Assignment of Importance to Engineering Economy Topics by Master of Engineering Management Students

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Abstract

This paper describes preliminary findings of an ongoing study of Master of Engineering Management (MEM) students and the importance they assign to topics in a graduate level engineering economy course. The objective of this study is to identify topics deserving greater course emphasis based on either job impact or application to personal or professional growth. The study evaluated eleven topical areas by asking students to rate usefulness. The ratings were evaluated for differences based on application to job, professional growth, and public/ private sector employment. Preliminary findings are discussed in this paper and contrasts between public and private sector practices are examined.

I. Introduction

Master of Engineering Management (MEM) students offer a unique perspective to educators. Since most of these students are several years into their career, they have strong opinions regarding the value of course topics for the near term in the current job and in the long term for their professional and personal development. As a result, they judge the quality of course content, in large part, based on the likelihood of application. For many students, the MEM degree will be the last time in the traditional classroom. Consequently, it becomes the instructor's challenge to provide topical emphasis and content that meets these diverse requirements.

Since many technical and engineering oriented students select MEM programs in lieu of alternative business related programs such as the MBA, MEM students have particularly high expectations related to financial analysis skills. Consequently, the MEM program must provide a high degree of the "business sense" that is perceived to be critical for climbing the organizational ladder and for the personal investment decisions that lead to personal financial success. The level of success in meeting these expectations is based in large part on the topics in the financial analysis course(s) such as graduate level engineering economics.

The study described in this paper targets improving understanding of the engineering economy topics valued by MEM students. A number of studies have examined the financial analysis tools that corporations employ [1,2]. But these studies did not track these tools into the engineering management work place at the operating manager (first level manager, second level manager,

and program / project manager) and engineer level. On a larger scale, the goal of this research is to answer these questions:

- What engineering economy topics do MEM students find useful in their current job?
- What engineering economy topics do MEM students see as useful for their personal and professional development?
- Are there differences in the answers to the previous questions and do these answers differ based on job related features?

The following sections describe the results of the first two semesters of data gathered in this study.

II. Preliminary Survey Results

During the spring and fall 2000 semesters, sections of "Cost Estimating and Financial Analysis" (the core financial course in the MEM program at Old Dominion University) were asked to voluntarily participate in an evaluation of the topics that had been covered. The results of that effort are discussed in this section and represent responses from over forty students or about 40% of the course population. The characteristics of the survey sample are summarized below:

- 75% of the respondents work in the public sector and 25% in the private sector.
- 92% of the public sector group works in the federal government and 8% in state government.
- Over 90% of the federal participants were involved in defense related activities.
- 87% of the private sector participants were involved in manufacturing and the remainder in technical services.

The survey focused on three areas. The first examined immediate student application of the course materials in the current job environment. The second area requested student opinion of the usefulness of the topic for longer - term application either personally or as a tool for professional development. The third area examined student views of whether topics should receive more or less emphasis. The following sections provide the preliminary results and highlight response differences between students employed in the public and private sectors. As the database grows in the long term, additional work - related differences will be examined including firm size, firm characteristics (such as publicly traded or privately held), job level, and others.

