans, post-hurricane rescues of those who did not evacuate, getting supplies to people stranded by flood waters, plans to repair the levee breaches, ideas for reorganizing political districts to provide better leadership in the future, etc. In addition, as a formal class exercise, students were divided into groups to discuss and do impromptu presentations centered on the following scenarios:

You are New Orleans Mayor Ray Nagin and his group of advisors. Your city has come through a horrible hurricane and is faced with several challenging situations.

You are Louisiana Governor Kathleen Blanco and her group of advisors. Your state has come through a horrible hurricane and is faced with several challenging situations.

You are the President of our university and his group of advisors. The state has been economically devastated. In addition to other challenging situations that have resulted, you are facing substantial, immediate budget cuts, and possible future budget cuts/restrictions.

You are Miami, Florida, Mayor Manuel Diaz and his group of advisors. A powerful hurricane is headed toward your area. (Note – This exercise was done in class as hurricane Wilma was being forecast to hit south Florida.)

You are David Paulison, the new head of FEMA, and his group of advisors. As a result of various situations following hurricane Katrina, your agency has been harshly criticized.

Each of these scenarios was accompanied by the following instructions:

Thoroughly discuss the following issues involved with leadership in your situation. I will ask you to summarize your discussion in a brief presentation to the class. The following questions should help you analyze your situation, and tell what you recommend doing and who is instrumental in getting those things done. You may need to ask and answer additional questions. Make any reasonable assumptions necessary to complete this task.

What are your short-term challenges?

What are your long-term challenges?

What opportunities are available?

What needs to be done to address your task?

Who (individuals and groups) is important to success in this situation?

The scenarios above were reworded to focus on management issues (rather than leadership issues) for an exercise in the Principles of Management classes.

DISCUSSION

Much lively, interesting, and substantive discussion resulted from the above exercises. Everyone in the area had relevant experiences, many had strong opinions, and tying them in to topics that were being discussed in class proved engaging for most students. So in the authors' opinion, these exercises enhanced students' learning. While there are many current events that legitimately provide fodder for class discussion, seldom does one find oneself in an environment so rich with topics that are at the same time relevant and of personal interest to students.

On a higher level, it is our hope that these exercises contributed in some way to the healing process. Although we are unaware of empirical research exploring this topic, abundant anecdotal evidence suggests that students - indeed, virtually everyone in the impacted areas - suffered to some degree from post-traumatic stress disorder (PTSD). It is not at all uncommon for those exposed to natural disasters such as major hurricanes to suffer from a variety of negative outcomes including difficulty learning (Post traumatic stress disorder, 2006). There is some indication that early discussion of traumatic events can lessen the severity of PTSD (Post traumatic stress disorder, 2006). By integrating the issues on everyone's mind with issues relevant in class, students were able to share their loss, their frustration, and their learning in a safe, supportive atmosphere. And that, to many an educator, is what teaching is all about.

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FACTORS RELATED TO TEACHER RETENTION

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ABSTRACT

The primary purpose of this study was to investigate the reasons why teachers intend to remain employed in their current positions for the next five years. A large body of research exists documenting why teachers leave the teaching profession but there is a relative paucity of research addressing why teachers stay.

Teacher attrition continues to pose problems in the United States with 29% of new teachers leaving the field of education by the end of their first five years (Viadero, 2002). This is among the highest attrition rates of any profession (Heller, 2004). Building a clear picture of the factors that influence teachers' decision to remain employed has important implications both at the system and the school levels. At the system level, human resource departments may find the information valuable in their efforts to attract and retain quality teachers as well as designing appropriate professional development activities that relate to teacher responses. At the school level, administrators could use the results as a means of analyzing their particular school's culture and climate as well as to devise professional development activities.

To identify the reasons why teachers would remain in teaching, the Teacher Intent to Remain Employed Scale (TIRES, Smith & Robichaux, 2004) was anonymously completed by 2,799 teachers in an urban school district. The TIRES is comprised of 27 items assessing the following factors: Rewards, Perks, Benefits, Parental Issues, and Preparation and additional demographic items. Results revealed that 68% of the respondents stated they intended to remain in teaching for the next five years. Results of the binomial chi-square indicated that the teachers in this sample were not statistically significantly less likely to report staying in teaching than the national rate of 71%. Results of a forward likelihood-ratio logistic regression indicated that teachers scoring higher on Perceived Rewards of Teaching were 1.4 more likely to indicate that they would remain in teaching than those scoring lower. Those scoring higher on Perceived Perks of Teaching were 1.3 more likely to indicate that they would remain in teaching than those scoring lower. Additionally, none of the demographic variables (years of experience, highest degree earned, area of certification, and undergraduate grade point average) demonstrated any statistical and practical significance.

This study suggests that teachers intend to remain in teaching because of reasons related to the perks rewards of teaching. Reasons that related to professional demands, parental issues and teacher preparation did not seem to influence intent to remain in teaching. With the 32% teacher attrition rate identified in this study, human resource needs can better be predicted for the next five years. Rather than speculate on why teachers are remaining in teaching, leaders in the school system being investigated now have a better depiction of the factors that impact teachers' reasons for staying employed. Implications of individual reasons for staying in teaching within the Rewards of Teaching Factor and the Perks of Teaching Factor will be discussed.

INCREASING STUDENT ENGAGEMENT THROUGH ELECTRONIC RESPONSE DEVICES

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ABSTRACT

Students in the Net Generation, those born in the 1980s and later, have grown up with entertaining media such as TV, video games, and the Internet for education as well as amusement. In comparison to these fast-paced, interactive media, traditional lecture classes are likely to be deemed dull and boring. Electronic response devices (clickers) have been found to increase students' engagement with course material while making class more fun. This study will examine students' responses to the use of clickers in business classes at a small campus of a large public university. Not surprisingly, students reported that the use of the clickers increased both their engagement with the class and the likelihood that they would attend class.

INTRODUCTION

Students in the Net Generation, those born in the 1980s and later, have grown up with entertaining media such as TV, video games, and the Internet for education as well as amusement (Oblinger & Oblinger, 2005). In comparison to these fast-paced, interactive media, traditional lecture classes are likely to be deemed dull and boring. This poses new challenges for educators who must strive to engage students in learning. Although social, active, learner-centered educational environments are important to all students, the Net Generation in particular has a strong need for engagement, immediacy and learning in a social environment (Ramaley & Zia, 2005). Electronic response devices (clickers) have emerged as potentially useful technology to help educators meet this challenge. This student examines the responses of students in five business classes to the in-class use of clickers.

NET GENERATION STUDENTS

Net Generation learners pose specific challenges in terms of the instructional methods used. Growing up in a fast-paced environment in which they were entertained and taught through the use of technology, many Millenials have naturally developed an ”entertain me” attitude. The purpose of this paper is not to condone or justify this attitude, but to suggested that the use of clickers in the classroom can help educators meet the challenges of teaching the Net generation learner.

Immediate feedback and student involvement are often required to created ideal learning situations (Hequet, 1995; Foreman, 2003). Learning games have been reported to provide just this type of situation in that they create a responsive environment where learners immediately know how they are doing (Cruickshank & Telfer, 1980). In addition, Sugar and Takacs (1999) report that games create an interactive learning experience by transforming inactive learning material into learning episodes where the learners are active players and participants. Using clickers to elicit opinions and informally test students' knowledge could be considered a learning game in that students find them fun and enjoy the tech-based interactivity.

CLICKERS IN THE CLASSROOM

The clickers used in this study were small electronic devices the size of a deck of cards, but thinner. They were purchased by the university, rather than by students. Although clickers currently use either infrared or radio frequency technology, the latter were chosen to eliminate problems regarding reception. The receiver, with a USB connection, plugs into the classroom computer. The software for the clickers created an interface with PowerPoint software, making it relatively easy to construct interactive slides.

For one review game, students were presented with questions with multiple choice answers, and then gave their answers with the clickers. The percentage of students who chose each answer was shown graphically before the correct answer was indicated with a star. In different renditions of the game, students were or were not allowed to discuss the question with classmates.

In another game, questions appeared without answers, and teams raced to "buzz in" to win the chance to attempt to answer the question. The clicker software was capable of determining the first to respond, making this a fairer (more accurate) system than depending on a human to determine who had raised a hand first. Similar games without the clickers had been played in class.

The clickers were also used in opinion polls that were interspersed throughout a lecture. The results of the polls were immediately shown in graphical and numerical form. The purpose of the polls was to create interest and stimulate discussion. Although this was not a "game" per se, students perceived it as fun, meaning it could be considered a game.

METHODOLOGY, RESULTS AND ANALYSIS

Based on the concept that Net Generation students would appreciate greater interactivity, review games were created using the clickers. This study examines students' perception of classroom clicker use to play a review game. Three management classes and two sections of a managerial accounting class were included, and respondents were freshmen, sophomore, juniors and seniors of a small campus of a large public university in the northeast United States. The responses of students who were in more than one class were included only once. Of 66 unique students surveyed, 47% were women and 89% were of traditional college age. The survey itself was conducted through the use of the clickers after the games were completed. Student comments were collected through a secure online site.

As shown in Table 1, most students prefer games that use technology, as only 9% of students did not prefer games with technology at least "somewhat." This is not surprising considering that almost 60% of them play video games (for entertainment) and a similar percentage thought they were "cool." Again, a very small percentage had negative feelings toward clickers.

Table 1. Opinions of Clicker Use in Class

In general, do you prefer games that use technology (are electronic)?	
No, not at all	3.0%
A little bit	6.0%
Somewhat	21.2%
Quite a bit	19.7%
Yes, a lot	47.0%
Do you play video games?	
Yes	59.1%
No	37.9%

Abstain 3.0%

How would you rate the "coolness" of clickers

They're not - they're dorky	7.6%
OK	31.8%
Waaaaaaaaay cool	60.6%

Would you be more likely to come to class if you knew we were going to use the clickers?

Yes	40.9%
No - I come to class all the time anyway	40.9%
No - nothing can motivate me to come to class	9.1%
Abstain	6.1%

Are you more likely to participate in a class opinion survey if you can use the clickers to do the poll, rather than raising your hand?

No, I always participate fully regardless of how we do it	15.2%
No, I won't participate unless I have to	7.6%
Probably yes	34.8%
Absolutely yes	42.2%

An important finding of this study is that students believe they would be more likely to attend class on day when they know clickers are going to be used. While 40% stated they already attend class regularly, an additional 40% indicated they would be more likely to come to class if they knew the clickers were going to be used that day, leaving only 15% who abstained or simply would not attend for their own reasons.

Similarly, increased participation in class could be expected as more than 40% reported that they "absolutely" would be more likely to partake in an in-class opinion poll, and an additional one-third saying they "probably" would.

These results taken together provide strong support for the use of clickers to improve classroom experiences for students. According to these Net Generation students, attendance would be likely to improve, as would participation during class. From the instructor's point of view, these are positive behaviors that should be encouraged.

CONCLUSION

Students who have grown up being entertained present particular challenges to teachers. This study has shown that clickers can be used to create a more learner-friendly environment for Millennials. If students accurately reported their future behaviors, both attendance and participation should increase with the use of clickers in the classroom. Clearly, future research should investigate not only the use of the clickers, but actual student behaviors related to them.

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DIFFERENCES IN PREPARING PRACTICING MANAGERS AND TRADITIONAL UNDERGRADUATE STUDENTS FOR APICS CERTIFICATION

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ABSTRACT

APICS (American Production and Inventory Control Society) administers the CPIM (Certification in Production and Inventory Management) series of examinations. It is a set of five tests that comprise what is arguably the key professional certification in the operations management field.

In this paper, we contrast the experiences of constructing and implementing a course aimed at the gateway CPIM examination, Basics Of Supply Chain Management (BSCM), for two student groups: (1) To begin with, adult business practitioners (BP), and then, (2) Traditional business undergraduate students (UG). The BP and UG groups differed in a variety of ways, including (1) level of operations experience, (2) reasons for taking the course, (3) willingness to engage in class discussions, (4) level of quantitative ability, (5) constraints on what they could spend on study resources for the course, and (6) number of classroom-hours allocated to the course. While there is significant instructional support available through APICS for the BP course, it took considerable "product redesign" and "process redesign" to transplant it to the UG audience.

The paper's contribution lies in highlighting key process and content issues in adapting practitioner-oriented APICS certification material for a traditional undergraduate setting.

APICS (American Production and Inventory Control Society) administers the CPIM (Certification in Production and Inventory Management) series of examinations. It is a set of five tests that comprise a key professional certification in the operations management (OM) field.

In this paper, we contrast the experiences of constructing and implementing a course aimed at the first CPIM examination, Basics Of Supply Chain Management, for two student groups: (1) To begin with, adult business practitioners (BP), and then, (2) Traditional business undergraduate students (UG). The objectives, pedagogies and challenges differ significantly between the two groups. It required considerable "product redesign" and "process redesign" to transplant the course to the UG audience. This paper's contribution lies in providing insight into tailoring both process and content in adapting a practitioner-oriented APICS certification course for a traditional undergraduate setting.

CPIM EXAMINATIONS

The CPIM professional certification program consists of following five examinations: Basics of Supply Chain Management (BSCM), Master Planning of Resources, Detailed Scheduling and Planning, Execution and Control of Operations, and Strategic Management of Resources. Most commonly, it is operations management practitioners who seek this certification. It is rare for non-practitioner business undergraduate students with little or no operations experience to take these examinations. BSCM is the gateway point to the CPIM series, and functions as an overview test. It also serves to initiate students seeking certification into APICS terminology, a vocabulary for the OM discipline that is laid out by Blackstone & Cox (2004).

In 1998, we were approached by a large toy manufacturing company to develop an on-site course for a student group consisting of about a dozen managers. Over the years, we offered this course several times, which provided the opportunity to make product and process improvements in the course. Subsequently, we created an elective course for undergraduate students in the business management major at our college that would kill two birds with one stone: fulfill requirements for the degree, and provide the student with the knowledge that she would need to pass the BSCM examination. We reasoned that doing the latter would improve the marketability of the student, especially given the value placed on practitioner certification by employers. The UG course was offered most recently in the fall of 2005.

TWO AUDIENCES

The BP and UG groups differed in a variety of ways, including (1) level of operations experience, (2) reasons for taking the course, (3) willingness to engage in class discussions, (4) level of quantitative ability, (5) constraints on what they could spend on study resources for the course, and (6) number of classroom-hours allocated to the course. A typical student in the BP group was seeking certification because her employer supported the goal as part of professional development, sponsored her effort by paying for the testing and study resources, and gave her time off from work to attend class sessions. The typical UG student was taking the course as an elective towards the fulfillment of requirements for a degree in business management. A typical BP student was in her thirties and had at least a year's worth of experience as a practitioner in the operations field. This age and experience level contributed to a greater willingness on the part of the BP student to participate in class discussions, inject real-world operations examples into the discussion, and ask questions that were practical and related to day-to-day issues. A typical UG student was twenty years old, with no manufacturing experience, although she had taken a prerequisite course, production/operations management.

Class discussions were more challenging to start and sustain in the UG group. Because of the students' lack of exposure to real-world issues, the questions they tended to pose were more often theoretical and abstract. They were also less likely to challenge statements made in class and were frequently content with passive note-taking. The BP student had her class paid for by her employer, which wasn't the case for the typical UG student. The BP course was 20 hours long while the UG course was 45 hours long.

THE BSCM EXAMINATION

Basics of Supply Chain Management (BSCM) is not just the portal examination in the CPIM series; it is also an overview test with its own stand-alone status. APICS awards a certificate for passing this test, and then awards the full-fledged certification upon the student's completion of the entire five-test series. For this reason, the test is attractive to the UG audience, since taking on the entire CPIM program is, given their lack of industry experience, daunting and inadvisable. By taking the BSCM test alone, the UG student can hope to obtain a certificate that will gain her a competitive advantage in the job market, while providing her with the option to continue on the path of full certification.

APICS has developed a set of resources to aid students in preparing for the BSCM test. They include: (1) An exam content manual that contained the syllabus and a list of all the APICS terminology to be mastered (APICS, 2004), (2) A dictionary explaining the terminology (Blackstone & Cox, 2004), (3) A course review workbook (APICS, 2000), and (4) An academic textbook on materials management (Arnold, 2001). The BP group had full access to these materials, provided by the employer firm. Since UG students faced greater financial constraints, we decided to use only two of the four resources above, (1) and (4).

"PRODUCT REDESIGN"

The topic areas for BSCM include: forecasting, master planning, material requirements planning, capacity management, inventory management, physical distribution, quality management and just-in-time manufacturing. Since many of these topics are large enough to justify an entire course devoted to them, the treatment in BSCM is necessarily a condensed one. This was especially true for the BP group given the length of the course.

The emphasis with both groups was on covering the topic areas with a special eye to incorporating the few hundred terms listed as "key terminology" in the CPIM exam content manual. Precise use of the APICS vocabulary was every bit as important as the concepts conveyed through the use of that vocabulary. For example, "move time" means moving material within a facility, not transporting it between facilities. Similarly continuous manufacturing and line manufacturing, which are sometimes loosely interchangeable in common parlance, have more precise meanings here: the former refers to the production of non-discrete items and the latter to discrete items. Nuances of terminology were particularly important because of the minute shades of meaning that test-takers often have to distinguish in the multiple-choice test format employed by CPIM. We often discovered that students expressed ideas with greater precision than they did the terminology. Unfortunately, there was no other way to remedy this deficiency than careful and repeated study of the designated terms in the dictionary.

Both the BP and UG groups found the mastery of terminology to be a special challenge, but in different ways. The BP group had the advantage of being manufacturing practitioners, which might lead one to believe that it might be easier for them to use the terminology correctly. This was frequently not true because it is common for firms to use terms from the operations discipline in slightly idiosyncratic ways that are inconsistent with normally accepted patterns of usage. These non-standard usages become ingrained within firms and their employees and are difficult to replace. The UG students, on the other hand, had never encountered many of these terms and faced a challenge in learning this large body of definitions, along with the precise nuances implied by them. It was common to find that the UG students were taken aback by even the most basic terms, and were prone to misusing them, or using them loosely.

The UG class possessed two content-related advantages: (1) The foundational production/operations management course was a prerequisite for this elective, and (2) They were coming fresh off a sequence of quantitative-based courses like statistics and management science, which allowed them to handle the quantitative aspects of the BSCM course with ease. BP students had often not been exposed to these quantitative areas for years, and frequently, some basic mathematical groundwork needed to be laid down before we could build upon it. Similarly, the luxury of the prerequisite course insured that the fundamentals of the operations management discipline were still fresh in the minds of the UG group, lessening the need for review. If the BP class was better equipped in practice than in theory, the reverse was true of the UG class.

"PROCESS REDESIGN"

Since the UG course was lengthier, we found it convenient to treat each topic in greater depth. We accomplished this in two ways: (1) Augmenting the chapter material with outside articles, and (2) Assigning sub-topics to students and requiring them to make individual presentations on them. For example, in the BP class we covered the four basic manufacturing strategies (make-to-stock, assemble-to-order, make-to-order, and engineer-to-order) as well as the principles of standardization and modularization. However, we had to stop short of the ideal culmination point, mass customization, because that concept belongs in a different module of the CPIM series. This was unfortunate because the building blocks to get to mass customization had been carefully laid down in this class. By contrast, because of the available time, mass customization could be presented

at length in the UG course, thus allowing for a better understanding of subsequent topics in the course like master scheduling. Such instances can be cited in almost every topic area, and we were consistently able to achieve a greater depth of coverage in the UG class.

The BP class session was often driven by two instruments: the workbook (APICS, 2000), and class discussions. There were no tests administered until the last class session, which was devoted to taking a sample CPIM test. Each UG class session ended with a quiz since the students were taking the course for a grade and earning three credit hours for it. In addition, students were evaluated on the basis of two examinations and in-class presentations.

In order to give the UG class a stronger flavor of practitioner concerns, we assigned topics for individual presentations. We specified that the research materials be drawn from both academic and practitioner sources. We also allowed for a lengthy question-and-answer period after each presentation, which forced the students to be more thorough in their preparation. Spurring class discussions turned out to be difficult in the UG group. To create fruitful class discussions we found it necessary to design sharply focused in-class small group discussion assignments.

CONCLUSION

Transplanting a CPIM certification course from a business practitioner audience to an undergraduate student audience requires several changes to be made in terms of course content, resources employed, pedagogical strategies and testing methods. This paper attempts to describe those changes and better prepare instructors as they go about the process of adapting the course from one environment to the other.

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DIFFERENCE WITHOUT DIFFERENCE: AN ASSESSMENT OF LEARNING OUTCOMES BASED ON A COMPARISON OF ACTIVE LEARNING AND TRADITIONAL LECTURE PEDAGOGICAL STYLES IN A BUSINESS LAW CLASSROOM

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ABSTRACT

Much has been written about active learning and how it produces a better learning environment for students. The purpose of this study is to determine whether an active learning classroom environment is more effective in helping university students learn the concepts of business law than the traditional lecture pedagogical style. To generate data to answer this question, three classes of introductory business law students were instructed on the topic of employment discrimination by a lecture method of delivery, and three classes of introductory business law students were taught the same topic by an active learning method of delivery. The learning outcomes of the student groups were then assessed using a standardized test, which was designed to measure the levels of student learning under several categories of Bloom's Taxonomy.

This study was performed on university students at the end of the fall semester in their first business law class. The groups were not told that they were being evaluated on how they responded to different teaching methods. The groups were led to believe that the different delivery methods were the result of instructor preferences. After the chapter material was delivered to the students and they were assessed on their knowledge by way of the standardized test, their responses were evaluated to determine whether there was any significant increase in learning for students who were taught by the active learning method of instruction versus students who were taught by a lecture method of instruction.

WHAT'S CTE GOTTA DO WITH IT: ARE CTE GRADUATES EMPLOYED IN THE FIELDS THEY RECEIVED THEIR TRAINING?

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ABSTRACT

The purpose of this quantitative study was to identify those groups of CTE program participants who generally pursue work in the career field in which they have received their training. Career and Technology Education program graduates who were members of the National Technical Honor Society (NTHS; n=1066) from various parts of the Unites States comprised the sample which included members from the various occupational groups identified by the NTHS Occupational Codes. The survey contained questions related to current employment status and unemployment rates among the various occupational groups identified. Findings were that NTHS program graduates who were employed had about 57.1% of the respondents working in the areas in which they received their training. The largest group of those unemployed were persons in the medical/health/social services field.

THE VALUE OF LAW-RELATED EDUCATION FOR FACULTY AND ACADEMIC ADMINISTRATORS IN HIGHER EDUCATION: THE CHALLENGE OF EDUCATING EDUCATORS

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ABSTRACT

This paper explores some of the legal issues surrounding employment practices of faculty and academic administrators in higher education and discusses the importance of law-related education for these members of the academic community. The paper examines the conduct of faculty and administrators against the backdrop of history and law, and attempts to foster a greater awareness of the legal challenges affecting them. It is designed to educate and inform faculty and administrators about the legal implications of the decisions they make. As it explores some of the reasons given for nonparticipation in law-related training activities, the paper discusses some of the implications for adult educational programs.

The paper addresses the value of law-related education for faculty and academic administrators in higher education. In addition to providing some sources of law-related information, the paper offers recommendations for practice and suggested ways to achieve the goal of providing the necessary law-related education to faculty and academic administrators in higher education.

JUST-IN-TIME TEACHING: ENCOURAGING SELF-REGULATORY LEARNING AND ENHANCING FACULTY-STUDENT FEEDBACK

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ABSTRACT

Students enter the classroom prepared to engage in active learning and having a clear idea of what they need to know and why. Just-in-Time Teaching (JiTT) is a strategy designed to encourage students to take more responsibility in their learning, and it provides instructors the capability to more effectively communicate their lessons. Pre-class student preparation includes assigned readings and the submission of responses to three open-ended questions involving a short mini-case. Course management software is used to provide students the mini-case and questions as well as to receive their responses to the mini-case questions. The goal of the mini-case is to provide a realistic scenario in which students will need to understand and apply concepts from the readings. Questions tap students' conceptual understanding of the topic, their ability to apply the concept, as well as their capability to recognize the managerial implications.

Students electronically submit responses to the pre-class warm-up (mini-cases) two hours before class. The instructor reviews the submissions "just-in-time" to adjust the classroom lesson to suit the students' needs. Typically, class discussion starts with a review of the pre-class warm-up responses. A summarized overview of the responses is provided as well as examples of both good and bad verbatim student responses. A ten minute mini-lecture usually is all that is needed to help correct misconceptions and/or misunderstanding of problem calculations. Once students are provided with this feedback, they work in teams of 4-5 to rework the mini-case and/or complete another example involving the key concepts and calculations. This second iteration allows the opportunity for revising and resubmitting their work and allows additional time for instructor feedback. Individual assignments and/or tests can then be used to grade students' knowledge and skills on the topic.

A detailed example of implementing this pedagogy in a Market Analysis course is provided, including the mini-case, pre-class warm-up questions and student responses. An exploratory assessment of the effectiveness of JiTT is included as well as some suggestions for adapting this pedagogy to other classes. Just-in-Time Teaching is a robust teaching and learning strategy that can encourage self-regulatory learning and enhances faculty-student feedback.

A REVIEW OF TWO IMPROVEMENT INITIATIVES: BUSINESS PROCESS IMPROVEMENT (BPI) AND BUSINESS PROCESS REENGINEERING (BPR)

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ABSTRACT

This paper reviews business process improvement (BPI) and business process reengineering (BPR) as improvement initiatives. One may derive the conclusion that BPI and BPR rely upon strategic command and control measures, with respect to process improvement guidance, when considering customer focus and corporate goals as influential factors within customer perceptions of satisfaction areas of service operations. However, despite their beneficial contributions as process improvement tools within the context of operations and production environments, BPI and BPR do not address their improvement methodology from the perspective of process maturity and evolution. Hence, evidence is provided to further substantiate the notion that an additional framework is necessary to provide a managerial tool as a foundation for successful maturation and evolution of process management within the context of production and operations process improvement initiatives.

