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Problem Solving in the Workplace through Application of Business Knowledge and Quantitative Methods

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Abstract: Ensuring that management curricula are current and relevant requires input from many stakeholders. Faculty planning committees call on business leaders, alumni, students, and future employers of graduates to provide necessary guidance in this process. In the study reported here, graduates of an undergraduate business program were asked to rate the importance of business knowledge and skills areas in the workplace. Twelve knowledge areas and twelve quantitative skills areas were included in the survey, specifically addressing frequency of use, general importance of the knowledge and skills, and necessity to include the knowledge and skills in a business curriculum. The graduates identified communication and operations management as the most important knowledge areas in business. The most frequently used quantitative skills listed were basic statistical analysis, budgeting, and financial analysis. Insights gleaned from this analysis will help with curriculum planning.

Key words: business curricula; communications; operations management; problem solving; quantitative methods

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1. Introduction and Background

Recent concentrated focus on Assurance of Learning by accrediting bodies has encouraged business programs to evaluate curricula placing specific emphasis on measurable learning goals. These learning goals are set by faculty who are experts in the disciplines covered in the program. Learning goals are based on input from many stakeholders and are designed to ensure that graduates of the program are prepared for challenges of the business world. The intense focus on curriculum is directly related to underprepared graduates. At least as far back as the 1970s, researchers found gaps between management education and practice (Badawy M. K., 1976). And many of these findings are reality today (Chia Robert & Holt Robin, 2008; Holter Norma C. & Kopka Donald J., 2001; Peckham Susanne, 2010). Business programs present theory without real world application to complement the theory. In addition, Badaway (1976) found that management education trains students for top-management positions rather than entry level or mid-level-management positions where most will begin their careers. Peckham (2010) reported that, according to a survey of employers conducted by the American Management Association (AMA), knowledge and skills learned in business programs fall short of expectations. Fletcher (2007) notes that

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industry is critical of graduates' lack of skills in communication, critical thinking, problem solving, and business knowledge.

Peckham (2010) notes that the AMA survey found that "four Cs" were most important to employers: critical thinking and problem solving; communication; collaboration and team building; and creativity and innovation. The current workforce is not well-developed in these areas. Survey results indicated that employers felt that it is easier to develop these skills in students rather than experienced workers. The AMA survey found that employers believe these skills to be most important because of another C: the pace of change. The ability of graduates to reason and adapt is critical to their success in the business world.

Brzovic and Matz (2009) note that experiencing practical, real-world problems builds students' skills in leadership, problem solving, and communication. Experiential learning brings theory and practice together. Students carry these experiences beyond the classroom and beyond graduation. Clinebell and Clinebell (2008) discuss the debate between academic rigor in business programs and incorporating more practical applications. Employers have indicated that graduates from business programs are ill-prepared for management positions. These findings have led business schools to hire professionally qualified faculty members to bring increased relevancy into the classroom. Chia and Holt (2008) propose that students gain knowledge and skill only through repeated experiences of real business life. Further, Chia and Holt believe that demonstration of skills and decision making strategies by educators is critical to the process. If students can mimic the actions of seasoned professors and practitioners, learning will take place.

Hoover, Giambatista, Sorenson, and Bommer (Fletcher Geoffrey H., 2007) and Holter and Kopka (2001) discuss pedagogy focused on skills. Hoover, Giambatista, Sorenson, and Bommer (Fletcher Geoffrey H., 2007) developed pedagogy designed to improve MBA student skills in communication, teamwork, leadership/initiative, decision making, and planning/organizing. These skills were deemed highly important by the researchers. The 5-year study results indicated that all skills except teamwork showed significant improvement as students experienced the teaching methods. Holter and Kopka (2001) developed a course to help students build communication, teamwork, thinking, and problem solving skills. As others, the authors indicted that their research found that employers were not happy with graduates' skills in these areas. The course required students to participate and demonstrate skills learned. Positive and negative student reactions to the new pedagogy were noted. Generally, skill improvement was observed.

2. Alumni Survey Provides Input

A recent survey of graduates of an undergraduate program with a bachelor of science in business administration asked the graduates to rate the importance of knowledge and skills learned in the program. The purpose of the survey was to gauge the current business practices of the program's alumni in order to broadly assess the curriculum. Faculty should regularly assess curricula and it was determined this type of outside input would greatly augment the expertise of the program's faculty. From a research perspective, this type of information can greatly benefit the broader academic community whose business programs are attempting to become more practical and real-world focused.

The business administration program is a part of a small public university with a total of approximately 3,000 students. The university was originally a "teachers college" and offered a program in business education for many years. The undergraduate degree in business administration was initiated in the mid 1960's and the business

education program was phased out. Records of the university's alumni office revealed contact information on 2,809 alumni with degrees in business administration. Email addresses were available for 1,380 of the alumni (49%) and the researchers determined the most cost-effective method for data collection would be to conduct an online survey.

