

# Using Factor Analysis to Identify Topic Preferences Within MBA Courses

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## ABSTRACT

This study demonstrates the role of a principal components factor analysis in conducting a gap analysis as to the desired characteristics of business alumni. Typically, gap analyses merely compare the emphases that should be given to areas of inquiry with perceptions of actual emphases. As a result, the focus is upon depth of coverage. A neglected area in need of investigation is the breadth of topic dimensions and their differences between the normative (should offer) and the descriptive (actually offer). The implications of factor structures, as well as traditional gap analyses, are developed and discussed in the context of outcomes assessment.

**Keywords:** gap analysis, factor analysis, factor matching, course topic dimensions, outcomes assessment.

## 1. INTRODUCTION

Outcomes assessment is now a staple of business education. In an effort to implement continuous improvement processes, curricula are assessed as to such considerations as the coverage and application of theory, currency of information, and career relevancy. Typically, the relevancy of a program is assessed through recruiter and employer perceptions of graduates, student perceptions of curricula, and alumni perceptions of value. Additionally, a key way to assess relevancy is to conduct a gap analysis of program emphases. In other words, compare what should have been emphasized with what was actually emphasized.

Gap analyses are now a definitive part of the services marketing literature [7], and a number of studies have addressed gap analyses in the context of outcomes assessment [1, 2, 4, 6, 9]. In all of these studies, the research has involved the identification of areas of under-

and overemphasis, weaknesses and strengths, and areas of under- and overpreparation. Such assessments are then used for curriculum refinements and subsequent assessments as to the efficacy of program emphases.

With the increasing development of gap analysis as a staple of curriculum assessment, enhancements are necessary in the analysis of gap results. Typically, the focus is on the revelation of the depth of coverage. In other words, is there too little or too much? To illustrate, gap analysis has embraced a study of knowledge and skill variables [1] in an effort to reveal the relative emphasis that should be placed on each. In this regard, a study of marketing alumni revealed an underemphasis on skills and an overemphasis on knowledge, thus suggesting pedagogical reform. While such studies of *depth* of coverage are important, the area of *breadth* is in need of development within gap studies. For example, studies of desired abilities and understandings among graduates need not solely concentrate on the depth of program development (i.e., individual areas that have been revealed as being strong and those that have been revealed as being weak), as breadth issues also prevail. With respect to the latter, what are the perceptual constructs of alumni involving the variables that should be emphasized? Typically, numerous variables are evaluated individually in gap analyses, yet they can also be grouped based on interdependencies. By engaging in such groupings, faculty can conceptualize issues using the “mind-sets” of alumni and thus simplify program evaluations. In essence, faculty discussions can be more easily managed and reform implemented. This study thus seeks to develop insights into the perceptual constructs of business alumni as to the abilities and understandings that should have been emphasized versus those that actually were. In essence, it will reveal how a program was framed versus how it should have been framed. It will also reveal insights into the traditional depth-of-coverage issue that is endemic to traditional gap analysis.

## 2. BREADTH OF COVERAGE

The issue of breadth involves an assessment of the gap-based data structure or constructs in two areas: topic areas that should be emphasized and topic areas that were emphasized. The dimensions recovered from the normative (i.e., the should) may thus be compared with the dimensions of the descriptive (i.e., the actual). By revealing these dimensions a useful vehicle is created for study and review. Additionally, if the dimensions are different between the normative and the descriptive, the resulting revelation can lead to attempts at reconciliation through course redesign and course content coverage.

This study will thus present the role of factor analysis and factor matching in gap assessments of course topic emphases, and it will follow through with the issue of depth of coverage as congruent topics may also present issues of under- and overemphasis.

## 3. THE STUDY

The population for this study encompassed all graduates from an MBA program in a New England private university. The subjects ( $n = 312$ ) all graduated between May 1988 and May 1998. The results of surveying this population produced an effective sample size of 72 respondents and evidenced a 23.1 percent response rate.

In the assessment, 11 course topic areas that were used in a prior gap analysis in the marketing area [1] were employed with slight modifications. (See Table 1 on the next page.) These 11 variables, which assess abilities and understandings, were measured using a seven-point scale in which respondents were asked to indicate the emphasis that MBA instructors should have given to each of the topic areas. The scale anchors ranged from a score of "1" for a "Very Low Emphasis" to a score of "7" for a "Very High Emphasis." The same 11 variables were also measured as to actual course topic emphasis using the same exact scaling, thus permitting a comparison of the normative with the descriptive (i.e., what actually was done).

## 4. FACTOR ANALYSIS

In an effort to reveal the dimensional structure of the normative and descriptive data by themselves, a principal components factor analysis was employed. In this approach, the analysis transforms each set of variables into a new set of composite variables or principal components that are orthogonal (uncorrelated) to each

other. It reveals the best linear combination of variables in the sense that the variable combination accounts for more variance in the data than any other linear combination of variables. The first factor extraction is therefore the best summary of linear relationships exhibited in the data, while the second factor is the next best linear combination, yet orthogonal to the first. Additionally, the principal components analysis provides a framework for assessing the latent variable that is holding a set of variables together in a factor pattern.