INTRODUCTION

The Federal Aviation Administration (FAA, 2001) defines business process improvement (BPI) as being a systematic approach to helping an organization make significant advances in the way its business processes operate and to aligning processes to better meet customer requirements. Harrington (1991) states that BPI also confronts problematic issues through eliminating waste and bureaucracy. Thus, the goal of BPI is to incite improvement through the streamlining of operations and production processes while retaining outputs of high quality.

BPI IMPROVEMENTS

Harrington (1991) indicates that such BPI improvements may be generated through implementation of the following phases:

1. Organizing for improvement--In this instance, improvement is fostered through building leadership, understanding, and commitment. Examples include training, effective communications, delineation of customer requirements, and process examination.
2. Understanding the process--In this instance, BPI advocates understanding all the dimensions of the business process. Examples include process definition, delineation of scope and boundaries, flow-charting, and further definition of customer expectations.
3. Streamlining--In this phase, BPI attempts to improve the efficiency, effectiveness, and adaptability of the business process. Examples include automation, standardization, elimination of bureaucracy, team building, and identification of improvement opportunities.
4. Measurement and controls--This phase of BPI implements a system to control the process for ongoing improvement. Examples include implementation of feedback systems, process auditing, elimination of poor-quality cost systems, and delineation of in-process measurements and targets.

5. Continuous improvement--This BPI phase embraces the implementation of a continuous improvement process. Examples include benchmarking, provision of advanced team training, qualification reviews, process qualification, and periodic reviews.

STRATEGIC EMBELLISHMENTS

Thompson and Strickland (1996) suggest strategic embellishments for implementation with respect to process improvement initiatives. A synopsis of their recommendations may be given as follows:

1. Flow charts--Managers may develop a flow chart of the total business process, including its interfaces with other value-chain activities. As a result, a better understanding of activities within operations and production environments may be gained.
2. Simplification--Managers may attempt to simplify the process first, eliminating tasks and steps where possible and analyzing how to streamline the performance of what remains. As a result, streamlining may be achieved within production and operations environments.
3. Strategy--Managers may evaluate each activity in the process to determine whether it is strategy-critical or not. Strategy-critical activities are candidates for benchmarking to achieve best-in-industry or best-in-world performance status. Given this notion, a better understanding of the contribution of operations and production environments can be gained.
4. Automation--Managers may determine which parts of the process can be automated (usually those that are repetitive, time-consuming, and require little thought or decision). They may consider introducing advanced technologies that can be upgraded to achieve next-generation capability and provide a basis for further productivity gains down the road. As a result of implementing automation, streamlining of the production and operations environment may be generated.

BUSINESS PROCESS REENGINEERING

Davis, Aquilano and Chase (1999) state that business process reengineering (BPR) may be considered as being the process of rethinking and restructuring an organization. Gordon (1996) substantiates this definition through her observation that reengineering is the rethinking, reinventing, and redesigning of either single or multiple organizational business systems. Macintosh and Francis (2000) indicate that reengineering is the radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed. Malhotra (1998) defines BPR as being the discrete initiatives that are intended to achieve radically redesigned and improved work processes in a bounded time frame.

Reengineering surpasses normal refining of existing processes to identify the core processes and reorganize work to eliminate unnecessary steps instead of focusing upon individual personnel issues (Davis, Aquilano & Chase, 1999; Gordon, 1996). Gordon, Davis, Aquilano and Chase, Thompson and Strickland (1996), and Davenport (1993) cite the following improvements as being outcomes of reengineering initiatives:

1. *Sheraton Hotels--Reengineering initiatives within the Sheraton Hotel corporate environment generated significant improvements within the operational structure. After elimination of processes that did not add value to running the hotel and elimination of paperwork that did not directly affect customer service, Gordon noted that Sheraton reduced the 40 managers and 200 employees required to run an average-sized hotel to 14 managers and 140 employees.*
2. *Citicorp Corporation--Reengineering efforts within the Citicorp environment, when coupled with traditional expense reduction methodologies, enabled personnel reductions of 15 percent and reduced operating expenses by 12 percent. The cumulative number of data centers was reduced from 240 to 60.*

3. *Chrysler Corporation--Reengineering to introduce process teams within the Chrysler environment allowed team responsibility of vehicle design from beginning to end. As a result, design issues were coordinated with manufacturing areas to generate models that were easier to build and allowed for regular consultation with purchasing agents regarding parts quality.*
4. *General Electric Corporation--Reengineering efforts within the General Electric circuit breaker division allowed dramatic gains in productivity and organizational capability. In this setting, the elapsed time from order receipt to delivery was cut from three weeks to three days by consolidating six production units into one, reducing a variety of former inventory and handling steps, automating the design system to replace a human custom-design process, and cutting the organizational layers between managers and workers from three to one.*
5. *Ford Motor Corporation--Reengineering efforts within the Ford Motor Corporation allowed significant restructuring and process linkage across functional boundaries. As a result, Davenport indicates that Ford reduced its accounts payable department by 75 percent.*

Davis, Aquilano and Chase (1999) and Gordon (1996) state that nine attributes of reengineering efforts exist. These nine characteristics may be given as follows:

1. Combination of jobs--This BPR attribute involves implementation of horizontal work compression and eliminates errors that occur in transferring information from one individual to another. As a result, cycle time is significantly reduced because only one person is responsible for overseeing the entire process.
2. Worker decision-making--This BPR attribute involves implementation of vertical work compression, and it eliminates the need for the traditional and costly hierarchical organizational structure with its many layers of management. As a result, faster customer response, lower overhead costs, and increased worker empowerment are manifested.
3. Natural order of process steps--The tenets of BPR do not require that processes be forced into a sequential order, and they advocate a natural sequence of events based on what needs to be done next. As a result, parallel, concurrent operations may exist because many jobs may be performed simultaneously, thereby reducing the throughput time.
4. Logical work performance--This BPR characteristic favors the shifting of work across traditional functional boundaries as a method of allowing multiple entities to make decisions. As a result, efficiency may be increased with respect to local operations decisions.
5. Multiple versions of processes--This BPR tenet advocates multiple process versions to meet the unique requirements of different market niches as well as individual customers as a method of avoiding the inflexibility and standardized products of assembly lines.
6. Checks and controls--BPR advocates a reduction in checks and controls because checking the accuracy of processes often occurs at the end of a sequence of steps rather than at each step. As a result, judgment of workers' performance is based on results rather than on how well they followed the process.
7. Limited contact--This BPR tenet involves limiting contact with external groups to instances that are essential to the process. As a result, reduced disturbance is introduced into process implementation.
8. Point of contact--This BPR characteristic advocates determination of a single manager as a primary point of contact for the purpose of providing that person with all necessary information. As a result, one individual would handle all accounts of a client.
9. Structure type--This BPR attribute fosters both centralized and decentralized structures for the purpose of placing decision-making at the most appropriate level and position in the organization.

BUSINESS PROCESS MANAGEMENT

Because organizations may lose customer focus within their corporate structures, Harrington (1991) indicates that some business processes may became ineffective, out of date, overly complicated, burdened with bureaucracy, labor intensive, time consuming, and irritating to

management and employees alike. Davis, Aquilano and Chase (1999) indicate that such occurrences may result in customer dissatisfaction if performance falls significantly short of expectations. Therefore, effective management must exist to govern process implementation and review as a method of countering such shortcomings for the purpose of generating acceptable levels of customer satisfaction.

Given these observations, organizational processes must be continuously examined to ensure that their performance is acceptable to both the firm and customer. As a method of accomplishing this task, firms may implement process improvement initiatives using business process management (BPM) tenets.

Eckes (2001) states that BPM may be considered as being the creation of an infrastructure to allow for successful process improvement through project teams as a critical component of quality improvement efforts with respect to processes. Eckes suggests that the following methodology be implemented to address process improvement from a team-based, process-related, project-oriented perspective:

Table 1: BPM Methodology

Step	Title	Description
1	Strategic Objectives	BPM initiatives for process improvement must relate to corporate strategy and must have the support of corporate leaders.
2	Process Creation	BPM initiatives must address the creation of core, key sub-processes and enabling processes.
3	Process Ownership	BPM identifies the owners of all processes under consideration, and owners must be assigned to all core, key sub-processes and enabling processes.
4	Process Dashboards	BPM requires the creation and validation of process dashboards as quantitative measures of process implementation and improvement.
5	Process Data Collection	BPM requires data collection practices to be implemented with respect to the defined dashboards to accumulate quantitative metrics regarding improvement initiatives.
6	Selection Criteria	BPM orders the improvement projects as a form of selection criteria derived from the analysis and assessment of quantitative data collected.

CONCLUSION

Within this methodology, Eckes (2001) indicates that customers travel through an organization through a series of processes, not through the functions or departments of the organization. Eckes further indicates that improvement initiatives must be chosen based upon their having the greatest impact on the business objectives of the organization. Given these concepts, managers implementing BPM as a form of process improvement initiative may address problematic situations from a perspective that considers both customer focus and corporate strategy using a logical method of improvement project ranking.

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THE CAPABILITY MATURITY MODEL (CMM) ARCHITECTURE AND FRAMEWORK WITHIN TRADITIONAL INDUSTRIAL ENVIRONMENTS: AN OVERVIEW

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ABSTRACT

This study investigated the potential for adapting the Capability Maturity Model (CMM) within traditional industrial environments. Using the CMM architecture, a similar Industrial Process Maturity Model (IPMM) was proposed. A survey was used to assess the perceptions of personnel within process improvement and process maturity work groups and initiatives. The data were analyzed and compared using ANOVA, Chi-Squared methods, and Pearson correlation coefficients. Stratification involved separating responses into categories of management versus non-management responses.

INTRODUCTION

This research determines that quality and process improvement methodologies existing within industrial environments do not advocate process maturity as their primary basis. This research also confirmed the notion that process maturity is not considered within previous or existing improvement initiatives. The proposed Industrial Process Maturity Model (IPMM) features the integration of software industry maturity models with aspects of traditional organizational settings that may provide a potential solution for shortcomings of existing paradigms. ANOVA indicates that process and procedural documentation exists in the host firms and that process and procedural training is required for both new and existing employees (Fowler, 1993). When considering the relationship between maturity level production process grouping and categorical grouping of processes within the context of improvement initiatives, a slightly positive Pearson relationship was found. Therefore, it can be concluded that little (if any) correlation exists between these issues. A slightly positive Pearson relationship between maturity level production process grouping and process maturity being a contributor to successful process output was found within the context of improvement initiatives. It can be concluded that little (if any) correlation exists between these issues.

RESEARCH SUMMARY

This research investigated aspects of Capability Maturity Model (CMM) derivation within traditional corporate environments. The literature review investigated the strengths and weaknesses of traditional management and process improvement philosophies, and it discussed the lack of process maturity attributes of each management and improvement philosophy. The examined management and improvement philosophies included TQM, BPI, BPR, BPM, Six-Sigma, and regulation (corporate or government). The literature review and basic CMM architecture assisted in the creation of the survey instrument.

The survey questionnaire (available upon request) was distributed via U.S. Postal Service to random recipients listed in the Forbes 500 lists for the years 2001 and 2002. Specific individuals were recipients based on data contained in the lists. The data sets for this research represented a 15.67 percent participating response rate. Respondents were classified as being either management or non-management personnel for the purpose of statistical analysis. The primary hypothesis statements tested were stated as follows:

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes may be defined as being ad hoc or chaotic.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes may not be defined as being ad hoc or chaotic.*

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes are disciplined and repeatable.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes are not disciplined and not repeatable.*

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes are standardized and consistent.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes are not standardized and are not consistent.*

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes are predictable.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes are not predictable.*

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes are continuously being evaluated for improvement.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes are not continuously being evaluated for improvement.*

ANOVA was used to test the primary hypothesis statements using data collected from management and non-management groups regarding their perceptions of process maturity as a component of process improvement initiatives (Hinkle, Wiersma & Jurs, 1998). The outcomes of the primary ANOVA hypothesis testing are presented in Table 1.

Table 1: Overview of Primary ANOVA Hypothesis Testing Outcomes

Question	Statement	Statistically Significant Outcome
1	Production processes may be defined as being ad hoc or chaotic	Yes
2	Production processes are disciplined and repeatable.	No
3	Production processes are standardized and consistent.	No
4	Production processes are predictable.	No
5	Production processes are continuously being evaluated for improvement.	Yes

ANOVA was implemented for questions 6-13. The outcomes of the analysis for each of these statements are given in Table 2.

Table 2: Overview of ANOVA for Questions 6-13

Question	Statement	Statistically Significant Outcome
6	Documentation of processes and procedures occurs in my firm.	No

7	Process and procedural training is mandatory for both old and new employees.	No
8	Quality emphasis exists only for final products--not processes themselves.	No
9	No quantitative information on product or process quality is recorded.	No
10	Process maturity is not seriously considered within our current process improvement initiatives.	Yes
11	Process improvement is advocated by my firm.	Yes
12	Improvement initiatives are/were strictly enforced through procedures and control mechanism.	Yes
13	Process improvement initiatives are/were tracked to examine their performance.	Yes

Pearson correlation coefficients were used to determine relationships between statements 14, 15, and 16 of the survey. Table 3 presents the testing outcomes.

Table 3: Overview of Pearson Testing Outcomes

Questions	First Issue	Second Issue	Pearson Value	Interpretation
14 and 15	Grouping of processes by maturity level would improve the outcomes of production processes.	Improvement initiatives advocating process grouping by category.	-0.02177	Little, if any, correlation is indicated from this analysis.
14 and 16	Grouping of processes by maturity level would improve the outcomes of production processes.	Process maturity being a contributor to successful process output.	0.02191	Little, if any, correlation is indicated from this analysis.

RESEARCH RECOMMENDATIONS

Firms that are considering the implementation of a process improvement initiative can use this research and its associated data to examine the potential benefits of advocating a maturity-based model for its improvement activities. Organizations seeking to optimize their processes may consider the proposed IPMM as being a candidate model in addition to such traditional paradigms such as TQM, BPI, BPM, etc., or they may consider it as an additional tool for embellishing any existing improvement initiative(s).

When comparing the basic frameworks of the CMM and the proposed IPMM, one notes both similarities and differences. Each level of the proposed IPMM directly correlates with respect to the philosophical descriptions of its counterpart within the CMM. However, the primary differences exist within the specific, direct specification of the tenets and attributes for each level of maturity. Although the CMM contains numerous key process areas within its architecture, the proposed IPMM does not contain definitions for any key process areas within its current design. It is beyond the scope of this paper to state specific activities that firms must observe within each level of the proposed IPMM. Instead, this research only proposes the high-level IPMM model itself. Future

research may investigate the salient characteristics of each IPMM level of maturity as a method of further defining and crafting its basic paradigm and key process areas.

The host environments for this study consisted of larger firms contained within the Forbes 500 list. Therefore, the applications of this research might not be applicable within smaller firms whose infrastructure is less complex. A future study may examine the potential of the proposed IPMM as a tool within smaller, less complex organizations.

Another recommendation for future investigation is related to the potential influence of bias within this research study. The Chi-Squared analysis indicated the potential for bias among the respondent survey responses. Therefore, future studies may attempt to repeat this research as a means of validating its outcomes, conclusions, and observations.

CONCLUSIONS

The literature review for this paper presents numerous methods through which traditional production industries may implement and embellish process improvement activities. Examples include TQM, BPR, BPI, BPM, Six-Sigma, Re-engineering, etc. Although these paradigms advocate both qualitative philosophies and quantitative metrics that enhance process improvement activities within organizational settings, none of these paradigms consider process maturity as its basis. However, within the software industry, the CMM provides an architecture that advocates process maturity as its basis. Therefore, this research investigates the potential of adapting the software model within traditional environments. The proposed IPMM features the integration of software industry maturity models with aspects of traditional organizational settings that may provide a potential solution for the shortcomings of existing paradigms.

When considering this research, one must realize that the concept of process quality is not identical to the concept of process maturity. During the course of implementation of the proposed IPMM, it is anticipated that fluctuations of process maturity will occur in that firms may digress or progress in maturity depending on the outcomes of certain activities. Therefore, process maturity may be considered from a dynamic perspective.

The first five survey questions directly correlated with each of the CMM's five maturity levels, and constituted the basis for the proposed IPMM levels of maturity. Statistically significant testing outcomes were noticed for the first and the fifth questions, whereas the second through fourth questions did not yield a statistically significant outcome. The analysis of this series of questions did not prove that processes are not chaotic or random, and that production processes are not continuously evaluated for improvement.

Based on the testing outcomes, hypothesis testing indicated that processes were considered to be disciplined and repeatable, standardized and consistent, and predictable (Siegel, 1994). Both the CMM and IPMM require these attributes to be manifested throughout organizational processes and improvement activities. Given these outcomes, most of the primary, basic organizational process requirements necessary for the existence of the proposed IPMM are indicated.

Questions 6-13 considered additional organizational attributes that are advocated by both the CMM and the proposed IPMM architectures. The testing outcomes from these survey questions indicate that process and procedural documentation exists in the host firms and that process and procedural training is required for both new and existing employees. This set of outcomes also indicates that an emphasis on quality products and quality processes exists within host environments. However, little quantitative information concerning the quality of both products and processes was not statistically proven by the testing outcomes (Walpole & Myers, 1993).

As expected, questions 6-13 also confirmed the notion that process maturity is not considered within previous or existing improvement initiatives. Also, based on the additional analysis, it appears that process improvement is not clearly advocated among the respondent firms. Further, it

appears that the host firms also do not clearly advocate performance tracking and the strict enforcement of such improvement initiatives.

When considering the relationship between maturity level production process grouping and categorical grouping of processes within the context of improvement initiatives, a slightly positive relationship was found. Therefore, it can be concluded that little (if any) correlation exists between these issues. A slightly positive relationship between maturity level production process grouping and process maturity being a contributor to successful process output was found within the context of improvement initiatives. Thus, it can be concluded that little (if any) correlation exists between these issues.

Practical aspects of the proposed IPMM must also be considered. Within corporate environments, it is anticipated that the IPMM may be used to embellish existing process improvement initiatives. The IPMM may also be a separate tool through which leaders may craft a separate philosophical improvement initiative that is exclusive of the existing methods used in workplace environments. However, because of the dynamic characteristics of individual host environments, no single implementation, solution, or recommendation should be considered as a generic prescription for the practical application and implementation of the proposed IPMM.

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A STUDY OF THE BENEFITS OF ADAPTING SOFTWARE PROCESS IMPROVEMENT FRAMEWORKS AND ARCHITECTURES IN TRADITIONAL SETTINGS

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ABSTRACT

This paper evaluates the benefits of adapting software engineering process improvement frameworks and architectures in traditional industrial settings. It is through this mechanism that managers of technical, engineering, and business environments may obtain an additional paradigm to support industrial process improvement initiatives. This preliminary research involves a multi-disciplinary study of computer science, software engineering, and industrial management.

INTRODUCTION

Because of the necessity of organizations to compete in a global economy, industrial management is increasingly becoming of utmost importance to the strategic pursuits, competitive advantage, and corporate function of numerous firms. Although sound manufacturing management methodologies favor process improvement activities to pursue and sustain corporate activities, they do not uniquely address process improvement through a standardized framework using process maturity as a basis for improvement efforts and activities.

No single baseline framework exists to uniquely address process improvement issues with respect to manufacturing considerations from an evolutionary and process maturation perspective. However, within the field of software engineering, the Capability Maturity Model (CMM) addresses process improvement from the perspective of process maturity and evolution (CMU, 1994).

Traditional manufacturing, production, and operations environments rely upon quantitative and qualitative methods of process improvement. Examples of such methods include the use of Total Quality Management [TQM] (Harrington, 1991), Business Process Re-engineering [BPR] (Jordan, 2000), and Six-Sigma (Eckes, 2001). Despite their tremendous benefits for organizations, none of these methods advocates process maturity as a theoretical basis or principle.

This preliminary research evaluated whether the CMM architecture may be modified to create a baseline framework capable of addressing industrial process improvement initiatives. This preliminary research derived an Industrial Process Maturity Model (IPMM) framework from the CMM architecture. The IPMM model may be recommended as a management tool to enhance process improvement initiatives within manufacturing environments.

Given the proliferation and growth of global business during the last century, both organizations and individuals have been affected with numerous challenges with respect to managing both manufacturing environments. Although organizations may employ different industrial management practices, each individual organization presents a unique situational basis for structuring process improvement initiatives. However, manufacturing management processes are not based on centralized maturity frameworks to assist in their development, maturation, monitoring, and evolution (Davis, Aquilano & Chase, 1999).

Through introduction of the CMM as a valid foundation for formulating industrial process improvement frameworks, both individuals and corporations may experience enhanced manufacturing management activities. By viewing process improvement from a maturity perspective, traditional manufacturing, production, and operations environments gain an additional tool through which their output effectiveness and efficiency may be improved or enhanced. Therefore, this paper evaluates the benefits of the IPMM as a derivative of the CMM architecture.

RESEARCH DESIGN AND DATA COLLECTION

The methodology of this preliminary research consisted of distributing a questionnaire that contained scaled, multiple-choice questions concerning personnel perceptions of current industrial process improvement activities and paradigms. Queried categories consisted of respondent perceptions concerning project management, process descriptions, process improvement paradigms, process efficiency and effectiveness, and factors related to derivatives of the software CMM levels. The questionnaires were distributed to quality assurance and quality control personnel, or personnel involved with process management among targeted respondents. The questionnaires were returned either via the U.S. postal service or manually. A period of two weeks was allowed to complete and return surveys. A self-addressed, stamped envelope was provided to return the survey. Once the survey forms were returned, the response rates were calculated and the responses were recorded. Appropriate personnel were employed to assist in the collection and the creation of data sets based upon the recorded responses to the survey.

The survey instrument was arranged into sections that consider existing and previous process industrial improvement paradigms, factors that contribute to a successful adaptation of the CMM within industrial environments, and corporate demographics. Host environment security, privacy, and confidentiality considerations were observed and respected during the implementation of this survey.

The survey conformed to specifications delineated by Fowler (1993) and those indicated by Hinkle, Wiersma & Jurs (1998). The instrument contained language tailored for simplicity in order to avoid ambiguous questions that could incite confusion among the surveyed respondents. Queries were presented using a multiple-choice format. Respondents were allowed to complete the survey at their leisure. Further, the survey was designed to be concise and required little time for completion. The collected data were used solely for the preliminary research purposes outlined and specified within this paper.

RESEARCH QUESTION AND INVESTIGATION

Survey questions were designed to investigate the salient characteristics of the primary research question: Can the CMM of the software industry be adapted to create a maturity framework within the manufacturing industry? The primary areas of investigation explored the issues of whether industrial process maturity is positively related to a successful process output and whether the existing process improvement paradigms address concerns of process maturity. The initial hypothesis statements for testing are listed below:

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes may be defined as being ad hoc or chaotic.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes may not be defined as being ad hoc or chaotic.*

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes are disciplined and repeatable.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes are not disciplined and not repeatable.*

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes are standardized and consistent.*

H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes are not standardized and are not consistent.*

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes are predictable.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes are not predictable.*

H0: $\mu_{Mgt} = \mu_{NMgt}$ *Production processes are continuously being evaluated for improvement.*
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ *Production processes are not continuously being evaluated for improvement.*

Respectively, each of the above hypothesis statements relates to the primary description of the first through fifth levels of the CMM. Additional data processing, testing outcomes, and analytical discussions will be presented in subsequent paper.

EXPECTED FINDINGS

The expected outcomes of this research are given as follows:

1. This research is expected to show that the CMM of the software industry can be adapted within unrelated industry as a process maturity framework.
2. This research is expected to show that existing process improvement paradigms do not address issues of process maturity.
3. This research is expected to show that existing industrial process environments do not conform to the tenets of the CMM.

SUBJECTS AND HOST ENVIRONMENTS

The primary host environments for this study consisted of firms that require an emphasis on production and operations environments. The Forbes Magazine listing of top 500 corporations was purchased as a source of potential subject environments that represent many industrial work settings. Additional listings consisted of the Forbes Magazine listing of its top 500 international corporations and the Forbes Magazine listing of top 500 private companies. These listings contained the Forbes Magazine top 500 companies with respect to assets, market value, profits, and sales within their respective classifications. An overall population superset of potentially 1500 companies was possible when the lists were integrated.

PROCEDURES

The overall population superset was expected to contain 1500 candidate members. A database was constructed to house the entire superset of potential subjects. Duplicate listings were eliminated. As a method of generating a sample set from this population, every fifth corporate listing was extracted from the superset to generate a randomized group for sampling purposes (Walpole & Myers, 1993). Based upon the responses to each survey question, stratification involved grouping responses into management and non-management classifications from a variety of host environments. Randomization occurred through the use of random sampling as a method of providing population elements with an equal chance of being selected as sample records. The generated records were recorded in a host environment subset database.

This host environment subset database provided the list of subject environments for research activities. Confidentiality of data was of prime importance. Additional feedback on survey design was obtained from colleagues employed within process improvement teams of a significant Fortune 1000 corporation in the Memphis, Tennessee area.

The survey packet contained the following materials: 1. research confidentiality statement, 2. survey instructions, 3. announcement of survey results, 4. survey introduction, 5. researcher

survey introduction, and 6. the questionnaire. Confidentiality and respect of corporate security were emphasized within the introductory materials. Further, a statement of instructions was included as a method of providing respondents with an example of proper survey completion and submission procedures. Names and addresses of specific respondents were provided with the list. A notice was included that informed respondents that the survey results may be obtained through electronic mail or surface mail. An introductory letter that stated the purpose of the survey was included with the questionnaire.

DATA PROCESSING

The data collected during this preliminary research initiative was maintained within an electronic database and spreadsheet environment that supported automated data processing. Data were analyzed using analysis of variance (ANOVA), Pearson Correlation Coefficients, Chi-Squared Methods, and any other appropriate mathematical techniques. Charts and graphs were used to graphically depict data characteristics, calculation outcomes, and any other relationships among data. Tables were also used for the presentation of data.

The survey responses were divided into two groups that represent the perceptions of management and non-management personnel in response to each survey question. ANOVA was used to evaluate management versus non-management responses to the survey questions. The Chi-Squared Method was used to compare actual responses with a set of anticipated responses for the survey data sets.