The researchers, with input from the business faculty, developed a survey instrument that gathered a profile of the respondent (age, year of graduation, etc.); asked for feedback from alumni regarding the current mission and learning goals of the program; and solicited information regarding current business practices in five broad areas:

- Communications
- Teamwork
- Ethics
- Application of Business Knowledge
- Problem-solving

Learning goals for the program are centered on these five themes.

The survey instrument was lengthy with 75 questions with several having subparts. The instrument was approved by the university's IRB in June 2012 and survey conducted in August. Email invitations were sent with two follow-up reminders to non-responders over a three week period. A total of 1380 emailed surveys were sent to alumni. Of those sent, 251 usable responses were received, an 18.2% response rate.

The business administration program offers the Bachelor of Science in Business Administration with four emphasis areas. The respondents reported the following distribution by emphasis area.

Table 1 Emphasis Areas of Survey Respondents

Emphasis Area	% of Respondents	Fall 2012 Enrollment
No Area Indicated	8.60%	
Accounting	24.60%	21.67%
Economics/Finance	12.90%	6.87%
Health Care Management	11.30%	29.83%
Management/Marketing	42.60%	41.63%

The program began offering emphasis areas within the Bachelor of Science in business administration in the early 1980s. The Health Care Management emphasis was added within the business program in 2001. A separate Bachelor of Science degree in health care management was offered prior to 2001, but it did not include the same core courses and the graduates of that program were not included in this study. Fall 2012 enrollment by major is shown in Table 1. Health Care Management has grown steadily since its introduction in 2001. Currently, the number of students majoring in Accounting and Management/Marketing closely follow the number of survey respondents who completed those majors. The percentage of students majoring in Economics/Finance is smaller than that percentage in respondents.

The year of graduation of the responders was compared with the overall database to determine if the sample was representative. Figure 1 shows the distribution by year of graduation of respondents is nearly identical with the historical data.

The respondents represented a broad range of industries and were relatively evenly divided by level of management as shown on Table 2.

Currently on our campus, 67% of students enrolled are female and 33% are male. On the survey, 40% of the respondents were female and 60% were male.

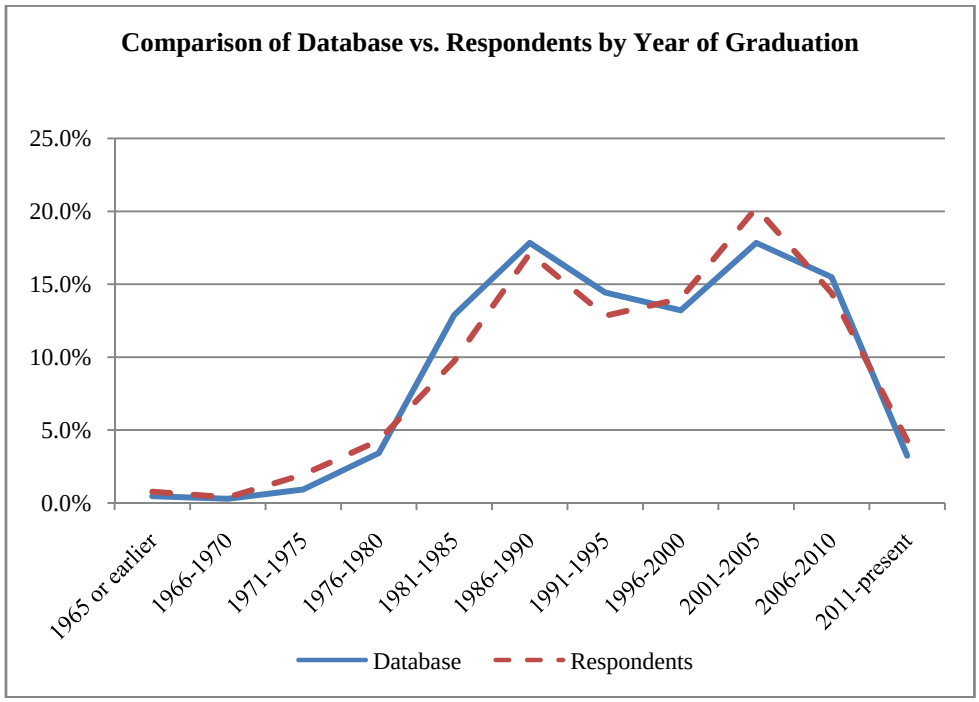

Figure 1 Percent of Respondents by Year of Graduation

Table 2 Respondent Level of Management

Level of Management	% of Respondents
Top Management/Senior Staff	28.20%
Middle Management	33.50%
First-Line Supervisor/Junior Staff, with no direct reports	38.30%

3. Analysis of Results

We extracted from the survey information on the respondents' opinions regarding the application of business knowledge and their use of specific quantitative methods in their work.