Table 1 shows the results of the factor analysis application to each data set (i.e. should and actual emphases). Each data set evidenced a sizable amount of explained variance. In this regard, the normative data revealed a four-factor solution that explained 75.69 percent of the variance. The descriptive data revealed a three-factor solution and a 72.87 percent variance extension. Both exceed a 60 percent total variance criterion that is considered as satisfactory [5]. The presence of a four-factor solution versus a three-factor solution also promises to be revealing.

To expedite the interpretation of these factors, all factor loadings equal to or in excess of .6 were selected for interpretation. Although the cutoff is arbitrary, the high loadings easily permit sensible interpretations at the .6 level. As can be seen in Table 1, the first factor in the normative data set denotes an emphasis on "softer skills." That is, "softer skills" can be viewed as the glue holding the variables in Factor 1 together. The second factor is interpreted as "problem analysis." Factor 3, in turn, evidences a "functional/integrative orientation," while Factor 4 portrays a "software/quantitative skills" composite. Basically, MBA alumni perceive four emphases as being most relevant to their careers.

An analysis of the descriptive data in Table 1 reveals identical interpretations for the first two factors (i.e., "softer skills" and "problem analysis"), yet the third factor reveals a "functional/integrative/quantitative skills" perspective. Noteworthy is the lack of a software preparation factor. Basically, a topic that should be offered is at odds with what is actually offered. What is essentially desired is a "software/quantitative skills" combination that is not revealed in the factor analysis of descriptive data. By focusing on factors, faculty can easily come to grips with emphasis areas. Additionally, the first factor should not be interpreted as the course topic that is most important to alumni, as it merely explains more of the variance. Overall, four factors within the normative data set have emerged for analysis and discussion. Indeed, one factor in the normative set is unique when contrasted to the factors in the descriptive data set.

**TABLE 1**

**Results of Principal Components Factor Analyses With Varimax Rotations:  
A Study of MBA Topic Areas as to Normative and Descriptive Emphases\***

<i>Variables</i>	<i>Normative</i>				<i>Descriptive</i>		
	<i>Factor 1</i>	<i>Factor 2</i>	<i>Factor 3</i>	<i>Factor 4</i>	<i>Factor 1</i>	<i>Factor 2</i>	<i>Factor 3</i>
1. Technical preparation (ability to use software such as spreadsheets, statistical packages, database packages, etc.)	-.071	.232	.013	.856	.415	.192	.385
2. Ability to identify an organizational problem	.060	.838	-.000	.225	.345	.820	.188
3. Ability to analyze the relationship between organizational variables	.017	.743	.356	.154	.129	.825	.268
4. Ability to develop workable solutions to organizational problems	.359	.760	.130	-.041	.316	.814	.223
5. Ability to work effectively on a team	.656	.469	.115	-.353	.717	.452	.117
6. Oral communication skills	.899	.167	.103	.047	.889	.176	.178
7. Written communication skills	.799	.184	.043	.325	.710	.261	.207
8. Quantitative skills (ability to work with numerical data)	.451	.009	.209	.635	.423	.341	.629
9. Ability to communicate effectively using the language of business	.652	-.069	.437	-.041	.627	.111	.543
10. Understanding concepts of the functional areas of a business (i.e., marketing, finance, etc.)	.124	.143	.882	.067	.119	.365	.810
11. Understanding how the functional areas of business relate to each other	.174	.198	.875	.071	.192	.116	.897
Eigenvalues	4.162	1.577	1.322	1.264	5.822	1.147	1.047

Note: 1 = very low emphasis and 7 = very high emphasis on the semantic differential scales.

\* Normative refers to the amount of emphasis that should have been given, while Descriptive refers to the amount of emphasis that was actually given.