LIMITATIONS AND SCOPE OF THE STUDY

Because of the complexity of the CMM framework, the individual key process areas for each maturity level, potential geographic and response biases, and the complexity of individual work settings across many firms, this preliminary research effort observed limitations. The area of interest for this study was confined to examining industrial process improvement frameworks based upon the basic CMM architecture. Therefore, it was outside the scope of this study to investigate any additional area(s) of application for the CMM (e.g., general business accounting maturity, maturity of corporate security, etc.). Hence, the results of the study were limited to the production and operations domain.

It is assumed that the perceptions and responses of those participating in the survey were representative of their unique organizations. The intent of this research was to collect the views of process specialists within industrial settings who arc experienced in the arts of process improvement management philosophies, process improvement leadership and direction, time and motion studies, and process innovation.

CONCLUSION

This preliminary research was conducted in large-scale environments whose infrastructure may incorporate process improvement paradigms (e.g.,TQM, BPR, etc.) for improved efficiency and effectiveness as a supporting measure for competitiveness. Therefore, this preliminary research might not be completely applicable for smaller organizations that exhibit less complex infrastructures.

Within this research initiative, bias may be manifested through the incomplete set of returned questionnaires. Because an incomplete set of surveys may be examined to generate the data, an accounting for data contained within the surveys that are not returned is not possible.

The geographic location of the host environments may also contribute to bias. Because the host environments are located within numerous regions, it is possible that unique cultural factors within the work setting may influence the research outcomes.

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THE EFFECTS OF PART-TIME INSTRUCTION ON GRADES IN THE APPLIED MATH WITH AN INTRODUCTION TO CALCULUS COURSE

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ABSTRACT

This paper studies the effect that part-time instruction has on students' final grades in the Applied Math with an Introduction to Calculus course at a comprehensive IIA university. We find that full-time faculty members assign grades 0.09 points higher than those assigned by part-time faculty members. Using a multiple linear regression, in which the response variable is students' grades, the explanatory variable faculty member status--i.e., full-time or part-time--is statistically significant at less than a 0.01 level of confidence (p-value = 0.089). Additionally, the explanatory variable GPA is also significant at an alpha level less than 0.01 with a p-value of 1.70E-84. The model yielded an adjusted R2 value of 0.487, indicating that 48.7 percent of students' grades are accounted for by the explanatory variables included in the model.

INTRODUCTION

Numerous institutions of higher education employ part-time faculty members as an affordable method of instruction in both graduate and undergraduate programs. Part-time faculty members generally are professionals with significant experience that enhances the exchange of ideas and information within the academic classroom setting. Part-time faculty members embellish the ranks of faculty for both undergraduate and graduate programs among traditional and non-traditional program modalities. Institutions of all sizes and missions, ranging from community colleges to doctoral programs, employ part-time faculty.

Various research efforts suggest that student grades are related to faculty member rank (Ford, Puckett & Tucker, 1987; Jackson, 1986). In The Teaching Professor, an explanation for inflated grades involves the exertion of student pressure against faculty to affect grading outcomes (Study reveals, 2004).

Clayson (2005) suggests that students overestimate their academic performance with respect to examinations, and that the associated error is related inversely to the awarded grade. Halfond (2004) discusses the entitlement mentality of students with respect to higher grades. Germain and Scandura (2005) describe the evaluation of student feedback of faculty members as an influential factor within the grading process. Long (2003) states that the grading potential among various factions of faculty may also be influenced according to part-time or full-time status and whether one has tenure or is non-tenured.

MATHEMATICS COURSE CONSIDERATIONS

This research was conducted using students in the Applied Math with an Introduction to Calculus course at a comprehensive IIA educational institution. This course was delivered using a traditional, semester-long and an accelerated, or non-traditional format. The delivery of this course

occurred in a setting using lectures, discussions, and exercises as the primary methods of instruction. The faculty members for this course represented both full-time and part-time faculty members.

Mathematics courses encompass subject areas ranging from remedial through doctoral topics. Within many institutions, some of the course titles for mathematics studies may include applied mathematics, applied calculus, complex analysis, real analysis, calculus, differential equations, linear algebra, numerical methods, numerical analysis, discrete math, probability and statistics, operations research, logic, and topology. With the discipline of higher mathematics, various methods of computation are associated with differential and integral functions. These computations are known as calculus.

This course was a class in applied math with an introduction to calculus, and it included the fundamental quantitative and algebraic skills needed in other mathematics and science courses. This course contained introductory topics in mathematics for students in arts and business majors. Topics within this course included functions; graphs; linear, polynomial, rational, exponential, and logarithmic models; and an introduction to differential and integral calculus. The only prerequisite for this course was the successful completion and understanding of algebra and basic calculus. The topics discussed within this course provided a basis for understanding higher concepts of calculus and business problems. Given the applied nature of this course, students may determine a practical benefit from the topics and material covered within this class.

The purpose of the current study is to analyze the effect of faculty member rank as it pertains to part time or full time employment status on student grades in the Applied Math with an Introduction to Calculus course. Can a student taking an Applied Math with an Introduction to Calculus course improve his or her grade by enrolling in a course taught by a part-time faculty member? In addition, we examine several student characteristics in order to determine whether those variables interact with faculty member status.

METHODOLOGY AND RESULTS

Data were collected from all sections of the Applied Math with an Introduction to Calculus course taught at a private comprehensive IIA university. Two part-time and three full-time faculty members were employed to teach the course. Part-time faculty members were classified as adjunct faculty. For the sample of 571 students, the following data, which we believe to include explanatory factors for student grades, were obtained:

1. The dependent variable, grade in the course (A, B, C, D, F)
2. The independent variable, status of the faculty member (part-time or full-time)
3. The independent variable, status of the student (day or evening student)
4. The independent variable, student major
5. The independent variable, student class standing (freshman, sophomore, junior, senior)
6. The independent variable, student age
7. The independent variable, student GPA

The dependent variable, grade, which is recorded on the students' record as an alpha character, was numerically represented in the model as: A = 4.0, B = 3.0, C = 2.0, D = 1.0, and F = 0.0. Although the dependent variable, grade, is ordinal data, since the interval between the grades can be estimated as being ten point intervals (except for the F category), the data is considered to closely approximate interval level data. The use of the values 4, 3, 2, 1, and 0 for the letter grades of A, B, C, D, and F is similar to using the midpoint of a class to estimate descriptive statistics for a frequency distribution. Students who withdrew from the course were deleted from the sample data. Since student withdrawal data was omitted, the results of the study are subjected to survival bias. The lack of control for such bias is recognized as a limitation of the study.

Table 1 examines and compares the sample variances of the grades given by part-time and full-time faculty members. Since the F-test value of 0.355 is less than the F-critical value of 1.2372, it can be assumed that the population variances are equal. Thus a two-sample hypothesis test for the equality of population means would employ the t-test, assuming unequal population variances (see Table 2).

Table 1: F-Test: Two-Sample for Variances		
	Full-time	Part-time
Mean	2.16	2.07
Variance	1.8632	1.7319
Observations	365	206
df	364	205
F		0.355
P(F <= f) one-tail		0.551
F-Critical one-tail		1.2372

Table 2 analyzes the relationship between the status of the faculty member, i.e., part-time or full-time, and the grade received in the Applied Math with an Introduction to Calculus course. The hypothesis tested was that there was no difference in the average grades awarded by part-time versus full-time faculty members (in the population). The two-tail p-value of 0.453 represents the probability that both populations, i.e., part-time and full-time faculty members, award grades equally. This contention is rejected at any reasonable level of alpha.

Table 2: T-Test: Two-Sample Assuming Unequal Variances		
	Full-time	Part-time
Mean	2.16	2.07
Variance	1.7319	1.8632
Observations	206	365
Hypothesized Mean Difference		0.088
df		569
t-Stat		0.751
t-Critical one-tail		1.65
P(T <= t) two-tail		0.453
t-Critical two-tail		1.96

Several studies have analyzed relationships between student grades and various student characteristics such as age, gender, class standing, attendance on a part-time or full-time basis, and academic major (Chan, Shum & Wright, 1997; Sen, Joyce, Farrell & Toutant, 1997). We decided to include these variables, along with our variable of main concern, i.e., whether the course was taught by a part-time or full-time faculty member, and measure their relationships with a multiple linear regression model. In this way, we can analyze the relationship between student grades and the employment status of the faculty member (part-time or full-time) while controlling for the various student demographic characteristics mentioned above.

The multiple regression approach will be utilized here. Using the coding method of A = 4 (or 95), B = 3 (or 85), etc., is similar to estimating the mean or standard deviation of data that has been summarized into a frequency distribution. Table 3 presents the results of a multiple regression analysis.

Table 3: Regression Results

Multiple R	0.701						
R2	0.492						
Adjusted R2	0.487						
Standard Error	0.965						
Observations	571						
ANOVA							
	SS	df	MS	F	Sig.		
Regression	508.30	5.00	101.66	109.23	1.32E-80		
Residual	525.87	565.00	0.93				
Total	1034.17	570					
Correlations							
	Zero-Coefficients	Std. Error	t Stat	Sig.	order	Partial	Part
(Constant)	-1.41	0.23	-6.101433762	1.95236E-09			
Faculty Status	-0.161	0.095	-1.705	0.089	-0.031	-0.072	-0.051
Day or Evening	0.073	0.131	0.557	0.578	-0.026	0.023	0.017
Age	-0.016	0.007	-2.239	0.026	-0.043	-0.094	-0.067
Class	-0.059	0.053	-1.111	0.267	-0.058	-0.047	-0.033
Cumulative GPA	1.502	0.065	23.268	1.70E-84	0.687	0.700	0.698

Student major, class standing, day or evening attendance, and student gender were included as indicator variables. None of these indicator variables were significantly related to the grade received. A graphical analysis of the residuals did not indicate serious violations of the model's assumptions. There are no extreme points (outliers). At each grade level, residual variance does

not indicate the presence of homoscedasticity; the residuals approximate a normal distribution. The adjusted coefficient of multiple determination shown in Table 3 is equal to 0.487, indicating that 48.7 percent of the change in the dependent variable, grade, is explained by the set of independent variables (which are student characteristics, except for the faculty member status variable). The F-statistic's high value of 109.23 corroborates the existence of a significant relationship between student grades and the set of independent variables.

Independent variables that would be significant at a 0.01 level of confidence include the following:

1. Faculty member status (Part-time or full-time) t-Stat value = -1.705
2. Grade point average (GPA), t-Stat value = 23.268
3. Age = -2.239

None of the other independent variables showed a significant relationship to the course grade. During the analysis, several issues of interest were identified for possible future research. There was insufficient information derived from this study to explore those issues here. Those issues include the following:

1. Do part-time and full-time faculty members employ similar methods of teaching?
2. Do part-time and full-time faculty members use similar methods of testing and grading?
3. Is there coverage by part-time and full-time faculty members that is consistent with the prescribed courses of study?
4. Is the performance of students in lower division courses that have a quantitative component different for those students taught by part-time versus full-time faculty members?

CONCLUSION

The objective of this paper was to examine the relationship between student grades in the Applied Math with an Introduction to Calculus course and the employment status of the faculty member, i.e., part-time or full-time. A multiple regression model, which allowed for the inclusion of many student characteristics, did report a significant relationship between the two factors. We find that a student's cumulative GPA was the strongest predictor of success in the course. Next in importance was the employment status of the faculty member, part-time or full-time. It is recognized that our sample may include selection bias since part-time faculty members may teach predominantly at times where non-traditional students are enrolled.

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A REVIEW OF SIX-SIGMA, INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO), AND THE CAPABILITY MATURITY MODEL (CMM)

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ABSTRACT

This paper reviews Six-Sigma and International Organization for Standardization (ISO) as process improvement tools for management. The Capability Maturity Model (CMM) is also discussed as a way for organizations to address specific business needs.

INTRODUCTION

Davis, Aquilano and Chase (1999) define Six-Sigma as being a quality improvement program developed by Motorola to reduce process variation to 50 percent of design tolerance. Brecker (2001) states that Six-Sigma was intended to improve the quality of processes that are already under control where major special causes of process problems have been removed. With respect to the quantitative aspects of these Six-Sigma attributes, Kan (1995) states that process improvement and process variation are inherent components of the Six-Sigma concept. From a product engineering perspective, Kan notes that if failure tolerance is incorporated into the design of the product, that means it is easier to meet the specifications of the finished product, and therefore, easier to achieve Six-Sigma quality.

Given the nature of the Six-Sigma concept, both Brecker (2001) and Eckes (2001) note that it may be implemented via the following methodology:

Table 1: Six-Sigma Methodology

Step	Title	Description
1	Define	Defines customers and their requirements, team charters, and the key process that affects the customer (Eckes, 2001).
2	Measure	Identifies the key measures, the process-related data collection plan, and execution of the plan for data collection (Brecker, 2001; Eckes, 2001).
3.	Analyze	Requires that one analyze the data collected as well as the process to determine the root causes for why the process is not performing as desired (Brecker, 2001; Eckes, 2001).
4	Improve	Requires that one generate and determine potential solutions and plot them on a small scale to determine if they positively improve process perfromance (Eckes, 2001).
5	Control	Develops, documents, and implements of a plan to ensure that performance improvement remains at the desired level (Brecker, 2001).

LEGISLATION

Roetzheim (2000) states that effective process management is not without legal considerations. Associated personal liability issues may be contemplated with respect to owners, directors, and officers of a company that fails to protect the interests of the shareholders in instances where the behavior of such individuals contributes to failure. Further, Roetzheim states that failure to follow best practices may expose a company to legal liability for any failure that results, and personal liability has been addressed in the courts for specific key process areas, including testing. Therefore, one may conclude that production and operations management must continually assess process improvement issues to ensure that risk associated with legal liability is minimal.

The United States Federal Government (EPA, 2000) notes that many corporations have found that over time core processes within their organization become inefficient, bureaucratic, and cumbersome, losing their intended focus. Routine practices often add tasks and steps that do not add value to the core business goal. These inefficiencies slow down the organization, detracting from the intended goals. Based upon this assessment, industrial management functions must be concerned with process improvement initiatives. Westerman (1993) states that such improvement initiatives may allow corporations the ability to change technologies, modify or replace equipment, and alter or automate processes. Thus, sound process improvement initiatives are of paramount importance to industrial management functions and activities.

ISO CONSIDERATIONS

When considering managerial aspects of production and operations processes, managers must also consider existing mechanisms through which process improvement initiatives and functions may be facilitated. As examples, one may consider International Organization for Standardization (ISO) certification. Zahran (1998) states that ISO certification may be applicable to producers of virtually any commodity, from cars to software. Davis, Aquilano and Chase (1999) state that ISO 9000 is a delineation of quality standards that incorporate the belief that management practice can be standardized to the benefit of both the producers of goods and services and their customers. Brecker (2001) reinforces this notion by stating that ISO 9000 was developed as a standard for business quality systems. Davis, Aquilano and Chase note that with respect to ISO 9000, the quality objective is to satisfy the customer organization's quality assurance requirements and to increase the level of confidence of the customer organizations in their suppliers, and a framework is provided to guide quality process improvement.

CAPABILITY MATURITY MODEL OVERVIEW

Whitten (1995) states that every organization will have its own uniquely defined software development process to accommodate its particular needs. Kan (1995), Paulk (1995), and the Software Engineering Institute at Carnegie Mellon University (CMU, 1994) define the Capability Maturity Model (CMM) as a conceptual structure for improving the management and development of software products in a disciplined and consistent way to address the specific business needs of individual organizations. Scorsch (1996) defines the CMM as being a mechanism that provides software organizations guidance on how to gain control of their processes to develop and maintain software and how to evolve toward a culture of software engineering and management excellence. Given these concepts, the CMM may be manifested within organizations as a customized, process-oriented tool to facilitate continual process improvement.

The CMM facilitates continual process improvement through evolutionary steps rather than revolutionary innovations within a framework of five maturity levels that lay successive foundations

for continuous process improvement (CMU, 1994; Kan, 1995). Kan, Paulk (1995), and the Software Engineering Institute state that these maturity levels may be delineated as follows:

Table 2: The CMM Process Maturity Levels Framework

Level	Maturity	Descriptive Attribute
1	Initial	The software process is characterized as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on individual effort and heroics (CMU, 1994; Kan, 1995; Paulk, 1995).
2	Repeatable	Basic project management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on projects with similar applications (CMU, 1994; Kan, 1995; Paulk, 1995).
3	Defined	The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for the organization. All projects use an approved, tailored version of the organization's standard software process for developing and maintaining software (CMU, 1994; Kan, 1995; Paulk, 1995).
4	Managed	Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled (CMU, 1994; Kan, 1995; Paulk, 1995).
5	Optimizing	Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies (CMU, 1994; Kan, 1995; Paulk, 1995).

Each CMM level increases visibility into processes for both managers and engineering staff and focuses upon processes that are of value across the organization (CMU, 1994). In essence, the CMM becomes an evolutionary plateau that facilitates achievement of mature processes. Within levels two through five of maturity are key process area (KPA) requirements that outline a set of goals considered important for enhancing process capability.

Related to each KPA is a set of practices necessary for describing the activities and infrastructure that contribute to the most effective implementation and institutionalization of the key process area (CMU, 1994). Each succeeding level of maturity introduces additional KPAs while retaining and building upon KPA tenets of each previous maturity level as a method of generating process maturation (based upon levels two through five of the CMM). Below, as described by the SEI (CMU, 1994) and Kan (1995), Table 3 delineates example key practice areas.

Table 3: The CMM KPA Framework

Level	Maturity	Key Practice Area
1	Initial	None specified.
2	Repeatable	Requirements Management Software Project Planning Software Project Tracking Software Subcontract Management Software Quality Assurance Software Configuration Management

3	Defined	Organization Process Focus Organization Process Definition Training Program Integrated Software Management Software Product Engineering Inter-group Coordination Peer Reviews
4	Managed	Quantitative Process Management Software Quality Management
5	Optimizing	Defect Prevention Technology Change Management Process Change Management

Practices that describe KPAs are ordered by common features as a method of convenience (CMU, 1994). Thus, order is determined by common attributes that judge whether the implementation and institutionalization of a KPA is effective, repeatable, and lasting. Five common KPA areas are manifested, and are given by the SEI as follows within Table 4:

Table 4: Examples of Common Features of KPA Organization

Example Area	Description
Commitment to Perform	Describes the actions the organization must take to ensure that the process is established and will endure. Involves establishing organizational policies and leadership.
Ability to Perform	Describes the preconditions that must exist in the project or organization to implement the software process competently. Involves resources, organizational structures, and training.
Activities Performed	Describes the activities, roles, and procedures necessary to implement a KPA. Involves establishing plans and procedures, performing work, tracking it, and taking corrective actions as necessary.
Measurement and Analysis	Describes the practices that are necessary to determine status related to the process. Involves measurements and analysis.
Verifying Implementation	Describes the steps to ensure that the activities are performed in compliance with the process that has been established. Involves reviews and audits by management and software quality assurance.

CONCLUSION

Given this basis of the CMM, organizations may greatly improve their organizational environments and processes through evolution from a setting where few processes exist to a setting in which processes are continuously monitored and systematically improved (CMU, 1994; Paulk, 1995). Reliance upon the individual heroics of personnel may evolve to manifest a strong sense of teamwork that exists across the organization. Caputo (1996) states that CMM implementation is only a predictor of performance, not a limit to performance within organizational environments. Finally, environments that employ risky technological environments and *ad hoc* data collection

methodologies may evolve into settings where proactive technological embellishment and defined data analysis are manifested to generate process improvements.

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A REVIEW OF EXISTING CAPABILITY MATURITY MODEL (CMM) DERIVATIVE FRAMEWORKS

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ABSTRACT

This paper discusses existing Capability Maturity Model (CMM) derivative frameworks [i.e., People Capability Maturity Model (PCMM), Project Management Maturity Model (PMM), etc.]. Other derivatives are also discussed. Through a discussion of various process-related issues, the goal of these CMM derivatives is to increase production within industry settings.

INTRODUCTION

The basis of the PCMM implements human resources best practices and organizational development methodologies as its basic pattern for KPA delineation (Curtis, Hefley & Miller, 2000). Through use of the PCMM, organizations may characterize the maturity of their work force practices, guide a program of continuous work force development, set priorities for immediate actions, and integrate work force development with process improvement as methods of fostering excellence within corporate structures. Table 1 delineates the basic maturity levels that comprise the PCMM.

Table 1: The PCMM Process Maturity Level Framework

Level	Maturity	Descriptive Attribute
1.	Initial	*Ad hoc*, no formal processes
2.	Repeatable	Focuses upon instilling basic discipline into work force activities
3.	Defined	Focuses upon issues surrounding the identification of the primary organization's competencies and aligning its people management activities with them
4.	Managed	Focuses upon quantitatively managing organizational growth in people management capabilities and in establishing competency-based teams
5.	Optimizing	Focuses upon issues that address continuous improvement of methods for developing competency development, coaching, and continuous work force innovation (Curtis, Hefley & Miller, 2000).

Similar to the CMM, each PCMM maturity level also increases visibility into processes for both managers and engineering staff and focuses upon processes that are of value across the organization (Kan, 1995). Within levels two through five of the PCMM are KPA requirements that outline a set of goals considered important for enhancing process capability with respect to environmental management functions (CMU, 1994; Kan, 1995). As described by Curtis, Hefley and

Miller (2000), Table 2 delineates example KPA requirements that are unique to the PCMM framework.

Table 2: The PCMM KPA Framework

Level	Maturity	KPA
1	Initial	None specified
2	Repeatable	Work environment, staffing, training, compensation
3	Defined	Skills analysis, work force planning, career development, participatory culture, competency-based practices
4	Managed	Mentoring, team-building, competency management, organizational performance alignment
5	Optimizing	Personnel competency development, coaching, continuous work force innovation

Another application domain of the CMM framework is that of project management. According to Project Management Technologies Corporation (PMTC, 1997), the CMM framework may be used as the basis for a project management maturity model (PMM). In this instance, unique project management KPA requirements are implemented within the traditional CMM framework. Table 3 delineates this model.

Table 3: The Project Management Maturity Level Framework

Level	Maturity	Descriptive Attribute
1	*Ad hoc*	*Ad hoc* informal. The project management process is disorganized and occasionally even chaotic. Systems and processes are not defined. Project success depends on individual effort. Chronic cost and scheduling problems exist
2	Abbreviated	Some project management processes and systems are established to track cost schedule and performance. Underlying disciplines, however, are not well understood or consistently followed. Project success is largely unpredictable and cost and schedule problems are the norm.
3	Organized	Project management processes and systems are documented standardized and integrated into an end-to-end process for the company. Project success is more predictable.
4	Managed	Detailed measures of the effectiveness of project management are collected and used by management. The process is understood and controlled. Project success is more uniform. Cost and schedule performance conforms to plans.
5	Adaptive	Continuous improvement of the project management process is enabled by feed-back from the process and piloting innovative ideas and technologies. Project success is the norm. Cost and schedule performance is continuously improving (PMTC, 1997).

INDUSTRIAL PROCESS MATURITY MODEL

The IPMM may also facilitate implementation through evolutionary steps rather than revolutionary innovations within a framework of five maturity levels that lay successive foundations

for continuous process improvement derived from those of the CMM (CMU, 1994; Kan, 1995). Thus, the proposed IPMM maturity levels may be delineated as follows in Table 4.

Table 4: The Proposed IPMM Process Maturity Level Framework

Level	Maturity	Descriptive Attribute
1	Initial	Industrial management processes may be informal, undefined, and unstructured.
2	Repeatable	Basic industrial management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier industrial management successes with similar applications.
3	Defined	Industrial management processes activities are documented, standardized, and integrated into a standard process for the organization. Industrial management initiatives use an approved, tailored version of the organization's standard industrial management process for developing, implementing, and maintaining industrial activities.
4	Managed	Detailed measures of industrial management processes are collected. Industrial management process and activities are quantitatively understood and controlled.
5	Optimizing	Industrial management process improvement is enabled by quantitative feedback from processes and from piloting innovative ideas and technologies.

Similar to the CMM architecture, the proposed IPMM model also contains a set of key practices necessary for describing the activities and infrastructure that contribute to the most effective implementation and institutionalization of the key process area (CMU, 1994). Each succeeding IPMM level of maturity introduces additional KPAs while retaining and building upon KPA tenets of previous maturity levels as a method of generating process maturation (based upon levels two through five of the proposed IPMM). As examples, Table 4 delineates proposed IPMM key process areas by maturity level, and Table 5 delineates example IPMM key practice areas.

Table 5: The Proposed IPMM KPA Framework

Level	Maturity	KPA
1	Initial	None specified
2	Repeatable	Industrial Initiative Requirements Management Industrial Initiative Project Planning Industrial Initiative Project Tracking Industrial Initiative Subcontract Management Industrial Initiative Quality Assurance and Monitoring Industrial Initiative Organizational Configuration

Table 5: The Proposed IPMM KPA Framework		
Level	Maturity	KPA
3	Defined	Organization Process Focus Organization Process Definition Training Program Integrated Management of Industrial Initiatives Industrial Initiative Activities Inter-group Coordination Peer Reviews
4	Managed	Quantitative Process Management Industrial Initiative Quality Management
5	Optimizing	Industrial Initiative Monitoring Technology Change Management Process Change Management

As with the CMM architecture, the proposed IPMM practices that describe KPAs are ordered by common features as a method of convenience (CMU, 1994). Thus, similar to the CMM framework, order is determined by common attributes that judge whether the implementation and institutionalization of a KPA is effective, repeatable, and lasting. Based upon Table 5, examples of five proposed IPMM KPA categories are presented within Table 6.

Table 6: Examples of Common Features of IPMM KPA Organization	
Example	Area Description
Commitment to Perform	Describes the actions the organization must take to ensure that the process is established and will endure. Involves establishing organizational policies and leadership.
Ability to Perform	Describes the prerequisites necessary to implement industrial management processes competently. Involves resources, organizational structures, and training.
Activities Performed	Describes the activities roles and procedures necessary to implement a KPA. performing work, tracking it, and Involves establishing plans and procedures taking corrective actions as necessary.
Measurement and Analysis	Describes the practices that are necessary to determine status related to the process. Involves measurements and analysis. Verifying Implementation Describes the steps to ensure that the activities are performed in compliance with the process that has been established. Involves review and audits by management (CMU 1994).