3.1 Application of Business Knowledge

Here we compared respondents' stated use of "standard" areas of business knowledge with the perception of the importance of that area to their work and the level of emphasis that it should receive in an undergraduate business program. It is hoped that insights gained from this study will help in the modification and continuous improvement of business programs.

The survey asked respondents to provide feedback on their practices in 12 business knowledge areas. In each, three questions were asked, with responses ranging from 1 to 5:

(1) How often do you apply this knowledge? (1 = Rarely or never, 5 = Very frequently on a daily basis)

(2) How important is it to your work? (1 = Not important at all, 5 = Critical to my success)

(3) How much emphasis should this topic receive at the undergraduate level? (1 = Not important at all, 5 = Needs very heavy emphasis)

The average response calculated for each area and question is displayed in Table 3. In addition the difference (in percent) between the ratings for each question is shown.

Table 3 Use and Importance of Business Knowledge Areas

Business knowledge discipline	Use of knowledge	Importance in work	Importance to teach	Import vs use	Teach vs import	Teach vs use
Accounting	3.35	3.40	3.80	1.7%	11.8%	13.7%
Communication	4.84	4.83	4.82	-0.2%	-0.2%	-0.4%
Economics	2.63	2.67	3.30	1.5%	23.9%	25.8%
Finance	3.44	3.38	3.82	-1.6%	13.0%	11.3%
Legal matters	2.76	3.03	3.44	9.9%	13.5%	24.7%
Operations management	4.11	4.12	4.25	0.3%	3.3%	3.6%
Human resources	2.68	2.75	3.31	2.4%	20.4%	23.3%
Strategic management	3.13	3.39	3.79	8.1%	12.1%	21.2%
Marketing management	2.59	2.70	3.47	4.2%	28.5%	33.9%
Personal sales	2.55	2.64	3.07	3.3%	16.3%	20.2%
Analytical methods	2.94	3.02	3.49	2.9%	15.3%	18.6%
Management info systems	3.09	3.26	3.72	5.3%	14.1%	20.2%

It is interesting to note that each Business Knowledge Discipline is used by practitioners, and all score above average on the 5 point scale of rarely used to very frequently used. In most disciplines, the “Importance in Work” and “Importance to Teach” categories scored higher than the “Use of Knowledge” category. Maybe these managers believe they need more knowledge in these areas. Continued and increased focus on these disciplines is important for graduates as they prepare for their business careers. Communications and Operations Management are reported as the Business Knowledge Areas most frequently used. Accounting, Finance, Strategic Management, and Management Information Systems are each used frequently as well. For the managers responding to the survey, Personal Sales, Economics, Human Resources, and Marketing Management scored lowest on Use and Importance scales. Personal Sales may be considered a part of Communication. Pure Economics may not be seen by practitioners as a daily need.

Table 4 Use of Business Knowledge Areas by Discipline

	Accounting	Economics/Finance	Healthcare Management	Management/Marketing
Accounting	4.4	3.3	2.9	3.0
Communication	4.8	4.9	5.0	4.8
Economics	2.8	3.0	2.0	2.6
Finance	3.8	3.6	3.3	3.3
Legal Matters	2.8	2.5	2.7	2.9
Operations Management	4.1	4.1	3.8	4.2
Human Resources	2.7	2.5	2.6	2.7
Strategic Management	2.9	3.3	2.8	3.3
Marketing Management	2.1	2.7	2.0	3.1
Personal Sales	2.2	2.7	2.0	2.9
Analytical Methods	3.2	3.3	2.5	2.9
MIS	3.0	3.4	2.8	3.2

Table 4 gives the average use of the Business Knowledge Areas by discipline/emphasis area. Recall that 1 means rarely or never used and 5 means used very frequently on a daily basis. As a reference, let us say that:

0–2.4 is low use

2.5–3.4 is moderate use

3.5–4.4 is heavy use

4.5–5 is very heavy use

Given that frame we note the following:

- Communication has very heavy use by all disciplines
- Operations Management has heavy use by all disciplines
- All disciplines use Economics, Marketing Management, and Personal Sales at low or moderate rates
- Strategic Management is used only moderately by each discipline
- The Economics/Finance emphasis uses accounting more than finance
- Health Care Management has low to moderate use of all of the Business Knowledge areas except for Communication

3.2 Application of Quantitative Skills

Further analysis of the data provides insight on quantitative skills. Business programs cover a variety of topics in the quantitative area with varying titles: quantitative methods, quantitative analysis, business analytics, analytical studies, management science, operations research, production and operations management, and statistics, to name a few. Business faculty members consider math skills to be very important as students work to develop their critical thinking and analytical skills. One of five learning goals of the university conducting the survey states that business graduates will be capable problem solvers. From problem formulation, to hypothesis testing, to advanced topics in regression analysis, business students are challenged to expand their capabilities in preparation for careers in business.