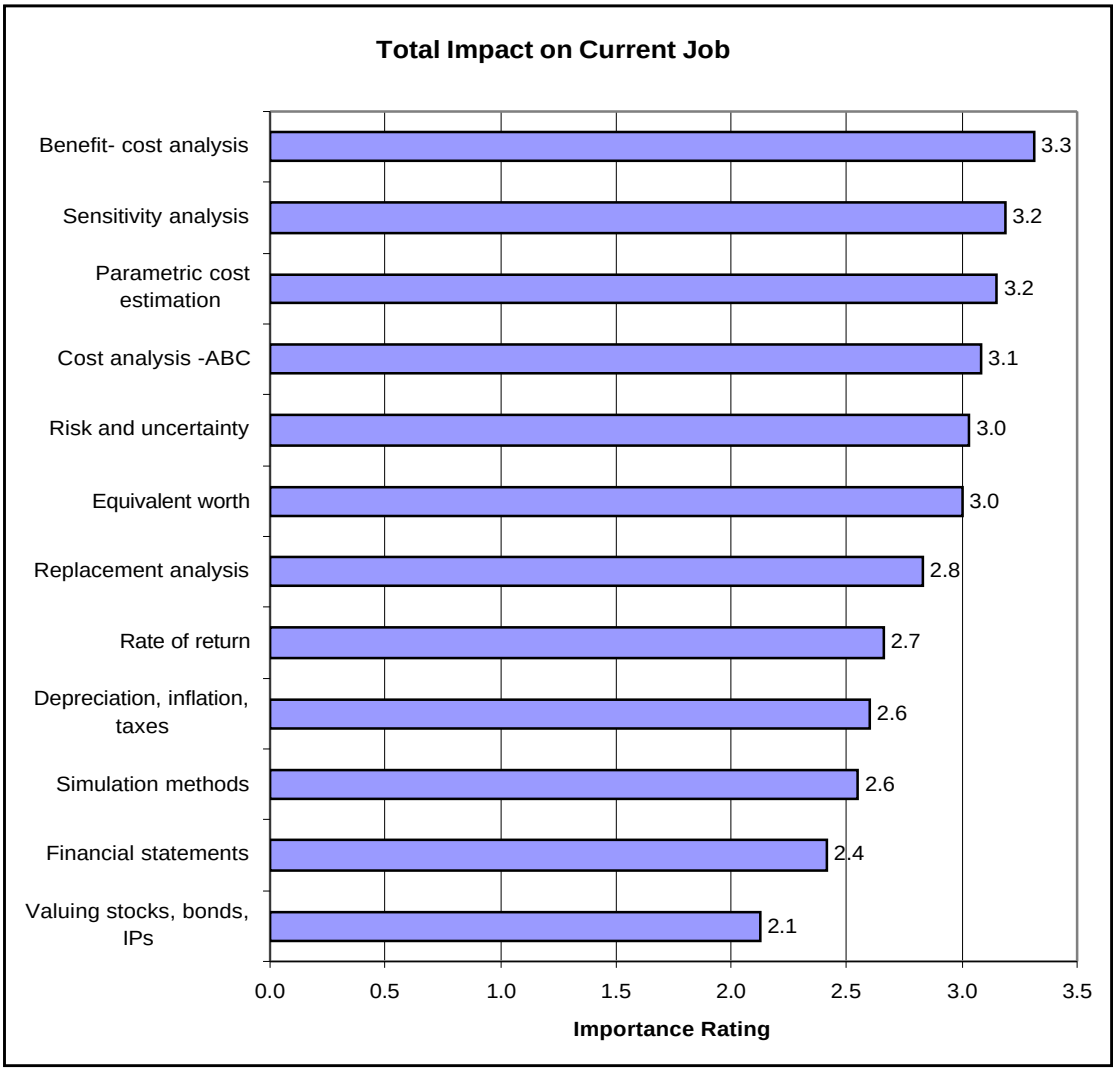
III. Topics Considered Useful in Current Job

The first survey sector targeted identification of the topics students saw as valuable in their current job responsibilities. Exhibit 1 shows the responses and highlights the following points:

- Cost analysis, equivalent worth methods, benefit cost analysis, parametric cost estimation, risk and uncertainty, and sensitivity analysis were selected as having the most impact on the current job duties.
- Financial statements and valuing stocks, bonds, and intellectual properties (IPs) were evaluated as least important for current job duties. In general, these results represent a statistically significant difference at the 95% confidence level with any topic that had an average score of three or more.

- Rate of return methods, depreciation and taxes, replacement analysis, and simulation methods were evaluated in the middle as far as current job impact.