Given this basis for the IPMM, organizations may greatly improve their industrial initiatives and processes through evolution from a setting where few processes exist to a setting in which processes are continuously monitored and systematically improved in a fashion that parallels CMM implementation (CMU, 1994; O'Brien, 1999). Further, through implementation of the IPMM architecture, organizations that employ risky technological environments and *ad hoc* data collection methodologies may evolve into settings where proactive technological embellishment and defined data analysis are manifested to generate industrial management process improvements similar to

those required by the CMM framework (Paulk, 1995). Table 7 delineates the previously introduced tools.

Table 7: Production and Operations Management Tools

Tool	Environments(s)	Benefit
TQM	FedEx Express	TQM allowed greater efficiency and effectiveness within package shipping and handling operations to achieve corporate advantage within its primary markets. As a result, the corporation received the Baldridge Award (Hunt, 1993, 1994).
Benchmarking	AT&T, Du Pont	Implementation of benchmarking programs embellished attempts to Ford, IBM increase both quality and productivity within each respective environment (Davis, Aquilano & Chase, 1999).
BPI	Wal-Mart	Implementation of BPI initiatives increased operational efficiency to provide higher quality service (O'Brien, 1999).
BPR	Sheraton Hotels,	BPR initiatives facilitated job and work integration, fostered Citicorp, Chrysler operating cost reductions, improved product design tactics, and reduced order processing time (Davis, Aquilano & Chase,1999; Harrington, 1991; Thompson & Strickland, 1996).
BPM	Westin Hotels	BPM initiatives allowed lower-ranked entities to advance to the top ten within the hotel chain (Eckes, 2001).
Six-Sigma	General Electric	Six-Sigma initiatives increased corporate profits while embellishing corporate processes (Eckes, 2001).
Legislation	U.S. Federal	Legislation addresses issues of industrialization, living standards, Government government-business relations, philosophies of collective intervention, patterns of industrial competition, and degrees of sophistication in public policy to protect both nature and humans from industrial outputs (Deresky, 1997).
ISO Standards	European Union	Through standardization tenets of the ISO, greater confidence in securing quality products among multiple markets is manifested (Gordon, 1996).

CONCLUSION

"There is no more important concern in any business, service, or manufacturing than doing something faster" (Eckes, 2001). This paper has provided evidence to support Eckes's statement. This paper has also introduced various philosophies, legislation, and quantitative tools that assist production and operations managers when implementing improvement initiatives to achieve this goal. Through addressing process-related issues, production and operations managers hope to increase the efficiency and effectiveness of processes within various industrial environments.

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EXPLORING TOTAL QUALITY MANAGEMENT (TQM) AND DERIVATIVE FRAMEWORKS OF THE CAPABILITY MATURITY MODEL (CMM)

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ABSTRACT

When considering TQM, managers must realize that they do not discover explicit tools to facilitate production and operations process improvement initiatives within the selected TQM philosophy itself. Instead, they must adopt variations of existing tools or create internal tools to fulfill the TQM tenet of continual process improvement with respect to corporate processes and procedures. Because TQM does not dictate specific production and operations process improvement guidelines, organizations must consider other models as tools through which evolutionary process improvement concerns associated with production and operations management may be facilitated. A unique framework is necessary to provide the foundation for successful maturation and evolution of processes and process management within the context of production and operations process improvement initiatives.

INTRODUCTION

The IPMM provides a framework that nurtures processes from their inception, maturation and evolution, and implementation. Through use of the IPMM, production and operations managers gain a tool which enables them to embellish process improvement initiatives through the use of a standardized framework that provides KPA tenets discretely attuned to the needs of industrial environments. Hence, the IPMM becomes a supportive measure that not only fulfills the TQM requirement of continuous improvement, but that also provides the necessary framework for addressing process-related issues from a maturation and evolutionary perspective.

Despite its categorical approach to improving production and operations process efficiency, benchmarking does not support process improvement initiatives through an evolutionary process maturity standpoint. Instead, it is concerned with goal setting and process development (Harrington, 1991). Although its methodologies advocate process development and alteration, such functions are tools through which improving production and operations process effectiveness and efficiency may be facilitated (Davis, Aquilano & Chase, 2000; Harrington, 1991, Thompson & Strickland, 1996). However, benchmarking does not provide a maturity framework to govern the evolution of individual processes. Instead, it examines quantitative measurement and knowledge without consideration of process evolution through maturity levels. Managers within production and operations environments must realize that a unique framework is necessary to provide the foundation for successful maturation and evolution of processes within the context of production and operations process improvement initiatives.

The IPMM addresses this issue through its proposed framework and discrete KPA tenets. Instead of supporting improvement initiatives from a quantitative aspect of efficiency and effectiveness, the IPMM provides the unique perspective of process improvement based upon process maturity and evolution. As a result, the IPMM becomes a tool through which operations and production managers may supplement benchmarking activities because it may be used as a

mechanism through which benchmarking may incite greater process efficiency while not compromising process effectiveness. Hence, the IPMM becomes a tool through which operations and production managers may guide the evolution and maturation of processes that are critical to benchmarking initiatives. As a result of embellishing benchmarking activities with the proposed IPMM, anticipated improvements in efficiency (without reduced effectiveness) may be accomplished.

BPI

BPI is concerned primarily with streamlining of processes, instead of evolutionary process maturation, to generate improvements with respect to efficiency and effectiveness. Streamlining, instead of evolution and maturation, becomes the influential factor within improvement initiatives. Therefore, operations and production managers must recognize that an additional framework is necessary to provide a managerial tool that advocates process evolution and maturity.

The proposed IPMM provides a tool that fulfills this unique requirement and it may be adapted to supporting streamlining activities found within industrial environments. Through use of the IPMM, production and operations managers gain a tool that facilitates process maturation from basic inception (IPMM Level 1) through an optimized state of implementation (Level 5). As processes evolve through the stages of the proposed IPMM, they become optimized during their maturation. As a result, wasteful process activities are eliminated, and the process itself is streamlined. Such streamlining occurs as a result of evolutionary maturation within the IPMM, and not as the result of a focused streamlining BPI initiative. Therefore, the proposed IPMM becomes a tool that not only addresses issues of process maturity and process evolution, but that also contributes to streamlining initiatives through its tenet of optimization.

Similar to BPI, BPR is also concerned with streamlining organizational hierarchies to incite process improvement outcomes. BPR advocates reduction of waste and inefficiency instead of fostering outcomes based upon the maturity of individual processes from an evolutionary framework perspective. Operations and production managers must recognize that an additional framework is necessary to provide a managerial tool as a foundation for successful maturation and evolution of processes. As a process progresses through the stages of evolution contained within the proposed IPMM, it becomes optimized. As a result, wasteful activities are eliminated. Hence, the proposed IPMM provides a tool that operations and production managers may implement to facilitate maturation of processes that are critical to streamlining efforts within both BPR and BPI initiatives because it advocates process optimization.

PROPOSED IPMM

The proposed IPMM fulfills this additional tool requirement. Because of its inclusion of feedback and piloting tenets, the proposed IPMM provides a mechanism through which measurement of customer satisfaction and pursuit of corporate objectives may be expressed quantitatively through metrics associated with matured, optimized processes. Hence, the proposed IPMM becomes a managerial tool through which processes critical to BPM initiatives are matured through a standardized framework of evolutionary stages.

Despite its valid contribution as an improvement methodology, operations and production managers must realize that Six-Sigma only addresses processes from the perspectives of philosophy and culture, business pursuits, or quantitative measurements. Therefore, the Six-Sigma concept does not address process improvement initiatives from the perspective of process maturity and evolution. Because of this inadequacy, an additional framework is necessary to provide a managerial tool as a foundation for successful maturation and evolution of process management within the context of production and operations process improvement initiatives.

The proposed IPMM may be considered as a tool through which production and operations managers may address this shortcoming within the Six-Sigma concept. Through its framework, organizational processes are matured and evolved through time across corporate boundaries to permeate and influence corporate culture towards greater achievement of corporate strategy and objectives. As a result, processes critical to Six-Sigma initiatives become tailored to efficiently and effectively generate quantitative measurements necessary for the pursuit of business goals and strategy.

Because it involves chronological evolution and maturation of processes, managers may integrate the proposed IPMM within corporate culture through a top-down methodology that advocates a "never-satisfied" approach to evaluating process maturity, securing corporate goals, and pursuing corporate strategy. Hence, the proposed IPMM becomes a cultural, philosophical and quantitative tool that operations and production managers may implement through organizational hierarchies.

No formal structure is indicated for addressing discrete process improvement activities with respect to a standardized framework, model, or architecture across global industrial management functions. Instead, legislation is concerned with safeguarding humans and nature from any detrimental outputs of industrial processes. Because legislation is not directly concerned with the maturation and evolution of process within an industrial setting, a framework is necessary to provide the foundation for successful maturation and evolution of process management within the context of production and operations process improvement initiatives.

The proposed IPMM provides a mechanism through which operations and production managers may address legislative issues within industrial environments. Through implementation of the proposed IPMM within an industrial setting, operations and production managers may influence the outcomes of related processes via process maturation and evolution. Therefore, processes within such environments may be matured to increase their efficiency while reducing the associated amounts of waste and harmful outputs that may be generated. Hence, the IPMM presents a valid mechanism that operations and production managers may implement to ensure that efficient, mature processes generate acceptable outputs with respect to legal specifications and constraints.
ISO

From a process-oriented perspective, Eckes (2001), indicates that ISO activities might not add to the value of the process and would not be a target for improvement because it leads to certification or continued adherence to the ISO standard. Instead, the ISO literature and discussion indicates that ISO is primarily concerned with certifications and standards and does not directly address issues of process maturity. Given such discussion, despite the existing management tools and techniques previously described, the absence of a formal framework regarding industrial management process development, improvement, monitoring, maturity, and alteration is evident within the ISO tenets.

The proposed IPMM presents a tool that operations and production managers may implement to embellish ISO initiatives within an industrial environment. Tenets of the proposed IPMM advocate process maturity and standardization. Therefore, ISO pursuits may be enhanced because repeatable, defined processes assist in formalizing and documenting industrial activities within operations and production environments. As a result, a greater validity of process specification may occur, and levels of conformance or non-conformance with ISO standards may be easily identified. Thus, areas of weakness may be improved until they are deemed acceptable within the ISO context, and strong areas may be maintained. Hence, the proposed IPMM provides an additional tool through which operations and production managers may enhance their improvement initiatives.

The proposed IPMM model implements the basic CMM maturity level frameworks as its foundation. Within this model, the general progression of maturity is evident with initial activity beginning in the *ad hoc* state and progressing through the continuous and repetitive state. However, each model requires delineation of unique, separate KPA requirements related to its given

application domain. Through examination of the PCMM and PMM models, evidence is presented to support the portability of the fundamental CMM maturity framework across application domains using different KPA requirements.

With respect to the P-CMM and PMM implementations, the application domains are constrained to those of project management and human resources. Therefore, they do not directly address issues that affect production and operations management activities. However, their existence outside the domain of software development validates the notion that the CMM framework is portable and may be tailored to address issues within unrelated application domains. Given this notion, the proposed IPMM framework is worthy of consideration within the operation and production domain as a tool through which managers may embellish their process improvement initiatives.

LITERATURE OBSERVATIONS

As organizations progress toward higher levels of global competitiveness, they must remain aware of industrially sound management practices. When competing within a global arena, corporations must also remain aware of the relationships existing among their operating practices with respect to various forms of TQM quantitative concepts (i.e., Six-Sigma, benchmarking, etc.), domestic and international legislation, ISO requirements, and industry dictates.

Each corporation, regardless of its industry or physical location, must examine its processes in order to ensure that they are optimal and industrially sound. Given these notions, coupled with information previously discussed, one may derive the following concepts regarding such attributes of process improvement initiatives within the context of operations and production management environments.

1. Because the CMM is primarily concerned with software process improvement instead of high-level organizational quality issues, it suffers shortcomings when applied to unrelated areas because necessary KPA requirements do not exist.
2. The CMM is a model that advocates continuous process improvement, primarily within organizational software environments, but is not directly concerned with unrelated process improvement applications.
3. The PCMM and PMM provide evidence to support the successful portability of the CMM architecture across process improvement domains.
4. Many methods of addressing issues within operations and production environments exist (i.e., TQM, legislation, ISO requirements, etc.), but they do not directly address discrete issues related to process improvement from an evolutionary and maturity perspective.
5. The lack of an accepted maturity model with respect to process improvement within operations and production management practices allows corporations the dynamic perspective of designing process mechanisms derived from a unique basis. As a result, process variance occurs within industries.
6. As a method of addressing process improvement issues within organizations that are unrelated to software environments, derivatives of the CMM may be generated (e.g., an IPMM) via development of necessary KPA requirements. The existence of the PCMM and PMM models substantiates this argument.
7. Based upon CMM architecture, an IPMM framework may be generated to address the unique requirements challenging sound operations and production management practices. Within the IPMM are maturity levels and KPAs associated with industrial management issues.

CONCLUSION

Through use of the CMM as a basis, organizations may develop IPMM activities through which industrial management processes may be improved to achieve higher levels of maturity within the context of production and operations environments. Given the flexible framework of the CMM, industrial management activities may evolve their separate set of objectives, maturity levels, and KPA requirements necessary to address issues of production and operations management process improvement.

Given the previous discussions, PCMM, PMM, and the recommended IPMM framework, evidence is provided that advocates implementation of the CMM as a mechanism through which process maturity frameworks unrelated to software issues may be generated. Therefore, one may conclude that the CMM is a valid tool to support derivative frameworks.

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THE SOFTWARE CAPABILITY MATURITY MODEL ARCHITECTURE AND POTENTIAL APPLICATIONS TO PROCESS IMPROVEMENTS: PRELIMINARY STUDY

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ABSTRACT

This preliminary research investigates the lack of a process improvement using maturity as a base. This paper considers the issue of whether the Capability Maturity Model (CMM) architecture may be modified to create a baseline framework capable of addressing industrial process improvement initiatives. The CMM is a software engineering process improvement model that emphasizes process maturity and evolution as its architectural basis.

INTRODUCTION

Because of the necessity of organizations to compete in a global economy, efficient and effective industrial management is increasingly becoming of paramount importance to strategic pursuits, competitive advantage, and corporate function. Although sound production and operations management methodologies favor process improvement activities in order to pursue and sustain corporate activities, they do not uniquely address industrial process improvement through a standardized framework using process maturity as its basis. Further, no single baseline framework exists to uniquely address process improvement issues with respect to industrial management considerations from an evolutionary and process maturation perspective.

HYPOTHESIS

Within the scope of this preliminary research, factors that necessitate such a maturity framework are investigated. An introductory proposal to outline a framework for an Industrial Process Maturity Model (IPMM), derived from the Capability Maturity Model (CMM) architecture is presented as a management tool in order to enhance process improvement initiatives within traditional industrial environments. As a method of addressing these concepts, Table 1 outlines the following hypothesis statements:

Table 1: Hypothesis Statements

H0:	$_{Mgt} = _{NMgt}$	Production processes may be defined as being ad-hoc or chaotic.
H1:	$_{Mgt} \quad _{NMgt}$	Production processes may not be defined as being ad-hoc or chaotic.
H0:	$_{Mgt} = _{NMgt}$	Production processes are disciplined and repeatable.
H1:	$_{Mgt} \quad _{NMgt}$	Production processes are not disciplined and not repeatable.

Table 1: Hypothesis Statements		
H0:	$_{Mgt} = _{NMgt}$	Production processes are standardized and consistent.
H1:	$_{Mgt} \quad _{NMgt}$	Production processes are not standardized and are not consistent.
H0:	$_{Mgt} = _{NMgt}$	Production processes are predictable.
H1:	$_{Mgt} \quad _{NMgt}$	Production processes are not predictable.
H0:	$_{Mgt} = _{NMgt}$	Production processes are continuously being evaluated for improvement.
H1:	$_{Mgt} \quad _{NMgt}$	Production processes are not continuously being evaluated for improvement.

Table 2 defines the following terms commonly used in CMM writings:

Table 2: Terminology
Benchmarking -Laudon and Laudon (2002) indicate that benchmarking is the determination of "strict standards for products, services, or activities and measuring organizational performance against those standards."
Business Process According to ProForma Corporation (2003) a business process may be defined as being "a series of activities designed to produce a product, service or major business deliverable."
Business Process Improvement (BPI)--The Federal Aviation Administration (FAA 2001) defines BPI as being a "systematic approach to helping an organization make significant advances in the way its business processes operate" and attempts to "align processes to better meet customer requirements."
Business Process Management (BPM)--According to Eckes (2001) BPM may be considered as being the "creation of an infrastructure" to allow for "successful process improvement through project teams" as a critical component of quality improvement efforts with respect to processes.
Business Process Reengineering (BPR)--According to Kendall and Kendall (2002) BPR is a method of "reorienting an organization around key processes."
Capability Maturity Model (CMM)--According to Kan (1995), Paulk (1995) and the Software Engineering Institute (SEI), the CMM may be defined as a "conceptual structure for improving the management and development of software products in a disciplined and consistent way to address the 'specific business needs' of individual organizations."
Industrial Process Maturity Model (IPMM)--The proposed model (derived from the CMM) that incorporates a maturity-based framework for use in traditional, industrial environments.
International Standards Organization (ISO)--According to Pfleeger (2002), ISO is a "series of standards that specifies actions to be taken when any system (i.e., not necessarily a software system) has quality goals and constraints."
Process--According to Pfleeger (2002), a process is "a series of steps involving activities constraints, and resources that produce an intended output of some kind."

Table 2: Terminology
Six-Sigma--According to Davis, Aquilano and Chase (1999), Six-Sigma is defined as being a "quality improvement program developed by Motorola to reduce process variation to 50 percent of design tolerance."
Total Quality Management (TQM)--A philosophy that Laudon and Laudon (2002) state as being the "concept that makes quality control a responsibility to be shared by all people in an organization."

LITERATURE REVIEW

Literature required to support this preliminary research is taken from the disciplines of software engineering, business management, organizational theory, and industrial engineering. The initial compilation of literature introduces numerous methodologies, philosophies, activities, and initiatives that have been employed to facilitate corporate process improvement within the context of production and operations management. However, none of the documents reveals that such initiatives address process improvement from either an evolutionary or maturity-oriented perspective. Table 3 presents existing tools, corporate environments of implementation, and their contribution to process improvement initiatives.

Table 3: Production and Operations Management Tools

Tool	Environment(s)	Benefit(s)
Benchmarking	AT&T, Du Pont, Ford, IBM, Motorola	Implementation of benchmarking programs embellished attempts to increase both quality and productivity within each respective environment.
BPI	Wal-Mart Corporation	Implementation of BPI initiatives increased operational efficiency to provide higher quality service.
BPM	Westin Hotels	BPM initiatives allowed lower-ranked entities to advance to the "top-ten" within the hotel chain.
BPR	Sheraton Hotels, Citicorp, Chrysler, General Electric	BPR initiatives facilitated job and work integration, fostered operating cost reductions, improved product design tactics, and reduced order processing time.
ISO Standards	European Union	Through standardization tenets of the ISO, greater confidence in securing "quality products" among multiple markets is manifested.

Table 3: Production and Operations Management Tools		
Tool	Environment(s)	Benefit(s)
Legislation	U.S. Federal Government	Legislation addresses issues of "industrialization, living standards, government-business relations, philosophies of collective intervention, patterns of industrial competition, and degrees of sophistication in public policy" to protect both nature and humans from industrial outputs.
Six-Sigma	General Electric	Six-Sigma initiatives increased corporate profits while embellishing corporate processes.
TQM	Federal Express	Greater efficiency and effectiveness within package shipping operations to gain competitive advantage. The corporation was awarded the Baldridge Award.

Each tool presented within the above table presents a powerful mechanism through which process improvement initiatives may be enhanced. However, despite the numerous benefits presented within this listing, the reviewed literature indicates that none of the existing tools addresses the maturity of production and operations processes using an evolutionary architecture as its basis. The perused literature does not indicate that a maturity model exists to describe such process considerations. The management and industrial engineering literature presents both qualitative and quantitative descriptions (e.g., re-engineering, business process improvement, cycle-time reduction, financial considerations, customer satisfaction and case studies) of the tools given in Table 3. However, none of these sources considers the maturity of processes within industrial environments using a maturity framework that advocates evolutionary progression of maturity stages through time. This concept is only described within the software engineering literature, and only addresses issues within the software engineering discipline. Within the software engineering literature, descriptions of the framework are not concerned with production and operations industrial settings.

As a method of investigating process maturity across areas that are unrelated to software engineering, the literature indicates that the CMM architecture has been adapted within project management, telecommunications, and security applications. However, no models were described that address industrial settings. Given the attributes of existing variants of the CMM architecture, this preliminary research investigates a derivative maturity model architecture that uniquely addresses production and operations management environments within industrial settings. Such a model presents an original contribution to the existing body of literature, and provides a method through which existing software engineering knowledge could be integrated with unrelated disciplines.

METHODOLOGY AND LIMITATIONS OF THE STUDY

The methodology involved a mail survey distributed through the U.S. Postal Service. The collected data were processed through methods of ANOVA, Chi-Squared methods, and Pearson

correlation coefficients for evaluating the primary hypothesis statements and secondary data processing. All data remained anonymous and confidential.

Because of the complexity of the CMM framework, the individual key process areas for each maturity level, potential geographic and response biases, and the complexity of individual work settings across a myriad of firms, this research effort must observe limitations. The area of interest for this study was confined to examining industrial process improvement frameworks based upon the basic CMM architecture. Therefore, it was outside the scope of this study to investigate any additional area(s) of application for the CMM (e.g., general business accounting maturity, maturity of corporate security). Hence, the results of the study were limited to the production and operations domain.

It is assumed that the perceptions and responses of those participating in the survey are representative of their unique organizations. The intent of this research is to collect the views of process specialists within industrial settings who are experienced in the arts of process improvement management philosophies, process improvement leadership and direction, time and motion studies, and process innovation.

This research was conducted with large-scale environments whose infrastructures could incorporate process improvement paradigms (i.e., TQM and BPR) for improved efficiency and effectiveness as a supporting measure for competitiveness. Therefore, this research might not be completely applicable for smaller organizations that exhibit less complex infrastructures.

RESEARCH EXPECTATIONS

This research is expected to show that the CMM of the software industry can be adapted within an unrelated industry as a process maturity framework. This research is also expected to show that existing process improvement paradigms do not address issues of process maturity and that existing industrial process environments do not conform to the tenets of the CMM.

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A REVIEW OF TWO IMPROVEMENT INITIATIVES: BUSINESS PROCESS IMPROVEMENT (BPI) AND BUSINESS PROCESS REENGINEERING (BPR)

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ABSTRACT

This paper reviews business process improvement (BPI) and business process reengineering (BPR) as improvement initiatives. One may derive the conclusion that BPI and BPR rely upon strategic command and control measures, with respect to process improvement guidance, when considering customer focus and corporate goals as influential factors within customer perceptions of satisfaction areas of service operations. However, despite their beneficial contributions as process improvement tools within the context of operations and production environments, BPI and BPR do not address their improvement methodology from the perspective of process maturity and evolution. Hence, evidence is provided to further substantiate the notion that an additional framework is necessary to provide a managerial tool as a foundation for successful maturation and evolution of process management within the context of production and operations process improvement initiatives.

INTRODUCTION

The Federal Aviation Administration (FAA, 2001) defines business process improvement (BPI) as being a systematic approach to helping an organization make significant advances in the way its business processes operate and to aligning processes to better meet customer requirements. Harrington (1991) states that BPI also confronts problematic issues through eliminating waste and bureaucracy. Thus, the goal of BPI is to incite improvement through the streamlining of operations and production processes while retaining outputs of high quality.

BPI IMPROVEMENTS

Harrington (1991) indicates that such BPI improvements may be generated through implementation of the following phases:

1. Organizing for improvement--In this instance, improvement is fostered through building leadership, understanding, and commitment. Examples include training, effective communications, delineation of customer requirements, and process examination.
2. Understanding the process--In this instance, BPI advocates understanding all the dimensions of the business process. Examples include process definition, delineation of scope and boundaries, flow-charting, and further definition of customer expectations.
3. Streamlining--In this phase, BPI attempts to improve the efficiency, effectiveness, and adaptability of the business process. Examples include automation, standardization, elimination of bureaucracy, team building, and identification of improvement opportunities.

4. Measurement and controls--This phase of BPI implements a system to control the process for ongoing improvement. Examples include implementation of feedback systems, process auditing, elimination of poor-quality cost systems, and delineation of in-process measurements and targets.
5. Continuous improvement--This BPI phase embraces the implementation of a continuous improvement process. Examples include benchmarking, provision of advanced team training, qualification reviews, process qualification, and periodic reviews.

STRATEGIC EMBELLISHMENTS

Thompson and Strickland (1996) suggest strategic embellishments for implementation with respect to process improvement initiatives. A synopsis of their recommendations may be given as follows:

1. Flow charts--Managers may develop a flow chart of the total business process, including its interfaces with other value-chain activities. As a result, a better understanding of activities within operations and production environments may be gained.
2. Simplification--Managers may attempt to simplify the process first, eliminating tasks and steps where possible and analyzing how to streamline the performance of what remains. As a result, streamlining may be achieved within production and operations environments.
3. Strategy--Managers may evaluate each activity in the process to determine whether it is strategy-critical or not. Strategy-critical activities are candidates for benchmarking to achieve best-in-industry or best-in-world performance status. Given this notion, a better understanding of the contribution of operations and production environments can be gained.
4. Automation--Managers may determine which parts of the process can be automated (usually those that are repetitive, time-consuming, and require little thought or decision). They may consider introducing advanced technologies that can be upgraded to achieve next-generation capability and provide a basis for further productivity gains down the road. As a result of implementing automation, streamlining of the production and operations environment may be generated.

BUSINESS PROCESS REENGINEERING

Davis, Aquilano and Chase (1999) state that business process reengineering (BPR) may be considered as being the process of rethinking and restructuring an organization. Gordon (1996) substantiates this definition through her observation that reengineering is the rethinking, reinventing, and redesigning of either single or multiple organizational business systems. Macintosh and Francis (2000) indicate that reengineering is the radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed. Malhotra (1998) defines BPR as being the discrete initiatives that are intended to achieve radically redesigned and improved work processes in a bounded time frame.