To address this topic, respondents were asked about the quantitative tools and methods applied in problem solving. Table 5 presents the frequency of use of key quantitative methods, with “occasionally” defined as once a year to once a month and “regularly” as twice per month to weekly.

Table 5 Frequency of Use of Quantitative Techniques

Technique	Never	Occasionally	Regularly	Daily
Basic statistical analysis	25.9%	33.0%	25.0%	16.0%
Budgeting	16.5%	41.5%	26.9%	15.1%
Hypothesis testing	59.0%	27.9%	9.4%	3.8%
Financial analysis	9.6%	31.8%	24.3%	24.3%
Inventory control	51.2%	24.8%	15.5%	8.5%
Lean operations analysis	64.6%	20.7%	11.4%	3.3%
Linear programming	83.6%	13.7%	1.9%	0.9%
Forecasting/Linear regression	54.0%	29.1%	12.2%	4.7%
Material requirements planning	62.1%	22.8%	9.0%	6.2%
Quality analysis, control charts, etc.	59.0%	21.9%	13.4%	5.7%
Scheduling-people	36.0%	20.8%	20.9%	22.3%
Scheduling-processes	37.9%	23.2%	18.5%	20.4%

The extremes in Table 5 are interesting. Here we see techniques that this set of respondents never use and use on a regular basis. Over 50% of the managers responding never use hypothesis testing, inventory control, lean operations analysis, linear programming, forecasting and linear regression, materials requirement planning, and quality analysis control charts. For these seven quantitative areas, less than 10% of the managers use these techniques on a daily basis. Faculty discussion on depth of coverage in these areas will lead to improved curricula. These results are interesting in that many of these topics are from Operations Management. Operations Management was second only to Communication in Table 3 as the most used Business Knowledge Discipline. Scheduling People and Processes, Financial Analysis, Basic Statistical Analysis, and Budgeting were the techniques with the greatest Regular and Daily use among respondents. We believe that many of these techniques help build students' skills in problem solving and critical thinking. As indicated earlier, research has shown that problem solving and critical thinking are essential skills for business graduates. Further study will be done to assess the need for specific quantitative skills. Curricula will be designed to meet the changing needs of today's workforce.

4. Application of Results to the Business Curricula

As faculty members consider ways to improve curricula, the model of introduce, reinforce, and assess should be used. Many skills and knowledge areas introduced early in the curriculum and are only marginally covered in upper level courses. The discussion below highlights potential strategies for improving curricula in the two knowledge and skills areas identified as most used by managers: communication and operations management.

The literature indicates that communication skills are extremely important, yet students lack adequate levels of preparation when they enter the workforce. Managers in the survey indicate the strong importance of communication, as well. Potential curricula improvements might include:

- a dedicated class in communications; we require a business writing class taught by English faculty and a speech class taught by language faculty; we require students entering upper level business courses to pass a writing assessment exam; stronger reinforcement of communication skills is needed in courses throughout the program.
- more writing and speaking assignments; we are working to improve our writing assessment tools to help us identify strategies to help students improve; we require our students to conduct three mock interviews with faculty and business leaders, each providing feedback on communication skills; each student must develop an electronic portfolio demonstrating knowledge and skills learned; the portfolio includes a 30 second elevator speech touting the student's best qualities; all seniors are required to attend an etiquette dinner where formal communication skills are demonstrated.
- experiential learning activities often reinforce critical communication skills; we require students to engage in projects with local small businesses where students, in conjunction with business owners, develop strategies to improve company sales and test these strategies during a specified time frame.

Numerous authors found that critical thinking and problem solving are very important skills and graduates need to improve in these areas. Managers in the survey rated operations management high in terms of use and importance. Curricular focus should consider:

- more intense math and reasoning courses; we require a logic and reasoning course prior to our business statistics course and the students are ill-prepared;
- advanced analytical exercises; we require case analyses and group projects with quantitative components; our students participate in a live economics simulation with decision making responsibilities periods.

5. Conclusions and Future Research

Managers today use quantitative skills. Managers believe that quantitative skills are important and need to be covered in business schools. Questions were raised by these results regarding coverage of some traditionally covered quantitative topics. Faculty will consider these recommendations critically when developing curricula. It is important to address additional questions in future research. Does academic major of the manager affect the opinion on importance and use of the techniques? Does management level have an effect? Does the industry of the respondent play a role in the importance of certain quantitative techniques? This study has provided evidence of the use of business knowledge and skills in the workplace and has brought to light numerous questions to be addressed.

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