Exhibit 1 Rating of Topic Impact on Current Job Responsibilities



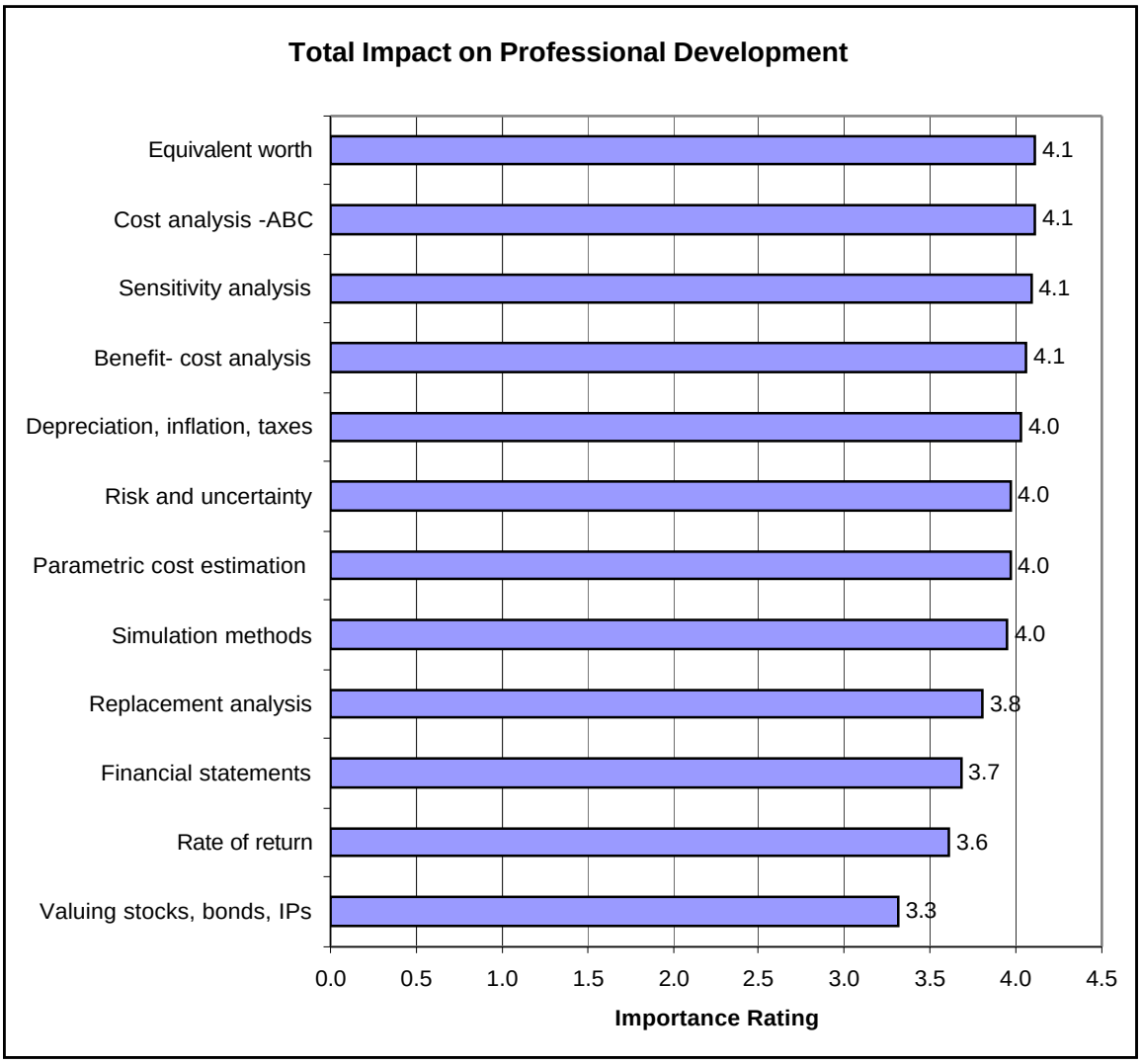
IV. Topic Usefulness for Personal or Professional Development

This section examines student ratings of topical importance for personal or professional development. Students were asked to consider topics from a perspective different from their immediate job responsibilities and to consider the value of the topics as components supporting personal or long-term professional development. Exhibit 2 contains the results of those responses.