Reengineering surpasses normal refining of existing processes to identify the core processes and reorganize work to eliminate unnecessary steps instead of focusing upon individual personnel issues (Davis, Aquilano & Chase, 1999; Gordon, 1996). Gordon, Davis, Aquilano and Chase, Thompson and Strickland (1996), and Davenport (1993) cite the following improvements as being outcomes of reengineering initiatives:

1. Sheraton Hotels--Reengineering initiatives within the Sheraton Hotel corporate environment generated significant improvements within the operational structure. After elimination of processes that did not add value to running the hotel and elimination of paperwork that did not directly affect customer service, Gordon noted that Sheraton reduced the 40 managers and 200 employees required to run an average-sized hotel to 14 managers and 140 employees.
2. Citicorp Corporation--Reengineering efforts within the Citicorp environment, when coupled with traditional expense reduction methodologies, enabled personnel reductions of 15 percent and reduced operating expenses by 12 percent. The cumulative number of data centers was reduced from 240 to 60.
3. Chrysler Corporation--Reengineering to introduce process teams within the Chrysler environment allowed team responsibility of vehicle design from beginning to end. As a result, design issues were coordinated with manufacturing areas to generate models that were easier to build and allowed for regular consultation with purchasing agents regarding parts quality.
4. General Electric Corporation--Reengineering efforts within the General Electric circuit breaker division allowed dramatic gains in productivity and organizational capability. In this setting, the elapsed time from order receipt to delivery was cut from three weeks to three days by consolidating six production units into one, reducing a variety of former inventory and handling steps, automating the design system to replace a human custom-design process, and cutting the organizational layers between managers and workers from three to one.
5. Ford Motor Corporation--Reengineering efforts within the Ford Motor Corporation allowed significant restructuring and process linkage across functional boundaries. As a result, Davenport indicates that Ford reduced its accounts payable department by 75 percent.

Davis, Aquilano and Chase (1999) and Gordon (1996) state that nine attributes of reengineering efforts exist. These nine characteristics may be given as follows:

1. Combination of jobs--This BPR attribute involves implementation of horizontal work compression and eliminates errors that occur in transferring information from one individual to another. As a result, cycle time is significantly reduced because only one person is responsible for overseeing the entire process.
2. Worker decision-making--This BPR attribute involves implementation of vertical work compression, and it eliminates the need for the traditional and costly hierarchical organizational structure with its many layers of management. As a result, faster customer response, lower overhead costs, and increased worker empowerment are manifested.
3. Natural order of process steps--The tenets of BPR do not require that processes be forced into a sequential order, and they advocate a natural sequence of events based on what needs to be done next. As a result, parallel, concurrent operations may exist because many jobs may be performed simultaneously, thereby reducing the throughput time.
4. Logical work performance--This BPR characteristic favors the shifting of work across traditional functional boundaries as a method of allowing multiple entities to make decisions. As a result, efficiency may be increased with respect to local operations decisions.
5. Multiple versions of processes--This BPR tenet advocates multiple process versions to meet the unique requirements of different market niches as well as individual customers as a method of avoiding the inflexibility and standardized products of assembly lines.

6. Checks and controls--BPR advocates a reduction in checks and controls because checking the accuracy of processes often occurs at the end of a sequence of steps rather than at each step. As a result, judgment of workers' performance is based on results rather than on how well they followed the process.
7. Limited contact--This BPR tenet involves limiting contact with external groups to instances that are essential to the process. As a result, reduced disturbance is introduced into process implementation.
8. Point of contact--This BPR characteristic advocates determination of a single manager as a primary point of contact for the purpose of providing that person with all necessary information. As a result, one individual would handle all accounts of a client.
9. Structure type--This BPR attribute fosters both centralized and decentralized structures for the purpose of placing decision-making at the most appropriate level and position in the organization.

BUSINESS PROCESS MANAGEMENT

Because organizations may lose customer focus within their corporate structures, Harrington (1991) indicates that some business processes may became ineffective, out of date, overly complicated, burdened with bureaucracy, labor intensive, time consuming, and irritating to management and employees alike. Davis, Aquilano and Chase (1999) indicate that such occurrences may result in customer dissatisfaction if performance falls significantly short of expectations. Therefore, effective management must exist to govern process implementation and review as a method of countering such shortcomings for the purpose of generating acceptable levels of customer satisfaction.

Given these observations, organizational processes must be continuously examined to ensure that their performance is acceptable to both the firm and customer. As a method of accomplishing this task, firms may implement process improvement initiatives using business process management (BPM) tenets.

Eckes (2001) states that BPM may be considered as being the creation of an infrastructure to allow for successful process improvement through project teams as a critical component of quality improvement efforts with respect to processes. Eckes suggests that the following methodology be implemented to address process improvement from a team-based, process-related, project-oriented perspective:

Table 1: BPM Methodology

Step	Title	Description
1	Strategic Objectives	BPM initiatives for process improvement must relate to corporate strategy and must have the support of corporate leaders.
2	Process Creation	BPM initiatives must address the creation of core, key sub-processes and enabling processes.

Table 1: BPM Methodology		
Step	Title	Description
3	Process Ownership	BPM identifies the owners of all processes under consideration, and owners must be assigned to all core, key sub-processes and enabling processes.
4	Process Dashboards	BPM requires the creation and validation of process dashboards as quantitative measures of process implementation and improvement.
5	Process Data Collection	BPM requires data collection practices to be implemented with respect to the defined dashboards to accumulate quantitative metrics regarding improvement initiatives.
6	Selection Criteria	BPM orders the improvement projects as a form of selection Criteria derived from the analysis and assessment of quantitative data collected.

CONCLUSION

Within this methodology, Eckes (2001) indicates that customers travel through an organization through a series of processes, not through the functions or departments of the organization. Eckes further indicates that improvement initiatives must be chosen based upon their having the greatest impact on the business objectives of the organization. Given these concepts, managers implementing BPM as a form of process improvement initiative may address problematic situations from a perspective that considers both customer focus and corporate strategy using a logical method of improvement project ranking.

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THE CAPABILITY MATURITY MODEL (CMM) ARCHITECTURE AND FRAMEWORK WITHIN TRADITIONAL INDUSTRIAL ENVIRONMENTS: AN OVERVIEW

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ABSTRACT

This study investigated the potential for adapting the Capability Maturity Model (CMM) within traditional industrial environments. Using the CMM architecture, a similar Industrial Process Maturity Model (IPMM) was proposed. A survey was used to assess the perceptions of personnel within process improvement and process maturity work groups and initiatives. The data were analyzed and compared using ANOVA, Chi-Squared methods, and Pearson correlation coefficients. Stratification involved separating responses into categories of management versus non-management responses.

INTRODUCTION

This research determines that quality and process improvement methodologies existing within industrial environments do not advocate process maturity as their primary basis. This research also confirmed the notion that process maturity is not considered within previous or existing improvement initiatives. The proposed Industrial Process Maturity Model (IPMM) features the integration of software industry maturity models with aspects of traditional organizational settings that may provide a potential solution for shortcomings of existing paradigms. ANOVA indicates that process and procedural documentation exists in the host firms and that process and procedural training is required for both new and existing employees (Fowler, 1993). When considering the relationship between maturity level production process grouping and categorical grouping of processes within the context of improvement initiatives, a slightly positive Pearson relationship was found. Therefore, it can be concluded that little (if any) correlation exists between these issues. A slightly positive Pearson relationship between maturity level production process grouping and process maturity being a contributor to successful process output was found within the context of improvement initiatives. It can be concluded that little (if any) correlation exists between these issues.

RESEARCH SUMMARY

This research investigated aspects of Capability Maturity Model (CMM) derivation within traditional corporate environments. The literature review investigated the strengths and weaknesses of traditional management and process improvement philosophies, and it discussed the lack of process maturity attributes of each management and improvement philosophy. The examined management and improvement philosophies included TQM, BPI, BPR, BPM, Six-Sigma, and

regulation (corporate or government). The literature review and basic CMM architecture assisted in the creation of the survey instrument.

The survey questionnaire (available upon request) was distributed via U.S. Postal Service to random recipients listed in the Forbes 500 lists for the years 2001 and 2002. Specific individuals were recipients based on data contained in the lists. The data sets for this research represented a 15.67 percent participating response rate. Respondents were classified as being either management or non-management personnel for the purpose of statistical analysis. The primary hypothesis statements tested were stated as follows:

H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes may be defined as being *ad hoc* or chaotic.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes may not be defined as being *ad hoc* or chaotic.

H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are disciplined and repeatable.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not disciplined and not repeatable.

H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are standardized and consistent.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not standardized and are not consistent.

H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are predictable.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not predictable.

H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are continuously being evaluated for improvement.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not continuously being evaluated for improvement.

ANOVA was used to test the primary hypothesis statements using data collected from management and non-management groups regarding their perceptions of process maturity as a component of process improvement initiatives (Hinkle, Wiersma & Jurs, 1998). The outcomes of the primary ANOVA hypothesis testing are presented in Table 1.

Table 1: Overview of Primary ANOVA Hypothesis Testing Outcomes

Question	Statement	Statistically Significant Outcome
1	Production processes may be defined as being *ad hoc* or chaotic.	Yes
2	Production processes are disciplined and repeatable.	No
3	Production processes are standardized and consistent.	No
4	Production processes are predictable.	No
5	Production processes are continuously being evaluated for improvement.	Yes

ANOVA was implemented for questions 6-13. The outcomes of the analysis for each of these statements are given in Table 2.

Table 2: Overview of ANOVA for Questions 6-13		
Question	Statement	Statistically Significant Outcome
6.	Documentation of processes andprocedures occurs in my firm.	No
7.	Process and procedural training is mandatory for both old and new employees.	No
8.	Quality emphasis exists only for final products--not processes themselves.	No
9.	No quantitative information on product or process quality is recorded.	No
10.	Process maturity is not seriously considered within our current process improvement initiatives.	Yes
11	Process improvement is advocated by my firm.	Yes
12	Improvement initiatives are/were strictly enforced through procedures and control mechanism.	Yes
13	Process improvement initiatives are/were tracked to examine their performance.	Yes

Pearson correlation coefficients were used to determine relationships between statements 14, 15, and 16 of the survey. Table 3 presents the testing outcomes.

Table 3: Overview of Pearson Testing Outcomes				
Questions	First Issue	Second Issue	Pearson Value	Interpretation
14 and 15	Grouping of processes by maturity level would improve the outcomes of production processes.	initiatives advocating process grouping by category.	-0.02177	Little, if any, correlation is indicated from this analysis.
14 and 16	Grouping of processes by maturity level would improve the outcomes of production processes.	Process maturity being a contributor to successful process output.	0.02191	Little, if any, correlation is indicated from this analysis.

RESEARCH RECOMMENDATIONS

Firms that are considering the implementation of a process improvement initiative can use this research and its associated data to examine the potential benefits of advocating a maturity-based model for its improvement activities. Organizations seeking to optimize their processes may consider the proposed IPMM as being a candidate model in addition to such traditional paradigms such as TQM, BPI, BPM, etc., or they may consider it as an additional tool for embellishing any existing improvement initiative(s).

When comparing the basic frameworks of the CMM and the proposed IPMM, one notes both similarities and differences. Each level of the proposed IPMM directly correlates with respect to the philosophical descriptions of its counterpart within the CMM. However, the primary differences exist within the specific, direct specification of the tenets and attributes for each level of maturity.

Although the CMM contains numerous key process areas within its architecture, the proposed IPMM does not contain definitions for any key process areas within its current design. It is beyond the scope of this paper to state specific activities that firms must observe within each level of the proposed IPMM. Instead, this research only proposes the high-level IPMM model itself. Future research may investigate the salient characteristics of each IPMM level of maturity as a method of further defining and crafting its basic paradigm and key process areas.

The host environments for this study consisted of larger firms contained within the Forbes 500 list. Therefore, the applications of this research might not be applicable within smaller firms whose infrastructure is less complex. A future study may examine the potential of the proposed IPMM as a tool within smaller, less complex organizations.

Another recommendation for future investigation is related to the potential influence of bias within this research study. The Chi-Squared analysis indicated the potential for bias among the respondent survey responses. Therefore, future studies may attempt to repeat this research as a means of validating its outcomes, conclusions, and observations.

CONCLUSIONS

The literature review for this paper presents numerous methods through which traditional production industries may implement and embellish process improvement activities. Examples include TQM, BPR, BPI, BPM, Six-Sigma, Re-engineering, etc. Although these paradigms advocate both qualitative philosophies and quantitative metrics that enhance process improvement activities within organizational settings, none of these paradigms consider process maturity as its basis. However, within the software industry, the CMM provides an architecture that advocates process maturity as its basis. Therefore, this research investigates the potential of adapting the software model within traditional environments. The proposed IPMM features the integration of software industry maturity models with aspects of traditional organizational settings that may provide a potential solution for the shortcomings of existing paradigms.

When considering this research, one must realize that the concept of process quality is not identical to the concept of process maturity. During the course of implementation of the proposed IPMM, it is anticipated that fluctuations of process maturity will occur in that firms may digress or progress in maturity depending on the outcomes of certain activities. Therefore, process maturity may be considered from a dynamic perspective.

The first five survey questions directly correlated with each of the CMM's five maturity levels, and constituted the basis for the proposed IPMM levels of maturity. Statistically significant

testing outcomes were noticed for the first and the fifth questions, whereas the second through fourth questions did not yield a statistically significant outcome. The analysis of this series of questions did not prove that processes are not chaotic or random, and that production processes are not continuously evaluated for improvement.

Based on the testing outcomes, hypothesis testing indicated that processes were considered to be disciplined and repeatable, standardized and consistent, and predictable (Siegel, 1994). Both the CMM and IPMM require these attributes to be manifested throughout organizational processes and improvement activities. Given these outcomes, most of the primary, basic organizational process requirements necessary for the existence of the proposed IPMM are indicated.

Questions 6-13 considered additional organizational attributes that are advocated by both the CMM and the proposed IPMM architectures. The testing outcomes from these survey questions indicate that process and procedural documentation exists in the host firms and that process and procedural training is required for both new and existing employees. This set of outcomes also indicates that an emphasis on quality products and quality processes exists within host environments. However, little quantitative information concerning the quality of both products and processes was not statistically proven by the testing outcomes (Walpole & Myers, 1993).

As expected, questions 6-13 also confirmed the notion that process maturity is not considered within previous or existing improvement initiatives. Also, based on the additional analysis, it appears that process improvement is not clearly advocated among the respondent firms. Further, it appears that the host firms also do not clearly advocate performance tracking and the strict enforcement of such improvement initiatives.

When considering the relationship between maturity level production process grouping and categorical grouping of processes within the context of improvement initiatives, a slightly positive relationship was found. Therefore, it can be concluded that little (if any) correlation exists between these issues. A slightly positive relationship between maturity level production process grouping and process maturity being a contributor to successful process output was found within the context of improvement initiatives. Thus, it can be concluded that little (if any) correlation exists between these issues.

Practical aspects of the proposed IPMM must also be considered. Within corporate environments, it is anticipated that the IPMM may be used to embellish existing process improvement initiatives. The IPMM may also be a separate tool through which leaders may craft a separate philosophical improvement initiative that is exclusive of the existing methods used in workplace environments. However, because of the dynamic characteristics of individual host environments, no single implementation, solution, or recommendation should be considered as a generic prescription for the practical application and implementation of the proposed IPMM.

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ADAPTING THE CAPABILITY MATURITY MODEL (CMM) TO UNRELATED INDUSTRIES AS A PROCESS MATURITY FRAMEWORK

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ABSTRACT

No single baseline exists to uniquely address process improvement issues with respect to industrial management from an evolutionary and process maturation perspective. This research illustrates that the software industry's Capability Maturity Model (CMM) can be adapted within unrelated industries as a process maturity framework. This research also shows that existing process improvement paradigms do not address issues of process maturity and that existing industrial process environments do not conform to CMM tenets.

INTRODUCTION

This research provides the data descriptions, analysis, and findings from survey research of the software Capability Maturity Model (CMM) architecture and the potential applications for process improvements. (The survey is available upon request.) In the full paper, the first section provides the discussion of the survey responses and survey instrument. The second section discusses the concerns of non-response bias. A discussion of the findings is contained in the third section. The remaining sections discuss the secondary analytical procedures and conclusions.

SURVEY RESPONSES AND DATA COLLECTION

Fifteen hundred unique candidate firms comprised the superset. A total of 300 surveys were distributed to the randomly selected firms. No duplicate recipients were allowed. Sixty-four surveys were completed. The response rate for the survey was 21.3 percent; however, 16 of the respondents declined participation. Forty-seven responses generated the data sets used in this research. The data sets represented a 15.67 percent participating survey response rate.

The survey was divided into three sections: Environmental Characteristics, Improvement Initiatives, and Demographic Data. The first section queried aspects of corporate infrastructure regarding process attributes. The second section queried aspects of process improvement initiatives (both previous and existing) of work environments. The third section of the survey queried demographic data of respondent environments.

Statements contained within section one and two of the survey consisted of five possible scaled responses: 1. Strongly Disagree, 2. Disagree, 3. Unable to Judge, 4. Agree, and 5. Strongly Agree. Section three contained checklist response selections.

Section one of the survey was composed of questions 1-10. The questions investigated various characteristics of working environments. Section two was composed of questions 11-16, which considered improvement initiatives within working environments. Section three consisted of questions 17-23, which collected demographic data that described respondent firms.

ANALYSIS AND EVALUATION OF THE FINDINGS

ANOVA was performed with respect to a portion of the survey data. Survey analysis included ANOVA for managerial and non-managerial personnel for each individual hypothesis statement. ANOVA decomposed variability into primary elements with respect to the collected data. Unlike other tests in which the examination of means, standard deviations, or other values is advocated, ANOVA implements either squared deviations or the variance so that computation of distances of individual data points from their own means or from the overall mean may be summarized (Siegel, 1994). Within this model, individual groups have their own means and values that deviate from that mean. All the data points from all of the groups generate the overall mean. Total deviation is generated via calculation of the sum of the squared differences between the data points and the overall mean.

The Pearson correlation coefficient is a measure of the linear association between two variables and is used when examining whether a significant relationship between these variables exists. The values of the correlation coefficient (r) range in scope from -1.0 to +1.0. The direction of the relationship is represented with the sign of the coefficient. The absolute value of the correlation coefficient indicates the strength of the linear relationship between the given variables. Smaller absolute values indicate a weaker relationship, whereas larger absolute values indicate a stronger relationship. Pearson correlation coefficients were used to investigate relationships between survey questions 14 and 15 and between questions 14 and 16.

PRIMARY DATA ANALYSIS AND HYPOTHESIS TESTING

Primary hypothesis testing concerns the first five questions of the survey. These questions provide the basis for the hypothesis statements of this paper. The primary hypothesis statements are as follows:

H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes may be defined as being *ad hoc* or chaotic.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes may not be defined as being *ad hoc* or chaotic.
H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are disciplined and repeatable.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not disciplined and not repeatable.
H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are standardized and consistent.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not standardized and are not consistent.
H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are predictable.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not predictable.
H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are continuously being evaluated for improvement.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not continuously being evaluated for improvement.

SECONDARY DATA ANALYSIS

Secondary data analysis for this paper considers survey questions 6-16. These questions continued to investigate various characteristics of working environments with respect to the tenets of both the CMM and the proposed IPMM. Questions 6-13 evaluated management and non-management perceptions concerning each given survey statement. Questions 14-16 were examined to determine correlations among the data.

ANOVA was used to examine the data associated with questions 6-13. Questions 14-16 implemented the Pearson correlation coefficient to examine whether a significant relationship between these survey objects exists. The values of the correlation coefficient (r) range from -1.0 to +1.0. The direction of the relationship is represented with the sign of the coefficient. The absolute value of the correlation coefficient indicates the strength of the linear relationship between the given variables. Smaller absolute values indicate a weaker relationship whereas larger absolute values indicate a stronger relationship.

PEARSON CORRELATION COEFFICIENTS

Koenker (1971) and Walpole and Myers (1993) state that the Pearson correlation coefficient is a measure of the linear association between two variables and is used when examining whether a significant relationship between these variables exists. The values of the correlation coefficient (r) range from -1.0 to +1.0, and the direction of the relationship is represented with the sign of the coefficient (Siegel, 1995). The absolute value of the correlation coefficient indicates the strength of the linear relationship between the given variables. Smaller absolute values indicate a weaker relationship whereas larger absolute values indicate a stronger relationship. Pearson correlation coefficients were used to investigate relationships between questions 14 and 15 and between questions 14 and 16. Hinkle, Wiersma and Jurs (1998) present the basic formula used to calculate the Pearson correlation coefficient.

PEARSON EVALUATION OF QUESTIONS 14 &15

The Pearson correlation coefficient formula was used to investigate the relationship between the issues represented with questions 14 and 15. The following values were implemented with Pearson's formula:

Table 1: Pearson Evaluation Values for Questions 14 & 15

Variables	Values Derived From Survey Data
Σxy	-2.65957
Σx^2	27.3191
Σy^2	546.246
Pearson's r-value	-0.02177

The value of the correlation coefficient (r) is within the acceptable range of -1.0 to +1.0. In this instance, the value of r is -0.02177. The negative direction of the relationship is represented with the sign of the coefficient (negative). The absolute value of the correlation coefficient indicates the strength of the linear relationship between the given variables. In this instance, the absolute value is 0.02177. The smaller absolute value indicates a weaker relationship between the data representing the given survey questions. Therefore, little, if any, correlation is indicated from this analysis.

The Pearson correlation coefficient formula was used to investigate the relationship between the issues represented with survey questions 14 and 15. The following survey values were implemented with Pearson's formula:

Table 2: Pearson Evaluation Values for Questions 14 & 16

Variables	Values Derived From Survey Data
Σxy	2.68085
Σx^2	27.3191
Σy^2	547.915
Pearson's r-value	0.02191

The value of the correlation coefficient (r) is within the acceptable range of -1.0 to +1.0. In this instance, the value of r is 0.02191. The positive direction of the relationship is represented with the sign of the coefficient (positive). The absolute value of the correlation coefficient indicates the strength of the linear relationship between the given variables. The absolute value is 0.02191. The smaller absolute value indicates a weaker relationship between the data representing the given survey questions. Therefore, little, if any, correlation is indicated from this analysis.

CONCLUSION

This section presents a brief synopsis of the research findings. ANOVA was used to test the primary hypothesis statements using data collected from management and non-management groups regarding their perceptions of process maturity as a component of process improvement initiatives. The outcomes of the primary ANOVA hypothesis testing are presented in Table 3.

Table 3: Synopsis of Primary ANOVA Hypothesis Testing Outcomes

Question	Statement	Statistically Significant Outcome
1	Production processes may be defined as being *ad hoc* or chaotic.	Yes
2	Production processes are disciplined and repeatable.	No
3	Production processes are standardized and consistent.	No
4	Production processes are predictable.	No
5	Production processes are continuously being evaluated for improvement.	Yes

ANOVA was implemented for questions 6 through 13. The outcomes of the analysis for each of these statements are given in Table 4:

Table 4: Synopsis of ANOVA for Questions 6-13		
Question	Statement	Statistically Significant Outcome
6	Documentation of processes and procedures occurs in my firm.	No
7	Process and procedural training is mandatory for both old and new employees.	No
8	Quality emphasis exists only for final products--not processes themselves.	No
9	No quantitative information on product or process quality is recorded.	No
10	Process maturity is not seriously considered within our current process improvement initiatives.	Yes
11	Process improvement is advocated by my firm.	Yes
12	Improvement initiatives are/were strictly enforced through procedures and control mechanisms.	Yes
13	Process improvement initiatives are/were tracked to examine their performance.	Yes

Pearson correlation coefficients were used to determine relationships between statements 14, 15, and 16 of the survey. Table 5 presents the testing outcomes:

Table 5: Synopsis of Pearson Testing Outcomes				
Questions	First Issue	Second Issue	Pearson Value	Interpretation
14 and 15	Grouping of processes by maturity level would improve the outcomes of production Processes.	Improvement initiatives advocating process grouping by category.	-0.02177	Little, if any, correlation is indicated from this analysis.
14 and 16	Grouping of processes by maturity level would improve the outcomes of production processes.	Process maturity being a contributor to successful process output.	0.02191	Little, if any, correlation is indicated from this analysis.

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THE CASE OF FIRST OFFICERS VS. SECOND OFFICERS: AN EMPIRICAL STUDY OF CREW MEMBERS' PERCEPTIONS OF FATIGUE COUNTERMEASURES

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ABSTRACT

This paper investigates whether fatigue countermeasures aid in the reduction of fatigue for flight crew members. Three areas of fatigue countermeasures suggested by the host firm's Crew Resource Management (CRM) department were examined: home status, flight duty, and travel duty. The study examines flight crew members' perceptions of fatigue and the corporate crew countermeasures. Perceptions of the activities were considered via a Z-test analysis of the responses. The stratification of data involved classifying responses based on the categories of first officer versus second officer. The outcomes of this study may be used to adjust corporate training and educational activities associated with fatigue countermeasures.

INTRODUCTION

Maynes (2005) defines crew resource management (CRM) as an area of the human factors discipline that considers the elements that affect flight crew members' performance of duty. With respect to safety, CRM provides a valuable basis for structuring the relationships and interactivity among flight crew members. CRM also strives for an increased level of efficiency of operations. Flin, O'Connor and Mearns (2002) note that CRM training among pilots was advocated during the 1970s due to accidents that resulted from human error. Birdsong (2005) studies the use of CRM from the perspective of military cargo flight operations. Margerison, McCann and Davies (1986) emphasize the importance of modifying cockpit behavior with respect to the functioning of flight crews.

LITERATURE REVIEW

Rhoades and Waguespack (2004) study the quality of airline service since 1987 within the United States and find that service has improved. Grose (1995) discusses the risks associated with flying. Despite various accidents and mishaps, Murray (1997) states that aviation is a safe transportation method. Shappell and Weigman (1997) and Murray state that any expectation of employees performing tasks without error is unreasonable. Disasters within aviation have produced a variety of accidents from which flight crew members may learn lessons and modify their behaviors to produce a safer work environment.

Fatigue occurs when mental or physical weariness impairs the functioning of human abilities. Birdsong (2005) states that mental acumen is decreased, personnel may be unaware of small mistakes, and the decision-making capacity is adversely affected as a result of fatigue.

Lubner, Markowitz and Isherwood (1991) and Birdsong state that aviation accidents are preventable.

HOST ENVIRONMENT

The host firm for this study is headquartered in the United States. The firm processes an average daily parcel throughput of several million packages. The firm has approximately 138,000 employees worldwide and services over 350 airports. The airline fleet includes the Boeing 727, the DC-10, the MD-10, and the MD-11. This firm also hosts continuous supply chains that are critical to the business operations of its clients.

Ensuring that parcels are successfully delivered within a specific period of time necessitates the implementation of night work schedules. Therefore, the potential for occurrence of accidents related to fatigue is a concern among crew members, corporate leadership, the pilot union, and government authorities. Federal Aviation Administration (FAA) regulations concerning training require firms to instruct their crew members of the subtle symptoms of fatigue and any potential countermeasures that may be beneficial to combat fatigue.

METHODOLOGY

The research design for this study consisted of a formal survey that queried crew members' personal experiences with fatigue. The survey consisted of Likert scale responses for hypothesis testing and a section for the collection of demographic data. All responses associated with this research were anonymous. Data was analyzed through Z-test calculations. The stratification of recipient responses was accomplished through the classification of respondents into the categories of first officer versus second officer. The alpha value was 0.05. The hypothesized mean for each of the statistical tests was zero.

The survey population and sample were generated from the host firm. This research included the positions of captain and first officer. All crew members were assigned to night flight cargo crews. The respondents had either completed fatigue countermeasures training or were currently undergoing some form of countermeasures training. Approximately 3,000 flight crew members composed the overall population. However, only 150 surveys were issued. The response rate was approximately 62 percent.

SCOPE AND BIAS

This study recognizes various limitations of its scope, and acknowledges the potential of bias among the collected survey responses. This study does not consider a large set of responses within its population. Because the response rate for this study is low, bias may exist.

The respondents may be influenced by their flight schedules and availability. Political battles with the government, other airlines, labor unions, and internal factions concerning sleep requirements may also be a source of bias and limitation within this research. The host firm is not the only source of training for all of its crew members. Many of its crew members received similar training with previous employers. Therefore, if a respondent received training from a previous employer or another source, then it is possible that these former experiences may influence the answers provided by the survey respondents.

The host firm's primary hours of operation, types of aircrafts and loads, and flight schedules differ from those of passenger or military entities. Passenger airlines perform services and operations primarily during the day. Military environments perform operations during both day and night. Therefore, this research may not be applicable outside the scope of cargo operations.

Air routes and flight operations may also affect this research. The host firm operates both domestic and international flights, and the duration and times of flights differ significantly among corporate locations and activities. As a result, crew schedules, duties, and performance requirements may vary. Therefore, this research may not be applicable to smaller airlines or airlines that do not sponsor comparable depth and breadth of operations.

The work environment itself may be a source of bias and limitation within this study. Some crew members may not trust the confidentiality of their responses, and may provide untruthful responses that may conflict with corporate desires as a method of avoiding any perceived accountability associated with truthful answers. This study also recognizes and acknowledges the potential for non-response bias to exist given the limited number of returned surveys.

DISCUSSION

Each of the hypothesis statements was tested with respect to crew members' perceptions regarding the suggested fatigue corporate countermeasures. Three key areas of fatigue countermeasures suggested by the host firm's CRM department were examined: home status, flight duty, and travel duty. The purpose of this study is to examine crew members' perceptions of fatigue and the countermeasures suggested by the host firm. The perceptions of the activities were considered via a Z-test analysis of the responses. The stratification of data involved classifying responses based on positions of first officers versus second officers. The hypothesis statements queried personal experiences with fatigue and the sleep habits of crew members. The following table presents the outcomes of each of the tested hypothesis statements:

Table 1: Hypothesis Testing Outcomes

H_O	H_A	Z-Value	Z-Critical	Significance
Crew members do not commence duty flights with a sleep deficit.	Crew members do commence duty flights with a sleep deficit.	0.44	1.96	No
Two or more sleep periods while on the road allows crew members to accumulate an average 7 to 8 hours of sleep.	Two or more sleep periods while on the road do not allow crew members to accumulate an average 7 to 8 hours of sleep.	0.78	1.96	No
A 15 minute nap before traveling diminishes fatigue during a trip.	A 15 minute nap before traveling does not diminish fatigue during a trip	0.81	1.96	No

Table 1: Hypothesis Testing Outcomes

H_O	H_A	Z-Value	Z-Critical	Significance
Crew members make sleep a priority during personal hours at home.	Crew members do not make sleep a priority during personal hours at home.	0.94	1.96	No
Anchor sleep patterns when at home help to increase energy.	Anchor sleep patterns when at home do not help to increase energy.	0.63	1.96	No
Utilizing the circadian rhythm improves the quality of sleep.	Utilizing the circadian rhythm does not improve the quality of sleep.	0.04	1.96	No
A pre-sleep routine promotes faster sleeping during travel.	A pre-sleep routine does not promote faster sleeping during travel.	0.82	1.96	No
Napping in the cockpit increases alertness during flight.	Napping in the cockpit does not increase alertness during flight.	0.53	1.96	No

Hypothesis testing did not show a statistically significant outcome for any of the tested statements. In each case, the null hypothesis was accepted with respect to the categories of crew members' perceptions concerning sleep deficit, sleep periods used to accumulate seven to eight hours of sleep, napping, making sleep a priority during personal hours, anchor sleep, the circadian rhythm, pre-sleep routines, and cockpit naps.

Sound safety and training practices must be observed and implemented to preserve human lives. The responsibility for ensuring that crew members are rested and capable of performing their duties effectively must be shared among organizations and individuals. Soeters and Boer (2000) state that 75-80 percent of accidents involving civil aircraft are attributed to human factors.

The use of the examined fatigue countermeasures during periods of rest, during the performance of duty, or when traveling for business purposes may avert accidents and provide a greater level of safety for both the host firm and other aviation members who are employed in similar environments. The implementation of a training program that includes topics associated with fatigue and its symptoms may provide organizations and individuals with information that may save lives and maintain a robust perception of the corporate environment. The outcomes of this study may be considered with respect to the inclusion of fatigue countermeasures training for both organizations and individuals.

RECOMMENDATIONS AND CONCLUSIONS

Overall, the hypothesis testing outcomes indicate that the perceptions of the respondents regarding the countermeasures suggested by the host firm may be helpful in reducing fatigue during periods when personnel reside in their personal homes, when performing flight duties, and

when traveling for business purposes. It is recommended that the use of the corporate fatigue countermeasures be continued. However, it is suggested that further investigations be performed regarding the personal use of anchor sleep patterns using a larger data set.

The hypothesis testing outcomes of this research may be useful to the host firm as a tool through which its fatigue countermeasures and related training philosophy may be adjusted. Given the testing outcomes, it is recommended that the current training activities and implementation be continued. Further, it is recommended that the host firm continue its existing flight operations in accordance with FAR 121.503 through FAR 121.525.

The stratification and categorization of responses used within the Z-test analysis was based only on the categories of first officer versus second officer. This study does not examine the suggested corporate fatigue countermeasures from any other perspectives. Therefore, it is suggested that additional data analysis use the responses based on respondent age, seniority, flight routes, marital status, and aircraft type. Further, these research outcomes may not be applicable to military personnel, passenger airlines, chartered services, private aviation, or other airline services. Therefore, it is recommended that research initiatives be undertaken within each of these settings with respect to the given hypothesis statements.

Other firms may also benefit from the outcomes of this study. The findings of this study may be considered with respect to fatigue countermeasures training programs. Therefore, it is recommended that similar studies be performed within any organization that is considering the implementation of training that contains topics of fatigue countermeasures.

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A STUDY OF THE BENEFITS OF ADAPTING SOFTWARE PROCESS IMPROVEMENT FRAMEWORKS AND ARCHITECTURES IN TRADITIONAL SETTINGS

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ABSTRACT

This paper evaluates the benefits of adapting software engineering process improvement frameworks and architectures in traditional industrial settings. It is through this mechanism that managers of technical, engineering, and business environments may obtain an additional paradigm to support industrial process improvement initiatives. This preliminary research involves a multi-disciplinary study of computer science, software engineering, and industrial management.

INTRODUCTION

Because of the necessity of organizations to compete in a global economy, industrial management is increasingly becoming of utmost importance to the strategic pursuits, competitive advantage, and corporate function of numerous firms. Although sound manufacturing management methodologies favor process improvement activities to pursue and sustain corporate activities, they do not uniquely address process improvement through a standardized framework using process maturity as a basis for improvement efforts and activities.

No single baseline framework exists to uniquely address process improvement issues with respect to manufacturing considerations from an evolutionary and process maturation perspective. However, within the field of software engineering, the Capability Maturity Model (CMM) addresses process improvement from the perspective of process maturity and evolution (CMU, 1994).

Traditional manufacturing, production, and operations environments rely upon quantitative and qualitative methods of process improvement. Examples of such methods include the use of Total Quality Management [TQM] (Harrington, 1991), Business Process Re-engineering [BPR] (Jordan, 2000), and Six-Sigma (Eckes, 2001). Despite their tremendous benefits for organizations, none of these methods advocates process maturity as a theoretical basis or principle.

This preliminary research evaluated whether the CMM architecture may be modified to create a baseline framework capable of addressing industrial process improvement initiatives. This preliminary research derived an Industrial Process Maturity Model (IPMM) framework from the CMM architecture. The IPMM model may be recommended as a management tool to enhance process improvement initiatives within manufacturing environments.

Given the proliferation and growth of global business during the last century, both organizations and individuals have been affected with numerous challenges with respect to managing both manufacturing environments. Although organizations may employ different industrial management practices, each individual organization presents a unique situational basis for structuring process improvement initiatives. However, manufacturing management processes

are not based on centralized maturity frameworks to assist in their development, maturation, monitoring, and evolution (Davis, Aquilano & Chase, 1999).

Through introduction of the CMM as a valid foundation for formulating industrial process improvement frameworks, both individuals and corporations may experience enhanced manufacturing management activities. By viewing process improvement from a maturity perspective, traditional manufacturing, production, and operations environments gain an additional tool through which their output effectiveness and efficiency may be improved or enhanced. Therefore, this paper evaluates the benefits of the IPMM as a derivative of the CMM architecture.

RESEARCH DESIGN AND DATA COLLECTION

The methodology of this preliminary research consisted of distributing a questionnaire that contained scaled, multiple-choice questions concerning personnel perceptions of current industrial process improvement activities and paradigms. Queried categories consisted of respondent perceptions concerning project management, process descriptions, process improvement paradigms, process efficiency and effectiveness, and factors related to derivatives of the software CMM levels.

The questionnaires were distributed to quality assurance and quality control personnel, or personnel involved with process management among targeted respondents. The questionnaires were returned either via the U.S. postal service or manually. A period of two weeks was allowed to complete and return surveys. A self-addressed, stamped envelope was provided to return the survey. Once the survey forms were returned, the response rates were calculated and the responses were recorded. Appropriate personnel were employed to assist in the collection and the creation of data sets based upon the recorded responses to the survey.

The survey instrument was arranged into sections that consider existing and previous process industrial improvement paradigms, factors that contribute to a successful adaptation of the CMM within industrial environments, and corporate demographics. Host environment security, privacy, and confidentiality considerations were observed and respected during the implementation of this survey.

The survey conformed to specifications delineated by Fowler (1993) and those indicated by Hinkle, Wiersma & Jurs (1998). The instrument contained language tailored for simplicity in order to avoid ambiguous questions that could incite confusion among the surveyed respondents. Queries were presented using a multiple-choice format. Respondents were allowed to complete the survey at their leisure. Further, the survey was designed to be concise and required little time for completion. The collected data were used solely for the preliminary research purposes outlined and specified within this paper.

RESEARCH QUESTION AND INVESTIGATION

Survey questions were designed to investigate the salient characteristics of the primary research question: Can the CMM of the software industry be adapted to create a maturity framework within the manufacturing industry? The primary areas of investigation explored the issues of whether industrial process maturity is positively related to a successful process output and whether the existing process improvement paradigms address concerns of process maturity. Table 1 contains the initial hypothesis statements for testing.

Table 1: Hypothesis statements
H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes may be defined as being *ad hoc* or chaotic.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes may not be defined as being *ad hoc* or chaotic.
H0: $\mu_{Mgt} = \mu_{NMg}$ Production processes are disciplined and repeatable.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not disciplined and not repeatable.
H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are standardized and consistent.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not standardized and are not consistent.
H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are predictable.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not predictable.
H0: $\mu_{Mgt} = \mu_{NMgt}$ Production processes are continuously being evaluated for improvement.
H1: $\mu_{Mgt} \neq \mu_{NMgt}$ Production processes are not continuously being evaluated for improvement.

Respectively, each of the above hypothesis statements relates to the primary description of the first through fifth levels of the CMM. Additional data processing, testing outcomes, and analytical discussions will be presented in subsequent paper.

EXPECTED FINDINGS

The expected outcomes of this research are given as follows:

1. This research is expected to show that the CMM of the software industry can be adapted within unrelated industry as a process maturity framework.
2. This research is expected to show that existing process improvement paradigms do not address issues of process maturity.
3. This research is expected to show that existing industrial process environments do not conform to the tenets of the CMM.

SUBJECTS AND HOST ENVIRONMENTS

The primary host environments for this study consisted of firms that require an emphasis on production and operations environments. The *Forbes Magazine* listing of top 500 corporations was purchased as a source of potential subject environments that represent many industrial work settings. Additional listings consisted of the *Forbes Magazine* listing of its top 500 international corporations and the *Forbes Magazine* listing of top 500 private companies. These listings contained the *Forbes Magazine* top 500 companies with respect to assets, market value, profits, and sales within their respective classifications. An overall population superset of potentially 1500 companies was possible when the lists were integrated.

PROCEDURES

The overall population superset was expected to contain 1500 candidate members. A database was constructed to house the entire superset of potential subjects. Duplicate listings were eliminated. As a method of generating a sample set from this population, every fifth corporate listing was extracted from the superset to generate a randomized group for sampling purposes (Walpole & Myers, 1993). Based upon the responses to each survey question, stratification involved grouping responses into management and non-management classifications from a variety of host environments. Randomization occurred through the use of random sampling as a method of providing population elements with an equal chance of being selected as sample records. The generated records were recorded in a host environment subset database.

This host environment subset database provided the list of subject environments for research activities. Confidentiality of data was of prime importance. Additional feedback on survey design was obtained from colleagues employed within process improvement teams of a significant Fortune 1000 corporation in the Memphis, Tennessee area.

The survey packet contained the following materials: 1. research confidentiality statement, 2. survey instructions, 3. announcement of survey results, 4. survey introduction 5. researcher survey introduction, and 6. the questionnaire. Confidentiality and respect of corporate security were emphasized within the introductory materials. Further, a statement of instructions was included as a method of providing respondents with an example of proper survey completion and submission procedures. Names and addresses of specific respondents were provided with the list. A notice was included that informed respondents that the survey results may be obtained through electronic mail or surface mail. An introductory letter that stated the purpose of the survey was included with the questionnaire.

DATA PROCESSING

The data collected during this preliminary research initiative was maintained within an electronic database and spreadsheet environment that supported automated data processing. Data were analyzed using analysis of variance (ANOVA), Pearson Correlation Coefficients, Chi-Squared Methods, and any other appropriate mathematical techniques. Charts and graphs were used to graphically depict data characteristics, calculation outcomes, and any other relationships among data. Tables were also used for the presentation of data.

The survey responses were divided into two groups that represent the perceptions of management and non-management personnel in response to each survey question. ANOVA was used to evaluate management versus non-management responses to the survey questions. The Chi-Squared Method was used to compare actual responses with a set of anticipated responses for the survey data sets.

LIMITATIONS AND SCOPE OF THE STUDY

Because of the complexity of the CMM framework, the individual key process areas for each maturity level, potential geographic and response biases, and the complexity of individual work settings across many firms, this preliminary research effort observed limitations. The area of interest for this study was confined to examining industrial process improvement frameworks based upon the basic CMM architecture. Therefore, it was outside the scope of this study to investigate any

additional area(s) of application for the CMM (e.g., general business accounting maturity, maturity of corporate security, etc.). Hence, the results of the study were limited to the production and operations domain.

It is assumed that the perceptions and responses of those participating in the survey were representative of their unique organizations. The intent of this research was to collect the views of process specialists within industrial settings who arc experienced in the arts of process improvement management philosophies, process improvement leadership and direction, time and motion studies, and process innovation.

CONCLUSION

This preliminary research was conducted in large-scale environments whose infrastructure may incorporate process improvement paradigms (e.g.,TQM, BPR, etc.) for improved efficiency and effectiveness as a supporting measure for competitiveness. Therefore, this preliminary research might not be completely applicable for smaller organizations that exhibit less complex infrastructures.

Within this research initiative, bias may be manifested through the incomplete set of returned questionnaires. Because an incomplete set of surveys may be examined to generate the data, an accounting for data contained within the surveys that are not returned is not possible.

The geographic location of the host environments may also contribute to bias. Because the host environments are located within numerous regions, it is possible that unique cultural factors within the work setting may influence the research outcomes.

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CREW MEMBERS' PERCEPTIONS OF A CARGO AIRLINE'S CREW RESOURCE MANAGEMENT (CRM) FATIGUE COUNTERMEASURES: AN EMPIRICAL STUDY

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ABSTRACT

This paper studies the efficacy of a cargo airline's crew resource management (CRM) fatigue countermeasures as successful deterrents to fatigue. Three areas of fatigue countermeasures were examined: home status, flight duty, and travel duty. These queries investigated crew members' perceptions of whether the countermeasures significantly reduced the onset of fatigue. The activities were analyzed using the Pearson correlation coefficient. Little, if any, strengths of relationships were observed. The findings of this study may be used to adjust corporate training and educational activities associated with fatigue countermeasures.

INTRODUCTION

Fatigue may result from everyday work situations or stressors that adversely affect flight crew members. Birdsong (2005) states that fatigue contributes to diminished and poor decision-making abilities among crew members and increases the risk of human error. Caldwell, Caldwell, Brown and Smith (2004) study the effects and symptoms of fatigue. Printup (2005) states that over 70 percent of aviation accidents are due to pilot error that may be associated with fatigue.

Humans are vulnerable to many harmful conditions, frailties, and weaknesses. They may become ill, they require rest and nourishment, they may tire, they may succumb to the effects of time and age, and they may experience emotional fluctuations ranging from joy to despair. Their needs are both dynamic and sporadic. Therefore, the potential exists for mental and physical fatigue. Fatigue is a condition that presents dangers for crew members, airline clients and customers, and corporate stakeholders. Fatigued crew members may make poor choices during critical moments that require peak performance and sound decision-making. Although fatigue may manifest itself with various symptoms, countermeasures exist that may be helpful in reducing the detrimental effects of fatigue. This study examines crew members' perceptions of fatigue and the corporate crew resource management (CRM) fatigue countermeasures suggested by the host firm.

HOST FIRM'S ENVIRONMENT

The host firm in this study is headquartered in the United States. The firm processes an average daily package throughput of approximately 3.2 million cargo deliverables and serves more than 375 airports worldwide. Therefore, the firm operates across many time zones and geographic regions, necessitating the use of transmeridian flights. The firm uses over 600 aircraft including the Boeing 727, the DC-10, the MD-10, and the MD-11. The firm is a part of the continuous supply chains that are critical to the business operations of its clients.

Federal Aviation Administration (FAA) regulations require that crew members receive instruction identifying the warning signs that are symptomatic of fatigue and the countermeasures that may be effective against such symptoms. Ensuring that parcels are successfully delivered within a specific period of time necessitates the implementation of night work schedules. Therefore, the potential for fatigue-related accidents to occur is a concern among crew members, corporate leadership, the pilot union, and government authorities.

This study examines whether crew members find the suggested corporate CRM fatigue countermeasures helpful in commencing duty flights without a sleep deficit when at home, when performing flight duty, and/or when traveling for business purposes. Airline operations during the morning and overnight hours disturb the sleep cycles of crew members. The assigning of differing flight schedules creates the potential for fatigue to occur. All crew members receive CRM training with respect to fatigue countermeasures.

The cockpit environment is continuously active (24 hours a day, seven days a week) with rotating assignments for crew members. Light schedules are determined through a bidding process based on seniority. Both historical and engineering data were used in the calculations regarding the duration of flight schedules. Flights occur primarily between 2:00 a.m. and 5:00 a.m. Federal Aviation Regulations 121.503 thru 121.525 regulates the hours of flight duty that crew members may work (Federal aviation, 1996). Corporate CRM regulations specify flight duty times for crew members. The firm has a fatigue policy that makes allowances for work absences when crew members are unable to safely perform their tasks and adequately satisfy their duty requirements. Food and beverages are catered as necessary with respect to flight duty time, locations, and delay periods as a fatigue countermeasure. Corporate CRM fatigue training includes instruction regarding the proper intake of food and the corresponding reaction of crew members concerning drowsiness and the onset of sleep associated with eating. Therefore, crew members must recognize their individual physical needs when planning and preparing their flight schedules.

METHODOLOGY AND EXPECTED OUTCOMES

The research design consists of a formal survey process that queried crew members' personal experiences concerning fatigue with respect to diet, exercise, circadian rhythm, and sleep habits. The survey consisted of Likert scale responses for the collection of demographic data. All responses associated with this research were anonymous.

The survey population and sample for this study were generated from the host firm's work environment. The positions of captain, first officer, second officer, and check airmen were surveyed. Crew members were assigned to night flight crews. The respondents had either completed corporate CRM fatigue countermeasures training or were currently undergoing some form of training. Approximately 3,000 crew members comprised the overall population. However, because this was a pilot study, only 150 surveys were issued. A response rate of 62 percent was observed with respect to the issued surveys.

The optimal performance of duties, when crew members are alert and rested, contributes to a safer work environment. Therefore, the anticipated outcomes of this study were expected to show that crew members' perceptions regarding the implementation of corporate CRM fatigue countermeasures made significant contributions to beginning duty flights without a sleep deficit.

INVESTIGATING CORRELATIONS

The data set was examined in order to investigate potential correlations among various notions associated with corporate CRM fatigue countermeasures. The Pearson correlation coefficient was used to analyze the data. Overall, several comparisons were made with the data, and each of the comparisons assumed that no sleep deficit existed among crew members. The Pearson correlation coefficients were then used to investigate whether a relationship existed between the corporate CRM fatigue countermeasures and the onset of fatigue when commencing duty flights.

The first investigation examined the relationship between not manifesting a sleep deficit when commencing duty flights and whether the use of anchor sleep patterns helped to increase energy. The second investigation examined the relationship between not manifesting a sleep deficit when commencing duty flights and making sleep a priority among crew members. The third investigation examined the relationship between not manifesting a sleep deficit when commencing duty flights and utilizing circadian rhythm to increase the quality of sleep. The fourth investigation examined the relationship between not manifesting a sleep deficit when commencing duty flights and the use of two or more sleep periods during duty travel in order to accrue an overall amount of eight hours of sleep. The fifth investigation examined the relationship between not manifesting a sleep deficit when commencing duty flights and taking a 15-minute nap before duty travel to reduce fatigue. The sixth investigation examined the relationship between not manifesting a sleep deficit when commencing duty flights and the use of a pre-sleep routine to induce slumber. The seventh investigation examined the relationship between not manifesting a sleep deficit when commencing duty flights and cockpit napping as a method of increasing alertness. Table 1 presents the Pearson correlation coefficients outcomes:

Table 1: Pearson Correlation Coefficient Outcomes

Query	Notion 1	Notion 2	Pearson Correlation Coefficients
1	Not manifesting sleep deficit when beginning duty flights	Home use of anchor sleep patterns increases energy	0.12
2	Not manifesting sleep deficit when beginning duty flights	Crew members make sleep a priority	0.23
3	Not manifesting sleep deficit when beginning duty flights	Utilizing the circadian rhythm improves the quality of sleep	0.26
4	Not manifesting sleep deficit when beginning duty flights	Two or more sleep periods while on the road allows crew members to accumulate an average of seven to eight hours of sleep	0.36
5	Not manifesting sleep deficit when beginning duty flights	A 15-minute nap before traveling diminishes fatigue during a trip	0.11
6	Not manifesting sleep deficit when beginning duty flights	A pre-sleep routine promotes faster sleeping during travel	0.19

7	Not manifesting sleep deficit when beginning duty flights	Napping in the cockpit increases alertness during flight	0.20

IMPLICATIONS AND RECOMMENDATIONS

This study investigated the strength of the relationships associated with an asymptomatic sleep deficit manifestation when commencing duty flights in conjunction with seven corporate CRM fatigue countermeasures. The Pearson correlation coefficients indicated that little, if any, relationship existed among the tested data sets associated with each of the notions tested.

The responsibility for ensuring that crew members are rested and are capable of performing their duties safely and efficiently must be shared among many entities. The use of the recommended corporate CRM fatigue countermeasures during periods of rest, during the performance of duty, and/or when traveling for business purposes may prevent accidents and provide a greater level of safety for both the host firm and for other members of the aviation and aerospace communities.

This research was conducted as a pilot study investigating crew members' perceptions of suggested corporate CRM fatigue countermeasures with respect to the periods when crew members reside in their personal homes, when performing flight duties, and/or when traveling for business purposes. Regardless of the setting or situation, sound safety and training practices must be observed and implemented in order to prevent accidents.

The anticipated outcomes of this study were expected to show that crew members' perceptions of the implementation of the corporate CRM fatigue countermeasures made a significant contribution to beginning duty flights without a sleep deficit. However, in contrast, the outcomes of this research suggested that little, if any, relationship exists among the tested countermeasure notions. Each of these notions was considered with respect to whether crew members begin duty flights without a sleep deficit. Little strength of relationship, if any, was observed among perceptions concerning whether the corporate CRM fatigue countermeasures significantly contributed to commencing duty flights without a sleep deficit.