- Cost analysis, equivalent worth, depreciation and taxes, benefit – cost, parametric cost estimation, risk and uncertainty and simulation methods were selected as most important for professional development.

- Rate of return, financial statements, and valuing stocks, bonds, and IPs were evaluated as less important for professional development.
- From a professional development view, students assigned increased importance to financial statements and simulation compared to ratings for current job impact.

Exhibit 2 Rating of Topic Impact on Professional Development



V. Recommendations for Continued Emphasis

Students were asked to make recommendations as to whether the current level of topical coverage should be increased or decreased. This response provides a test of consistency between ratings on topical usefulness and Exhibit 3 contains the summary of responses.

- Rate of return methods, financial statement analysis, and valuing stocks, bonds, and IPs received the largest responses for either reducing or eliminating coverage.

- Benefit - cost analysis, parametric cost estimation, risk and uncertainty, and simulation methods received the largest number of responses to increase coverage.
- Students appear to give a mixed response on valuing stocks, bonds, and IPs. By a small margin (9 to 7) increase was recommended over decrease / eliminate coverage. With over one-third of the recommendations for no change.

Exhibit 3 Recommendations for Continued Topical Emphasis

Percent of Responses	Increase	Same	Reduce	Eliminate
Cost Analysis -ABC	10	90	0	0
Equivalent Worth	7	90	3	0
Rate of Return	3	81	13	3
Depreciation, Inflation, Taxes	10	83	3	4
Benefit- Cost Analysis	20	77	3	0
Replacement Analysis	7	87	6	0
Parametric Cost Estimation	30	67	3	0
Risk and Uncertainty	23	67	7	3
Sensitivity Analysis	25	67	8	0
Financial Statements	11	64	18	7
Simulation Methods	31	62	0	6
Valuing Stocks, Bonds, and IPs	36	36	21	7

VI. Summary and Conclusions

The combination of a diverse and changing workplace coupled with high student expectations necessitates inclusion of topics and emphasis levels that provide the coverage that meets both the current and long-term career needs of the MEM student population. This paper provides preliminary results of a study to enhance this understanding.

- MEM students identify three tiers of topics that have varying impact on current job duties, and these are identified in Exhibit 4. Financial statements and valuing stocks, bonds and IPs have the least impact on current job duties.
- For professional development, students upgrade depreciation, inflation and taxes and simulation analysis to the top tier. In addition, financial statement analysis is upgraded from the bottom tier to the mid tier.
- Valuing stocks, bonds and IPs is consistently rated in the bottom tier.

As a final note, it is important to remember that this data represents a sample population that is public sector defense related. It will be important to note changes in this data as the number of private sector responses increases.

The authors plan to continue this survey for several more years and solicit increased involvement from MEM programs throughout the country. Additionally, the authors will be collecting longitudinal data to see recommendations change after a number of years pass. We hope that this study may also be a model for increased collaboration in other subject matter areas that are critical to MEM programs.

Exhibit 4 Tiers of Topical Importance

Job Impact		**Professional Development**	
Category	Topics	Category	Topics
Top tier (> 3.0)	Cost Analysis – ABC Equivalent Worth Benefit-Cost Analysis Parametric Cost Estimation Risk and Uncertainty Sensitivity Analysis	Top tier (> 4.0)	Cost analysis –ABC Equivalent Worth Depreciation, Inflation, Taxes Benefit-Cost Analysis Parametric Cost Estimation Risk and Uncertainty Sensitivity Analysis Simulation methods
Mid Tier (2.6 to 3.0)	Rate of Return Depreciation, Inflation, Taxes Replacement Analysis Simulation methods	Mid Tier (3.5 to 4.0)	Rate of Return Replacement Analysis Financial Statements
Bottom Tier (< 2.6)	Financial Statements Valuing Stocks, Bonds, and IPs	Bottom Tier (< 3.5)	Valuing Stocks, Bonds, and IPs

Bibliography

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2. Klammer, T., B. Koch, and N. Wilner, "Capital Budgeting Practices – A Survey of Corporate Use," *Journal of Management Accounting Research*, Fall 1991, (pp. 113-130).

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