The findings of this study may be considered with respect to the adjustment of corporate CRM fatigue countermeasures training for both internal and external organizations and individuals. Change is the mechanism through which individuals, groups, and organizations mature into stronger entities. Within the host firm's environment, the continuation of the prescribed corporate CRM fatigue countermeasures may provide advantages that could preserve life and avoid accidents despite the indications suggested by the outcomes of this study. It is recommended that such procedures and any associated corporate CRM fatigue countermeasures training continue for crew members.

This study only investigates potential correlations among the collected data; it does not examine the suggested corporate CRM fatigue countermeasures from any other perspective. Therefore, it is suggested that additional research commence using stratification and categorization of responses based on respondent's age, seniority, flight routes, marital status, rank or flight crew position, and aircraft type.

Further, this study was conducted within the work environment of a cargo airline engaged in overnight operations. Therefore, these outcomes may not be applicable to military environments, passenger airlines, chartered services, or other airline services. Also, because only night operations were considered, these outcomes may not be applicable to daytime operations. Given this consideration, it is recommended that research initiatives be undertaken within each of these settings and conditions with respect to the investigated statements.

This was a pilot study investigating initial outcomes regarding crew members' perceptions of corporate CRM fatigue countermeasures. A small number of responses were considered from the analyzed data; therefore, it is recommended that this research be repeated using a larger data set.

CONCLUSIONS

The outcomes of these investigations show that no relationship exists between commencing a duty flight without a sleep deficit and the use of anchor sleep patterns before duty flights. The investigations did not show a strong relationship between commencing duty flight without a sleep deficit and observance of the circadian rhythm.

Little, if any, relationship was observed between commencing duty flight without a sleep deficit and using multiple sleep periods during the travel period to accumulate seven or eight hours of sleep. Little, if any, relationship was observed between commencing duty flight without a sleep deficit and the use of a 15-minute nap before commencing duty flight. The outcomes indicated that little, if any, relationship existed between commencing duty flight without a sleep deficit and pre-sleep routines to induce sleep. Lastly, the outcomes indicated that little, if any, relationship existed between commencing duty flight without a sleep deficit and cockpit napping during duty flight.

The Pearson correlation coefficient outcomes did not demonstrate a significant outcome in any of the cases tested. Therefore, it is concluded that the corporate CRM fatigue countermeasures have little, if any, relationship with commencing duty flights without manifesting a sleep deficit.

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AN EMPIRICAL STUDY OF PERCEPTIONS RELATED TO CARGO FLIGHT CREW MEMBERS' FATIGUE COUNTERMEASURES: CAPTAINS vs. SECOND OFFICERS

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ABSTRACT

The purpose of this study was to examine personnel perceptions of fatigue and the corporate crew countermeasures suggested by the host firm. Three areas of fatigue countermeasures suggested by the firm's crew resource management (CRM) department were examined: home status, flight duty, and travel duty. The perceptions of the activities were considered via a Z-test analysis of the responses. The stratification of data involved classifying responses based on the categories of captain versus second officer. The outcomes of this study may be used to adjust corporate training and educational activities associated with fatigue countermeasures.

INTRODUCTION

Murray (1997) states that aviation personnel are susceptible to the fallibility of human weaknesses. Fatigue occurs when mental or physical weariness impairs the functioning of human abilities. Therefore, crew members ultimately exhibit the symptoms of fatigue. Birdsong (2005) states that mental acumen is decreased, that crew members may be unaware of small mistakes, and that the decision-making capacity is adversely affected as a result of fatigue. Bettes (2002) notes that aviation accidents are among the most feared modern events. Weigman and Shappell (2001) state that aviation accidents have increased over the years. Lubner, Markowitz and Isherwood (1991) state that accidents related to aviation are a preventable cause of death.

Numerous countermeasures exist that may be helpful in reducing the symptoms and effects of fatigue. Examples include getting seven to eight hours of sleep, napping before duty, making sleep a priority during personal hours, achieving sufficient amounts of anchor sleep, observing of the circadian rhythm, using of pre-sleep routines, and taking cockpit naps. The purpose of this research is to investigate cargo crew members' perceptions associated with these sleeping habits during duty, personal time, and business travel.

LITERATURE REVIEW

This study suggests that sleep inertia negatively affects decision-making capacity for nearly 30 minutes after abrupt, nocturnal waking, and that the strongest symptoms occur within the three-minute period after initial wakefulness occurs. This study also suggests that the capacity to make decisions may continue to be negatively affected by approximately 20 percent below an optimal level after 30 minutes of wakefulness.

Caldwell and Roberts (2000) examine the effects of stimulants with respect to aviator performance. Belland (2003) studies the use of amphetamines and barbiturates among aviators

during World War II, Vietnam, and the Gulf War. This research discusses the potential of fatigue as a prevalent factor among military operations. This research finds that safety performance is diminished during such continuous operations involving fatigued crew members.

LeDuc, Caldwell and Ruyak (2000) study the potential of physical exercise as a fatigue countermeasure among crew members. Petrie, Powell and Broadbent (2004) examine various fatigue counter-strategies among international aviation personnel. Cocklin (2004) examines performance issues with respect to the Swissair 111 accident of 1998. Lowden, Akerstedt and Wibom (2004) examine the exposure of workers to bright lights during night shift work in order to investigate the suppression of melatonin and sleepiness.

HOST FIRM'S ENVIRONMENT

The host firm is headquartered in the United States. The firm processes an average daily parcel throughput of several million packages. This firm has approximately 138,000 employees worldwide and flies to over 350 airports. The fleet is comprised of the Boeing 727, the DC-10, the MD-10, and the MD-11. This firm also hosts continuous supply chains that are critical to the business operations of its clients.

Ensuring that parcels are delivered within a specific period of time necessitates the implementation of night work schedules. Therefore, the potential for accidents related to fatigue is a concern among crew members, corporate leadership, the pilot union, and government authorities. Federal Aviation Administration (FAA) regulations concerning training require that crew members be aware of the subtle symptoms of fatigue and any potential beneficial countermeasures of fatigue.

Airline operations during the morning and overnight hours disturb the sleep cycles of crew members. The assigning of multiple flight schedules leads to crew member fatigue. All crew members receive CRM training with respect to fatigue countermeasures. This study examines the perceptions of fatigue countermeasures in order to investigate whether crew members find the suggestions to be helpful in reducing fatigue at home, during flight duty, and when traveling for business purposes.

METHODOLOGY

The research design for this study involved the use of a formal survey that queried personal crew members' experiences with fatigue. The survey consisted of Likert scale responses for hypothesis testing and a section for the collection of demographic data. All responses associated with this research were anonymous. Data were analyzed through the use of Z-test calculations. The stratification of recipient responses was accomplished through the classification of respondents into the categories of captains versus second officers. The alpha value was 0.05. The hypothesized mean for each of the statistical tests had the value of zero.

The survey population and sample for this study were generated from the host firm. All of the personnel were members of night flight cargo crews. The respondents had either completed fatigue countermeasures training or were currently undergoing some form of countermeasures training. A total of approximately 3,000 flight crew members composed the population. However, only 150 surveys were issued with a response rate of approximately 62 percent.

SCOPE AND BIAS

This research study recognizes various limitations of its scope and acknowledges the potential of bias due to the low response rate among the collected surveys. Therefore, this research does not consider a large set of responses within its data set.

The work environment itself may be a source of bias and limitation within this study. Some crew members may not have trusted the confidentiality of their responses, and may have provided untruthful responses that may conflict with corporate desires as a method of avoiding any perceived accountability associated with truthful answers. This study also recognizes and acknowledges the potential for non-response bias to exist given the low number of returned surveys.

DISCUSSION

The demographic data obtained from this survey presents some interesting characteristics of the respondents. Forty-seven percent of the respondents were female and 53 percent were male. No respondents were between the ages of 20-25, five percent of the respondents were between the ages of 26-30, 19 percent of the respondents were between the ages of 31-39, 19 percent of the respondents were between the ages of 40-45, 25 percent of the respondents were between the ages of 46-50, 21 percent of the respondents were between the ages of 51-55, and 11 percent of the respondents were over the age of 55.

Each of the hypothesis statements were tested with respect to crew members' perceptions regarding the suggested fatigue corporate countermeasures. Three areas of fatigue countermeasures suggested by the host firm's CRM department were examined: home status, flight duty, and travel duty. The perceptions of the activities were analyzed using a Z-test. The following table presents the outcomes of each of the tested hypothesis statements:

Table 1: Hypothesis Testing Outcomes

H_O	H_A	Z-Value	Z-Critical	Significance
Crew members do not commence duty flights with a sleep deficit.	Crew members do commence duty flights with a sleep deficit.	1.64	1.96	No
Having two or more sleep periods while on the road allows crew members to accumulate an average 7- 8 hours of sleep	Having two or more sleep periods while on the road does not allow crew members to accumulate an average of 7-8 hours of sleep.	-0.66	1.96	No
A 15-minute nap before traveling diminishes fatigue during a trip.	A 15-minute nap before traveling does not diminish fatigue during a trip.	0.13	1.96	No

Table 1: Hypothesis Testing Outcomes				
H_O	H_A	Z-Value	Z-Critical	Significance
Crew members make sleep a priority during personal hours at home.	Crew members do not make sleep a priority during personal hours at home.	-0.24	1.96	No
Anchor sleep patterns when at home help to increase energy.	Anchor sleep patterns when at home do not help to increase energy.	1.07	1.96	No
Utilizing the circadian rhythm improves the quality of sleep.	Utilizing the circadian rhythm does not improve the quality of sleep.	1.70	1.96	No
A pre-sleep routine promotes faster sleeping during travel.	A pre-sleep routine does not promote faster sleeping during travel.	-0.13	1.96	No
Napping in the cockpit increases alertness during flight.	Napping in the cockpit does not increase alertness during flight.	-0.03	1.96	No

Hypothesis testing did not show a statistically significant outcome for any of the tested statements. In each case, the null hypothesis was accepted with respect to the categories of crew members' perceptions concerning sleep deficit, sleep periods used to accumulate seven to eight hours of sleep, napping, making sleep a priority during personal hours, anchor sleep, the circadian rhythm, pre-sleep routines, and cockpit naps.

Regardless of the setting, sound safety and training practices must be observed and implemented to preserve life. The responsibility for ensuring that crew members are rested and capable of performing their duties attentively and effectively must be shared among organizations, groups, and individuals.

The use of the examined fatigue countermeasures during periods of rest, performance of duty, or when traveling for business purposes may avert accidents and provide a greater level of safety for both the host firm and other members of the aviation community. The implementation of a training program that includes topics associated with fatigue and its symptoms may provide organizations and individuals with information that may preserve life.

SIGNIFICANCE AND RECOMMENDATIONS

Overall, the hypothesis testing outcomes indicate that the perceptions of the respondents regarding the countermeasures suggested by the host firm may be helpful in reducing fatigue during periods when crew members reside in their homes, when performing flight duties, and when traveling for business purposes. It is recommended that the use of the corporate fatigue countermeasures be continued. However, it is suggested that further investigations be performed regarding the personal use of anchor sleep patterns using a larger data set.

The hypothesis testing outcomes of this research may be useful to the host firm as a tool through which its fatigue countermeasures and related training philosophy may be adjusted. Given the testing outcomes, it is recommended that the current training activities and implementation be continued. Further, it is recommended that the host firm continue its existing flight operations in accordance with FAR 121.503 through FAR 121.525.

The stratification and categorization of responses used within the Z-test analysis were based only on the categories of captain versus second officer. This study does not examine the suggested corporate fatigue countermeasures from any other perspectives. Therefore, it is suggested that additional data processing use the responses based on respondent age, seniority, flight routes, marital status, and aircraft type. Further, this study was conducted within the work setting of a commercial cargo airline. As a result, these research outcomes may not be applicable to military personnel or other airline services. Therefore, it is recommended that research initiatives be undertaken within each of these settings with respect to the given hypothesis statements.

Other firms may also benefit from the outcomes of this study. The findings of this study may be considered with respect to fatigue countermeasures training programs. Therefore, it is recommended that similar studies be performed within any organization that is considering the implementation of training that contains topics of fatigue and fatigue countermeasures.

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DERIVATION OF THE CMM TO SUPPORT THE GENERATION OF A BASELINE IPMM

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ABSTRACT

Because of the necessity of organizations to compete in a global economy, industrial management is increasingly becoming of paramount importance to strategic pursuits, competitive advantage, and corporate function. Although sound production and operations management methodologies favor process improvement activities to pursue and sustain corporate activities, they do not uniquely address industrial process improvement through a standardized framework Further, no single baseline framework exists to uniquely address process improvement issues with respect to industrial management considerations from an evolutionary and process maturation perspective. As a method of addressing this shortcoming, this paper considers the issue of whether the Capability Maturity Model (CMM) architecture may be modified to create a baseline framework capable of addressing industrial process improvement initiatives. Further, an introductory proposal to outline a framework for an Industrial Process Maturity Model (IP MM), derived from the CMM architecture is presented as a management tool to enhance process improvement initiative within production and operations environments.

INTRODUCTION

Given the proliferation and growth of global business during the last century, both organizations and individuals have been affected with numerous challenges with respect to managing both production and operations environments. Although organizations may employ a myriad of industrial management practices, each individual organization presents a unique situational basis for structuring process improvement initiatives. However, as a method of instigating effective process improvement activities, production and operations management processes are not related to a centralized maturity framework to assist in their development, maturation, monitoring, and evolution. Through introduction of the CMM as a valid foundation for formulating industrial process improvement frameworks, both individuals and corporations may experience greater benefit of enhanced production and operations management activities. Hence, one may introduce a modified version of the CMM architecture as a basis for deriving an IPMM framework.

LITERATURE REVIEW AND INDUSTRIAL PROCESS MATURITY MODEL

Independently, the CMM is not directly concerned with industrial management philosophies or methodologies. Instead, it is concerned with the overall improvement of processes within organizational software environments (Soganich, 1994). Hence, the CMM suffers shortcomings when applied to organizational functions that are not associated withsoftware development because KPA requirements do not exist to directly address unrelated issues. As a method of applying the

CMM concept to additional organizational functions, one may consider developing a CMM-based derivative framework that facilitates process improvement efforts with respect to environmental management issues. Thus, an IPMM could be crafted using the CMM architecture as its basis.

The proposed IPMM may employ similar maturity levels found within the CMM (i.e., Initial through Optimizing), and may employ a unique set of KPA requirements within each maturity level. Instead of being concerned with software processes, the proposed IPMM KPA requirements would address issues regarding industrial management. As a result of introducing the proposed IPMM into corporate structures, organizations would gain an additional tool through which improved production and operations management functions could be facilitated.

The IPMM may be implemented through "evolutionary steps rather than revolutionary innovations" within a framework of "five maturity levels that lay successive foundations for continuous process improvement" derived from those of the CMM (Kan, 1995; Soganich, 1994). Thus, the proposed IPMM maturity levels may be delineated within the following table:

Table 1: The Proposed IPMM Process Maturity Level Framework

Level	Maturity	Description
1.	Initial	Industrial management processes may be informal; undefined; and unstructured.
2.	Repeatable	Basic Industrial management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier Industrial management successes with similar applications.
3	Defined	Industrial management processes activities are documented, standardized, and integrated into a standard process for the organization. Industrial management initiatives use an approved, tailored version of the organization's standard Industrial management process for developing, implementing, and maintaining Industrial activities.
4	Managed	Detailed measures of Industrial management processes are collected. Industrial managementprocesses and activities are quantitatively understood and controlled.
5	Optimizing	Industrial management process improvement is enabled by quantitative feedback from processesand from piloting innovative ideas and technologies.

As with the CMM architecture, the proposed IPMM practices that describe KPAs are "ordered by common features as a method of convenience" (Soganich, 1994). Thus, similar to the CMM framework, order is determined by common attributes that judge "whether the implementation and institutionalization of a KPA is effective, repeatable, and lasting" (Soganich, 1994). The following table presents these concepts.

Table 2: Examples of Common Features of IPMM KPA Organization	
Example Area	Description
Commitment to Perform	The "actions the organization must take to ensure that the process is established and will endure. Involves establishing organizational policies and leadership" (Soganich, 1994).
Ability to Perform	The prerequisites necessary to implement Industrial management processes competently. Involves "resources, organizational structures, and training" (Soganieh, 1994).
Activities Performed	The "activities, roles, and procedures necessary to implement a KPA" and "establishing plans and procedures, performing work, tracking it, and taking corrective actions" (Soganich, 1994).
Measurement/Analysis	The "practices that are necessary to determine status related to the process" (Soganich, 1994). Verify Implementation The "steps to ensure that the activities are performed in compliance with the process that has been established. Involves reviews and audits by management" (Soganich, 1994).

Given this basis for the IPMM, organizations may greatly improve their industrial initiatives and processes through evolution from a setting where "few processes exist" to becoming a setting in which processes are "continuously monitored and systematically improved" in a fashion that parallels CMM implementation (O'Brien, 1999; Soganich, 1994). Further, through implementation of the IPMM architecture, organizations that employ "risky technological environments" and "ad hoc data collection" methodologies may evolve into settings where "proactive technological embellishment" and "defined data analysis" are manifested to generate Industrial management process improvements similar those required by the CMM framework (Paulk, 1995; Soganich, 1994).

IPMM CONTRIBUTION

Managers must realize that they do not discover explicit tools to facilitate production and operations process improvement initiatives within the selected TQM philosophy itself. Instead, they must adopt variations of existing tools or create internal tools to fulfill the TQM tenet of continual process improvement with respect to corporate processes and procedures. Because TQM does not dictate specific production and operations process improvement guidelines, organizations must consider other models as tools through which evolutionary process improvement concerns associated with production and operations management may be facilitated. The IPMM satisfies this requirement because it provides a framework that nurtures processes from their inception, maturation and evolution, and implementation. Through use of the IPMM, production and operations managers gain a tool which enables them to embellish process improvement initiatives through the use of a standardized framework that provides KP A tenets discretely attuned to the needs of industrial environments. Hence, the IPMM becomes a supportive measure that not only fulfills the TQM requirement of continuous improvement, but that also provides the necessary framework for addressing process-related issues from a maturation and evolutionary perspective.

Benchmarking does not support process improvement initiatives through an evolutionary process maturity standpoint. Instead, it is concerned with "goal setting and process development" (Harrington, 1991). Again, managers within production and operations environments must realize that a unique framework is necessary to provide the foundation for successful maturation and evolution of processes within the context of production and operations process improvement initiatives. The IPMM addresses this issue through its proposed framework and discrete KPA tenets. Instead of supporting improvement initiatives from a quantitative aspect of efficiency and effectiveness, the IPMM provides the unique perspective of process improvement based upon process maturity and evolution. As a result, the IPMM becomes a tool through which operations and production managers may supplement benchmarking activities because it may be used as a mechanism through which benchmarking may incite greater process efficiency while not compromising process effectiveness. Hence, the IPMM becomes a tool through which operations and production managers may guide the evolution and maturation of processes that are critical to benchmarking initiatives.

BPI is concerned primarily with streamlining of processes, instead of evolutionary process maturation, to generate improvements with respect to efficiency and effectiveness. Streamlining, instead of evolution and maturation, becomes the influential factor within improvement initiatives. Therefore, operations and production managers must recognize that an additional framework is necessary to provide a managerial tool that advocates process evolution and maturity. Again, the proposed IPMM provides a tool that fulfills this unique requirement. Through use of the IPMM, production and operations managers gain a tool that facilitates process maturation from basic inception (Level 1) through an optimized state of implementation (Level 5). As processes evolve through the stages of the proposed IPMM, they become optimized during their maturation. As a result, wasteful activities are reduced, and processes are streamlined. Such streamlining occurs as a result of evolutionary maturation within the IPMM, and not as the result of a focused streamlining BPI initiative.

Operations and production managers must accommodate the conclusion that BPM relies upon strategic command and control measures, with respect to process improvement guidance, when considering customer focus and corporate goals as influential factors affecting customer perceptions of satisfaction regarding areas of service operations. However, BPM does not address its improvement methodology from the perspective of process maturity and evolution. Operations and production managers require an additional tool to provide a foundation for successful maturation and evolution of process management within the context of production and operations process improvement initiatives.

The proposed IPMM again fulfills this requirement. Because of its inclusion of feedback and piloting tenets, the proposed IPMM provides a mechanism through which measurement of customer satisfaction and pursuit of corporate objectives may be expressed quantitatively through metrics associated with matured, optimized processes. Hence, the proposed IPMM becomes a managerial tool through which processes critical to BPM initiatives are matured through a standardized framework of evolutionary stages.

Despite its valid contribution as an improvement methodology, operations and production managers must realize that Six-Sigma only addresses processes from the perspectives of philosophy and culture, business pursuits, or quantitative measurements. Therefore, given previous discussion, the Six-Sigma concept does not address process improvement initiatives from the perspective of process maturity and evolution. Because of this inadequacy, an additional framework is necessary to provide a managerial tool as a foundation for successful maturation and evolution of process management within the context of production and operations process improvement initiatives.

Once again, the proposed IPMM may be considered as a tool through which production and operations managers may address this shortcoming within the Six-Sigma concept. Through its framework, organizational processes are matured and evolved through time across corporate boundaries to permeate and influence corporate culture towards greater achievement of corporate strategy and objectives. As a result, processes critical to Six-Sigma initiatives become tailored to efficiently and effectively generate quantitative measurements necessary for the pursuit of business goals and strategy. Because it involves chronological evolution and maturation of processes, managers may integrate the proposed IPMM within corporate culture through a top-down methodology that advocates a "never satisfied" approach to evaluating process maturity; securing corporate goals; and pursuing corporate strategy. Hence, the proposed IPMM becomes a cultural tool, philosophical tool, and quantitative tool that operations and production managers may implement through organizational hierarchies.

The proposed IPMM model implements the basic CMM maturity level frameworks as its foundation. Within this model, the general progression of maturity is evident with initial activity beginning in the ad hoc state, and progressing through the continuous and repetitive state. However, each model requires delineation of unique, separate KPA requirements related to its given application domain.

CONCLUSION

As organizations progress toward higher levels of global competitiveness, they must remain aware of industrially sound management practices. Firms must also remain aware of the relationships existing among their operating practices with respect to various forms of TQM philosophies; quantitative concepts (e.g., Six-Sigma; benchmarking; etc.); and industry dictates. Each corporation, regardless of its industry or physical location, must examine its processes to ensure that they are optimal and industrially sound. Given these notions, coupled with information previously discussed, one may derive the following concepts regarding such attributes of process improvement initiatives within the context of operations and production management environments:

Because the CMM is primarily concerned with software process improvement instead of high-level organizational quality issues, it suffers shortcomings when applied to unrelated areas because necessary KPA requirements do not exist.

1. The CMM is a model that advocates continuous process improvement, primarily within organizational software environments, but is not directly concerned with unrelated process improvement applications.
2. Many methods of addressing issues within operations and production environments exist (e.g., TQM; legislation; etc.), but they do not directly address discrete issues related to process improvement from an evolutionary and maturity perspective.
3. The lack of an accepted maturity model with respect to process improvement within operations and production management practices allows corporations the dynamic perspective of designing process mechanisms derived from a unique basis. As a result, process variance occurs within industries.
4. Derivatives of the CMM may be generated (e.g., an IPMM; etc.) via the development of necessary KPA requirements. The existence of the P-CMM and PMM models substantiates this argument.

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A BRIEF REVIEW OF TOTAL QUALITY MANAGEMENT AND BENCHMARKING: PROCESS MANAGEMENT AND THE DISCIPLINE OF INDUSTRIAL MANAGEMENT

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ABSTRACT

From the reading of the literature, one gains an understanding of the importance of process management within the discipline of industrial management. Resulting from the outcomes of process management activities, organizational hierarchies and components may be affected in either a positive or negative fashion, and corporate success or failure may be fostered. As a method of providing a foundation for corporate success, several traditional methodologies may be implemented to improve process management activities and environments (e.g., TQM, ISO certification, and legislation). However, although each of these methodologies provides a unique tool to address managerial process activities from philosophical and quantitative perspectives, none are directly concerned with process maturity from the perspective of providing a standardized framework that may be adapted within any industrial production and operations environment. Hence, such a framework is necessary to provide the foundation for successful maturation and evolution of process management within the context of production and operations process improvement initiatives.

INTRODUCTION

According to Harrington (1991), a process may be defined as being any activity or group of activities that takes an input, adds value to it, and provides an output to an internal or external customer that implements organizational resources to provide definitive results. Ferrie (1995) defines a process as being a definable set of activities, which from a known starting-point achieve a measurable output to satisfy an agreed customer need. Davenport (1993) defines a business processes as being a structured, measured set of activities designed to produce a specified output for a particular customer or market. Kutschker (1994) indicates that business processes attempt to produce outputs that are supportive of organizational targets, and that cut across functions, departments, and in some cases across the boundaries of an organization.

Although these definitions are inclusive of several applications (e.g., accounting processes, software processes, ordering/shipping processes, etc.), Harrington (1991) discretely identifies production processes that exist within the context of industrial management (e.g., allocation, planning/scheduling management, inventory management, etc.). In such instances, Harrington indicates that a production process is any process that comes into physical contact with the hardware or software that will be delivered to an external customer, up to the point where the product is packaged, and is not inclusive of shipping and distribution processes. Further, Harrington indicates that production processes are supported with separate business processes. Given these considerations, one may conclude that unique processes exist within the production domain of the industrial management environment.

LITERATURE REVIEW

With respect to this domain, Zahran (1998) indicates that product-focused organizations expect process-related activity outcomes to result in the generation of a tangible entity. However, Kutschker (1994) indicates that most managers are concerned with localized process attributes--specifically, those which concern their department only. Zahran (1998) further indicates that the process-related managerial activities associated with generating such tangible entities are often neglected, deferred, or viewed as being a low-priority activity. According to Brecker (2001), some initiatives fail to achieve their objectives because there was a lack of commitment to the specific improvement actions and to their effective implementation.

Roetzheim (2000) reinforces these notions, and indicates that no industry, type of business, or company is immune to such shortcomings. As a result of such poor management, Harrington (1991), Kutschker (1994), Zahran (1998), Malhotra (1998), and Roetzheim indicate that project failure may occur, and that significant losses may be manifested (e.g., opportunity costs, economic losses, etc.).

As a prime example, Roetzheim (2000) introduces the Boeing corporate financial losses during the 1990s as sample outcomes of poor production and process management. In this instance, the Boeing parts management system was late and over budget, and was scheduled for deployment in 1999 (nearly two years after its original, anticipated date of deployment). Further, Roetzheim indicates that the managerial cost of failure may be derived from the following process management attributes:

1. The financial amount expended in excess of original budget constraints
2. The costs of inefficiencies as the workforce attempted to deal with an aborted deployment of the system and slipped production schedules
3. The lost opportunity costs associated with increased sales and with improved efficiency, and
4. The reduced valuation of Boeing stock as a result of having their first loss in 50 years.

From reviewing the concepts described by Harrington (1991), Zahran (1998), and Roetzheim (2000), one may derive the notion that poor management activities may hamper production and operations activities associated with industrial management functions, and that both corporate business environments and organizational hierarchies are affected by managerial activities within industrial environments. Bohn (2000) confirms this conclusion through observations that, within manufacturing environments, managers and engineers rush from task to task, not completing one before another interrupts them. Serious problem-solving efforts degenerate into quick-and-dirty patching.

Bohn (2000) further indicates that productivity suffers, and that managing becomes a constant juggling act of deciding where to allocate overworked people and which incipient crisis to ignore at the moment. As a result, one may conclude that organizational hierarchies must endure the consequences associated with poor process management, detrimentally affected environments, and unsound process practices.

From a process-oriented perspective, Mejabi and Black (2000) provide additional discussion to support the concept that managerial activities affect corporate environments. In this instance, Mejabi and Black introduce the notion that processes are everywhere in an organization, and that certain processes may be more important than others. As a result of this relationship, Mejabi and Black indicate that certain managerial activities and processes may be critical for maintaining market

share with respect to industries where frequent new product design and development of new products are critical for ensuring business success. Given this notion, one may conclude that managerial aspects of process activities directly affect corporate success or failure.

Holmes (2000) states that improvement involves examining processes proactively to determine improvement opportunities and that improving processes should be a part of what is done every day. As a method of enhancing managerial process environments to foster successful outcomes of process activities, Hicks (2000) indicates that many corporations advocate improvement initiatives. According to Harrington (1991), Hicks, Mejabi and Black (2000), Roetzheim (2000), Jordan (2000), and Zahran (1998), such improvement efforts may consist of total quality management (TQM), benchmarking, reengineering, just-in-time operations, legislation, and ISO certification.

Soganich (1997) confirms the validity of such initiatives through his observations that management techniques have continued to evolve and be implemented in many industrial settings, and through continuous improvement programs, productivity and efficiency have continually increased. Hence, one may derive the notion that improvement programs and philosophies become tools through which industrial environments may improve their managerial functions as a method of attempting to foster corporate success.

TOTAL QUALITY MANAGEMENT (TQM) OVERVIEW

According to Kan (1995), Total Quality Management (TQM) may be defined as a philosophy that represents a style of management aimed at achieving long-term success by linking quality with customer satisfaction through the creation of a culture in which all members of the organization participate in the improvement of processes, products, and services. Brecker (2001) introduces the concept that TQM is an overall business (quality) improvement system that also encompasses leadership, strategic planning, and human resources as well as process improvement. Macintosh and Francis (2000) indicate that TQM also has the Japanese philosophy *Kaizen* (i.e., continuous improvement) as a supporting tenet.

Given these definitions and considerations, one may derive the notion that TQM becomes a strategic philosophy that permeates all levels and facets of organizational structure and personnel to improve overall organizational quality and generate customer satisfaction. According to Hunt (1992, 1993), the four primary philosophical tenets of TQM may be listed as follows:

1. Customer Focus: TQM advocates total customer satisfaction
2. Process: TQM advocates reduced process variations and continuous process improvement
3. Cultural: TQM advocates an enterprise-wide corporate culture awareness of quality pursuits
4. Analytical: TQM advocates continuous improvements in all quality parameters via measurement systems.

BENCHMARKING

According to Thompson and Strickland (1996), benchmarking may be defined as cross company comparisons of how well basic functions and processes in the value chain are performed, how materials are purchased, how suppliers are paid, how inventories are managed, how employees are trained, how payrolls are processed, how fast the company can get new products to market, how the quality control function is performed, how customer orders are filled and shipped, and how maintenance is performed. This definition is enhanced through examination of Harrington's (1991)

perspective in which benchmarking is a continuous discovery and learning experience that identifies and evaluates best processes and performance in order to integrate them into an organization's present process to increase its effectiveness, efficiency, and adaptability.

According to Harrington (1991) and Davis, Aquilano and Chase (1999), benchmarking may be categorized as follows:

1. Internal Benchmarking--In this instance, benchmarking is a comparison among similar operations or processes within a firm's own organization, may be the starting point for identifying the best practices that currently exist within the company, and fosters the documenting process, which is necessary for identifying future areas for improvement (Davis, Aquilano & Chase, 1999).
2. Competitive Benchmarking--In this instance, benchmarking is a comparison between an organization's performance and that of its best direct competitors for the purpose of demonstrating how the company compares to other firms in its industry (Davis, Aquilano & Chase, 1999). Competitive benchmarking is concerned with evaluation of a rival's products, services, and processes, and provides a foundation for reverse engineering (Harrington 1991).
3. Functional Benchmarking--In this instance, across dissimilar industries, benchmarking is a comparison of performance with the best functional areas, regardless of the industry in which they are located (Davis, Aquilano & Chase, 1999). As a result, one may discover innovative processes not currently used in your particular product types that will allow your process to become the best-of-breed (Harrington, 1991).
4. Generic Benchmarking--In this instance, benchmarking examines specific work processes and process steps, which transcend industries, for the purpose of identifying those firms that have adopted innovative processes thereby providing targets that can be more readily acceptable by members of the organization (Davis, Aquilano & Chase, 1999; Harrington, 1991).

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THE EFFECTS OF PART-TIME INSTRUCTION ON GRADES IN THE APPLIED MATH WITH AN INTRODUCTION TO CALCULUS COURSE

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ABSTRACT

This paper studies the effect that part-time instruction has on students' final grades in the Applied Math with an Introduction to Calculus course at a comprehensive IIA university. We find that full-time faculty members assign grades 0.09 points higher than those assigned by part-time faculty members. Using a multiple linear regression, in which the response variable is students' grades, the explanatory variable faculty member status--i.e., full-time or part-time--is statistically significant at less than a 0.01 level of confidence (p-value = 0.089). Additionally, the explanatory variable GPA is also significant at an alpha level less than 0.01 with a p-value of 1.70E-84. The model yielded an adjusted R^2 value of 0.487, indicating that 48.7 percent of students' grades are accounted for by the explanatory variables included in the model.

INTRODUCTION

Numerous institutions of higher education employ part-time faculty members as an affordable method of instruction in both graduate and undergraduate programs. Part-time faculty members generally are professionals with significant experience that enhances the exchange of ideas and information within the academic classroom setting. Part-time faculty members embellish the ranks of faculty for both undergraduate and graduate programs among traditional and non-traditional program modalities. Institutions of all sizes and missions, ranging from community colleges to doctoral programs, employ part-time faculty.

Various research efforts suggest that student grades are related to faculty member rank (Ford, Puckett & Tucker, 1987; Jackson, 1986). In *The Teaching Professor*, an explanation for inflated grades involves the exertion of student pressure against faculty to affect grading outcomes (Study reveals, 2004).

Clayson (2005) suggests that students overestimate their academic performance with respect to examinations, and that the associated error is related inversely to the awarded grade. Halfond (2004) discusses the entitlement mentality of students with respect to higher grades. Germain and Scandura (2005) describe the evaluation of student feedback of faculty members as an influential factor within the grading process. Long (2003) states that the grading potential among various factions of faculty may also be influenced according to part-time or full-time status and whether one has tenure or is non-tenured.

MATHEMATICS COURSE CONSIDERATIONS

This research was conducted using students in the Applied Math with an Introduction to Calculus course at a comprehensive IIA educational institution. This course was delivered using a traditional, semester-long and an accelerated, or non-traditional format. The delivery of this course occurred in a setting using lectures, discussions, and exercises as the primary methods of instruction. The faculty members for this course represented both full-time and part-time faculty members.

Mathematics courses encompass subject areas ranging from remedial through doctoral topics. Within many institutions, some of the course titles for mathematics studies may include applied mathematics, applied calculus, complex analysis, real analysis, calculus, differential equations, linear algebra, numerical methods, numerical analysis, discrete math, probability and statistics, operations research, logic, and topology. With the discipline of higher mathematics, various methods of computation are associated with differential and integral functions. These computations are known as calculus.

This course was a class in applied math with an introduction to calculus, and it included the fundamental quantitative and algebraic skills needed in other mathematics and science courses. This course contained introductory topics in mathematics for students in arts and business majors. Topics within this course included functions; graphs; linear, polynomial, rational, exponential, and logarithmic models; and an introduction to differential and integral calculus. The only prerequisite for this course was the successful completion and understanding of algebra and basic calculus. The topics discussed within this course provided a basis for understanding higher concepts of calculus and business problems. Given the applied nature of this course, students may determine a practical benefit from the topics and material covered within this class.

The purpose of the current study is to analyze the effect of faculty member rank--as it pertains to part-time or full-time employment status--on student grades in the Applied Math with an Introduction to Calculus course. Can a student taking an Applied Math with an Introduction to Calculus course improve his or her grade by enrolling in a course taught by a part-time faculty member? In addition, we examine several student characteristics in order to determine whether those variables interact with faculty member status.

METHODOLOGY AND RESULTS

Data were collected from all sections of the Applied Math with an Introduction to Calculus course taught at a private comprehensive IIA university. Two part-time and three full-time faculty members were employed to teach the course. Part-time faculty members were classified as adjunct faculty. For the sample of 571 students, the following data, which we believe to include explanatory factors for student grades, were obtained:

1. The dependent variable, *grade* in the course (*A*, *B*, *C*, *D*, *F*)
2. The independent variable, *status of the faculty member* (part-time or full-time)
3. The independent variable, *status of the student* (day or evening student)
4. The independent variable, *student major*
5. The independent variable, *student class standing* (freshman, sophomore, junior, senior)
6. The independent variable, *student age*
7. The independent variable, *student GPA*

The dependent variable, *grade*, which is recorded on the students' record as an alpha character, was numerically represented in the model as: A = 4.0, B = 3.0, C = 2.0, D = 1.0, and F = 0.0. Although the dependent variable, *grade*, is ordinal data, since the interval between the grades can be estimated as being ten point intervals (except for the *F* category), the data is considered to closely approximate interval level data. The use of the values 4, 3, 2, 1, and 0 for the letter grades of *A*, *B*, *C*, *D*, and *F* is similar to using the midpoint of a class to estimate descriptive statistics for a frequency distribution. Students who withdrew from the course were deleted from the sample data. Since student withdrawal data was omitted, the results of the study are subjected to survival bias. The lack of control for such bias is recognized as a limitation of the study.

Table 1 examines and compares the sample variances of the grades given by part-time and full-time faculty members. Since the F-test value of 0.355 is less than the F-critical value of 1.2372, it can be assumed that the population variances are equal. Thus a two-sample hypothesis test for the equality of population means would employ the t-test, assuming unequal population variances (see Table 2).

Table 1: F-Test: Two-Sample for Variances

	Full-time	Part-time
Mean	2.16	2.07
Variance	1.8632	1.7319
Observations	365	206
df	364	205
F	0.355	
P(F <= f) one-tail	0.551	
F-Critical one-tail	1.2372	

Table 2 analyzes the relationship between the status of the faculty member, i.e., part-time or full-time, and the grade received in the Applied Math with an Introduction to Calculus course. The hypothesis tested was that there was no difference in the average grades awarded by part-time versus full-time faculty members (in the population). The two-tail p-value of 0.453 represents the probability that both populations, i.e., part-time and full-time faculty members, award grades equally. This contention is rejected at any reasonable level of alpha.

Table 2: T-Test: Two-Sample Assuming Unequal Variances

	Full-time	Part-time
Mean	2.16	2.07
Variance	1.8632	1.7319

Observations	365	206
Hypothesized Mean Difference	0.088	
df	569	
t-Stat	0.751	
t-Critical one-tail	1.65	
P(T <= t) two-tail	0.453	
t-Critical two-tail	1.96	

Several studies have analyzed relationships between student grades and various student characteristics such as age, gender, class standing, attendance on a part-time or full-time basis, and academic major (Chan, Shum & Wright, 1997; Sen, Joyce, Farrell & Toutant, 1997). We decided to include these variables, along with our variable of main concern, i.e., whether the course was taught by a part-time or full-time faculty member, and measure their relationships with a multiple linear regression model. In this way, we can analyze the relationship between student grades and the employment status of the faculty member (part-time or full-time) while controlling for the various student demographic characteristics mentioned above.

The multiple regression approach will be utilized here. Using the coding method of A = 4 (or 95), B = 3 (or 85), etc., is similar to estimating the mean or standard deviation of data that has been summarized into a frequency distribution. Table 3 presents the results of a multiple regression analysis.

Table 3: Regression Results

Multiple R	0.701						
R^2	0.492						
Adjusted R^2	0.487						
Standard Error	0.965						
Observations	571						
ANOVA							
	SS	df	MS	F	Sig.		
Regression	508.30	5.00	101.66	109.23	1.32E-80		
Residual	525.87	565.00	0.93				
Total	1034.17	570					

Table 3: Regression Results							
Correlations							
	Coefficients	Std. Error	t Stat	Sig.	Zero-order	Partial	Part
(Constant)	-1.41	0.23	-6.101433762	1.95236E-09			
Faculty Status	-0.161	0.095	-1.705	0.089	-0.031	-0.072	-0.051
Day or Evening	0.073	0.131	0.557	0.578	-0.026	0.023	0.017
Age	-0.016	0.007	-2.239	0.026	-0.043	-0.094	-0.067
Class	-0.059	0.053	-1.111	0.267	-0.058	-0.047	-0.033
Cumulative GPA	1.502	0.065	23.268	1.70E-84	0.687	0.700	0.698

Student major, class standing, day or evening attendance, and student gender were included as indicator variables. None of these indicator variables were significantly related to the grade received. A graphical analysis of the residuals did not indicate serious violations of the model's assumptions. There are no extreme points (outliers). At each grade level, residual variance does not indicate the presence of homoscedasticity; the residuals approximate a normal distribution. The adjusted coefficient of multiple determination shown in Table 3 is equal to 0.487, indicating that 48.7 percent of the change in the dependent variable, *grade*, is explained by the set of independent variables (which are student characteristics, except for the faculty member status variable). The F-statistic's high value of 109.23 corroborates the existence of a significant relationship between student grades and the set of independent variables.

Independent variables that would be significant at a 0.01 level of confidence include the following:

1. Faculty member status (Part-time or full-time) t-Stat value = -1.705
2. Grade point average (GPA) t-Stat value = 23.268
3. Age = -2.239

None of the other independent variables showed a significant relationship to the course grade.

During the analysis, several issues of interest were identified for possible future research. There was insufficient information derived from this study to explore those issues here. Those issues include the following:

1. Do part-time and full-time faculty members employ similar methods of teaching?
2. Do part-time and full-time faculty members use similar methods of testing and grading?
3. Is there coverage by part-time and full-time faculty members that is consistent with the prescribed courses of study?

4. Is the performance of students in lower division courses that have a quantitative component different for those students taught by part-time versus full-time faculty members?

CONCLUSION

The objective of this paper was to examine the relationship between student grades in the Applied Math with an Introduction to Calculus course and the employment status of the faculty member, i.e., part-time or full-time. A multiple regression model, which allowed for the inclusion of many student characteristics, did report a significant relationship between the two factors. We find that a student's cumulative GPA was the strongest predictor of success in the course. Next in importance was the employment status of the faculty member, part-time or full-time. It is recognized that our sample may include selection bias since part-time faculty members may teach predominantly at times where non-traditional students are enrolled.

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THE EFFECTS OF PART-TIME INSTRUCTION IN THE FINITE MATH COURSE

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ABSTRACT

This paper studies the effect that part-time instruction has in the Finite Math course at a comprehensive IIA university. We find that full-time faculty members assign grades 0.22 points higher than those assigned by part-time faculty members. Using a multiple linear regression, in which the response variable is students' grades, the explanatory variable faculty member status --i.e., full-time or part-time--is statistically significant at less than a 0.01 level of confidence (p-value = 0.137). Additionally, the explanatory variable GPA is also significant at an alpha level less than 0.01 with a p-value of 5.4E-183. The model yielded an adjusted R^2 value of 0.508, indicating that 50.8 percent of students' grades are accounted for by the explanatory variables included in the model.

INTRODUCTION

Grades label and may motivate students. They foster career and personal opportunities, and they may dictate a student's future. Grades provide a sense of relief and exhilaration when the student successfully passes a course, or they may also incite feelings of despair and hopelessness during the midst of failure when success was expected. Grades may emancipate someone from the halls of higher education with the conferring of an academic or professional degree, or they may relegate the student to another year of study. Regardless of the course outcome, grading provides a description of performance that may or may not be significant and indicative of the knowledge, skill, and understanding gained during the course.

Various factors affect grading outcomes, and it is impossible to acknowledge all of the factors that affect grading processes. Michaels and Miethe (1989) analyze the exertion of academic effort and associated grading outcomes and note that strong, efficient studying generates effective outcomes. Ballard (2004) describes the necessity of adapting grading methods to satisfy the consumer mentality of students.

Another factor to consider within the grading process is the faculty member. Sonner (2000) finds that full-time faculty members award lower grades than do their part-time faculty member counterparts. A similar finding of this grading difference is noted by Leverett, Zurita and Kamery (2004) in a study of grades assigned by part-time versus full-time faculty in principles of accounting classes. Therefore, research exists to support the notion that students can earn higher grades by taking courses taught by part-time faculty members.

FINITE MATH COURSE CONSIDERATIONS

This research was conducted by sampling students enrolled in the Finite Math course at a comprehensive IIA university. The course was taught using both a traditional, semester-long approach and an accelerated, non-traditional format. The delivery of the course incorporated lectures, discussions, problem-solving, and exercises as its primary methods of instruction. Both part-time and full-time faculty members taught the course.

The finite math course stresses applications for liberal arts and business majors. Topics within this course included lines, linear systems, matrices, linear programming, probability and statistics, and financial mathematics. The only prerequisite for this course was the successful completion and understanding of basic mathematics and an acceptable score on a departmental placement examination. The topics discussed within this course provided the basis for understanding the higher concepts of liberal arts and business problems contained within the future components of degree programs.

The methods of mathematics instruction differ from one institution to another. Lim and Moore (2002) investigate non-goal specific problems with respect to geometry students. Butler (2003) introduces methods of structuring course instruction with respect to the needs of self-regulation for adults with learning disabilities. Cates and Skinner (2000) discuss the potential for increasing the amount of assignments and homework among students enrolled in mathematics courses with respect to the interspersing of materials.

Grading outcomes among mathematics courses may differ among colleges and universities. Hoyt and Sorensen (2001) question whether passing grades are awarded to students who did not sufficiently learn course materials. Such concerns of grade inflation are expressed from various perspectives.

The purpose of the current study is to analyze the effect of faculty member rank--as it pertains to part-time or full-time status--on student grades in the Finite Math course. Can a student taking a Finite Math course improve his or her grade by enrolling in a course taught by a part-time or full-time faculty member?

METHODOLOGY AND RESULTS

Data were collected from all sections of the Finite Math course taught at a private comprehensive IIA university. Two part-time and three full-time faculty members were employed to teach the course. Part-time faculty members were classified as adjunct faculty. For the sample of 1,184 students, the following data, which we believe to include explanatory factors for student grades, were obtained:

1. The dependent variable, *grade* in the course (*A*, *B*, *C*, *D*, *F*)
2. The independent variable, *status of the faculty member* (part-time or full-time)
3. The independent variable, *status of the student* (day or evening student)
4. The independent variable, *student major*
5. The independent variable, *student class standing* (freshman, sophomore, junior, senior)
6. The independent variable, *student age*
7. The independent variable, *student GPA*

The dependent variable, *grade*, which is recorded on the students' record as an alpha character, was numerically represented in the model as: A = 4.0, B = 3.0, C = 2.0, D = 1.0, and F = 0.0. Although the dependent variable, *grade*, is ordinal data, since the interval between the grades can be estimated as being ten point intervals (except for the *F* category), the data is considered to closely approximate interval level data. The use of the values 4, 3, 2, 1, and 0 for the letter grades of *A*, *B*, *C*, *D*, and *F* is similar to using the midpoint of a class to estimate descriptive statistics for a frequency distribution. Students who withdrew from the course were deleted from the sample data. Since student withdrawal data was omitted, the results of the study are subjected to survival bias. The lack of control for such bias is recognized as a limitation of the study.

Table 1 examines and compares the sample variances of the grades given by part-time and full-time faculty members. Since the F-test value of 0.120 is less than the F-critical value of 1.192, it can be assumed that the population variances are equal. Thus a two-sample hypothesis test for the equality of population means would employ the t-test, assuming unequal population variances (see Table 2).

Table 1: F-Test: Two-Sample for Variances

	Full-time	Part-time
Mean	2.21	1.99
Variance	1.6952	1.6461
Observations	985	199
df	984	198
F	0.120	
P(F <= f) one-tail	0.729	
F-Critical one-tail	1.192	

Table 2 analyzes the relationship between the status of the faculty member, i.e., part-time or full-time, and the grade received in the Finite Math course. The hypothesis tested was that there was no difference in the average grades awarded by part-time versus full-time faculty members (in the population). The two-tail p-value of 0.033 represents the probability that both populations, i.e., part-time and full-time faculty members, award grades equally. This contention is rejected at any reasonable level of alpha.

Table 2: T-Test: Two-Sample Assuming Unequal Variances

	Full-time	Part-time
Mean	2.21	1.99
Variance	1.6952	1.6461

Table 2: T-Test: Two-Sample Assuming Unequal Variances		
	Full-time	Part-time
Observations	985	199
Hypothesized Mean Difference	0.216	
df	1182	
t-Stat	2.141	
t-Critical one-tail	1.65	
P(T <= t) two-tail	0.033	
t-Critical two-tail	1.96	

Several studies have analyzed relationships between student grades and various student characteristics such as age, gender, class standing, attendance on a part-time or full-time basis, and academic major (Chan, Shum & Wright, 1997; Sen, Joyce, Farrell & Toutant, 1997). We decided to include these variables, along with our variable of main concern, i.e., whether the course was taught by a part-time or full-time faculty member, and measure their relationships with a multiple linear regression model. In this way, we can analyze the relationship between student grades and the employment status of the faculty member (part-time or full-time) while controlling for the various student demographic characteristics mentioned above.

The multiple regression approach will be utilized here. Using the coding method of A = 4 (or 95), B = 3 (or 85), etc., is similar to estimating the mean or standard deviation of data that has been summarized into a frequency distribution. Table 3 presents the results of a multiple regression analysis.

Table 3: Regression Results							
Multiple R	0.714						
R^2	0.510						
Adjusted R^2	0.508						
Standard Error	0.913						
Observations	1184						
ANOVA							
	SS	df	MS	F	Sig.		
Regression	1021.996	5	204.399	245.475	9.63E-180		

Table 3: Regression Results							
Residual	980.882	1178	0.833				
Total	2002.878	1183					
Correlations							
							Zero-
	Coefficients	Std. Error	t Stat	Sig.	order	Partial	Part
(Constant)	-0.724	0.140	-5.180	2.61E-07			
Instructor Status	-0.131	0.088	-1.489	0.137	-0.062	-0.043	-0.030
Day or Evening	-0.039	0.097	-0.399	0.690	-0.043	-0.012	-0.008
Age	-0.019	0.005	-3.465	0.001	-0.069	-0.100	-0.071
Class	-0.012	0.032	-0.379	0.704	-0.025	-0.011	-0.008
GPA	1.290	0.037	34.789	5.4E-183	0.698	0.712	0.709

Student major, class standing, day or evening attendance, and student gender were included as indicator variables. None of these indicator variables were significantly related to the grade received. A graphical analysis of the residuals did not indicate serious violations of the model's assumptions. There are no extreme points (outliers). At each grade level, residual variance does not indicate the presence of homoscedasticity; the residuals approximate a normal distribution. The adjusted coefficient of multiple determination shown in Table 3 is equal to 0.508, indicating that 50.8 percent of the change in the dependent variable, *grade*, is explained by the set of independent variables (which are student characteristics, except for the faculty member status variable). The F-statistic's high value of 245.475 corroborates the existence of a significant relationship between student grades and the set of independent variables.

Independent variables that would be significant at a 0.01 level of confidence include the following:

1. Faculty member status (Part-time or full-time) t-Stat value = -1.489
2. Grade point average (GPA) t-Stat value = 34.789
3. Age = -3.465

None of the other independent variables showed a significant relationship to the course grade.

During the analysis, several issues of interest were identified for possible future research. There was insufficient information derived from this study to explore those issues here. Those issues include the following:

1. Do part-time and full-time faculty members employ similar methods of teaching?
2. Do part-time and full-time faculty members use similar methods of testing and grading?
3. Is there coverage by part-time and full-time faculty members that is consistent with the prescribed courses of study?
4. Is the performance of students in upper division courses that have a quantitative component different for those students taught by part-time versus full-time faculty members?

CONCLUSION

The objective of this paper was to examine the relationship between student grades in the Finite Math course and the employment status of the faculty member, i.e., whether part-time or full-time. A multiple regression model, which allowed for the inclusion of many student characteristics, did report a significant relationship between the two factors. We find that a student's cumulative GPA was the strongest predictor of success in the Finite Math course. Next in importance was the status of the faculty member, part-time or full-time. It is recognized that our sample may include selection bias since part-time faculty members may teach predominantly at times and places where non-traditional students are enrolled. Our data was collected at a single university; thus, our results may lack universal application.

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