## 5. F MATCH

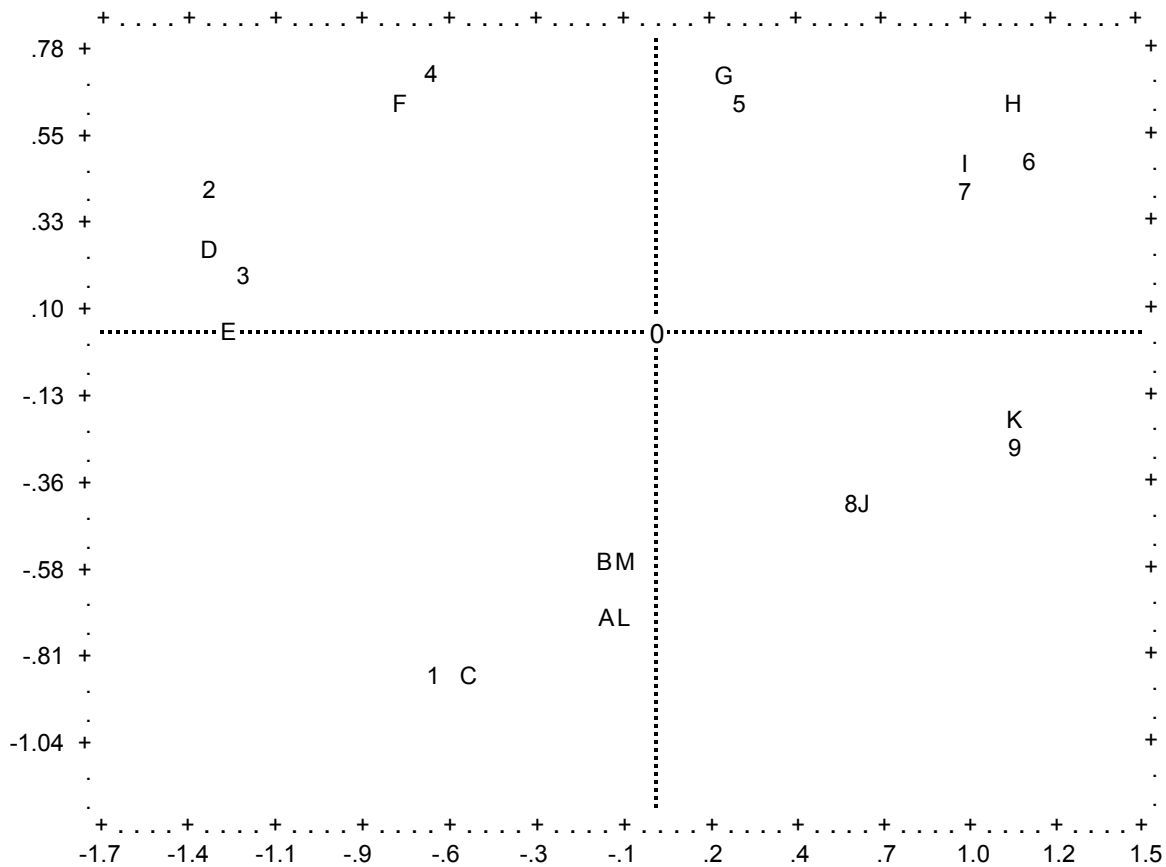
In an effort to validate the results, the apparent similarities between the first and second factors within the normative and descriptive data sets can be assessed as to convergence. Both factors have similar factor loading patterns and interpretations. This similarity can be confirmed through Cliff's F-match procedure [8]. In this approach, factor matching performs an orthogonal rotation of two matrices to assess congruence. The results of matching Factors 1 and 2 in the normative data

set with the same factors in the descriptive data set are seen in Figure 1.

In this portrayal, the normative data have been viewed as a target and the descriptive data have been matched to it. The resulting goodness-of-fit between the two matrices is equal to .90, and the correlation of the distance vectors is equal to .73. This is an outstanding fit, and it confirms the similarity in the first two factor patterns in each of the two data sets. The remaining factors are unique.

FIGURE 1

Factor Matching: Results\* of Orthogonal Rotation of Factors 1 and 2 of Both Normative and Descriptive Topic Area Emphases to Congruence



<b>Legend:</b>	Normative Emphases	=	1	2	3	4	5	6	7	8	9	10	11
	Characters	=	1	2	3	4	5	6	7	8	9	A	B
	Descriptive Emphases	=	1	2	3	4	5	6	7	8	9	10	11
	Characters	=	C	D	E	F	G	H	I	J	K	L	M

\*Goodness of fit = .900 (where -1.0 is the worst and +1.0 is perfect)  
Correlation of Distance Vectors = .730

## 6. DEPTH OF COVERAGE

While the factor analysis has revealed similarities and differences between the normative and the descriptive, the

issue of depth of coverage remains. To assess this, each normative variable mean score was compared with its descriptive counterpart mean score and a *t* test was conducted. The results are seen in Table 2.

**TABLE 2**  
**A Gap Analysis of MBA Alumni as to**  
**Normative and Descriptive Topic Area Emphases**

<i>Variables</i>	<i>Topic Area Means</i>		<i>t value*</i>	<i>Prob.</i>
	<i>Normative</i>	<i>Descriptive</i>		
1. Technical preparation (ability to use software such as spreadsheets, statistical packages, database packages, etc.)	5.71	3.93	8.03	.000
2. Ability to identify an organizational problem	5.94	4.96	6.63	.000
3. Ability to analyze the relationship between organizational variables	5.35	4.76	3.35	.001
4. Ability to develop workable solutions to organizational problems	5.88	4.89	6.11	.000
5. Ability to work effectively on a team	6.10	5.19	5.41	.000
6. Oral communication skills	6.04	5.13	6.21	.000
7. Written communication skills	6.06	5.00	6.73	.000
8. Quantitative skills (ability to work with numerical data)	5.64	5.10	2.99	.004
9. Ability to communicate effectively using the language of business	5.71	4.81	5.30	.000
10. Understanding concepts of the functional areas of a business (i.e., marketing, finance, etc.)	5.42	4.85	4.00	.000
11. Understanding how the functional areas of business relate to each other	5.32	4.74	3.15	.002

Note: 1 = very low emphasis and 7 = very high emphasis on the semantic differential scales.

\*Degrees of freedom = 71.

## 7. IMPLICATIONS

By assessing breadth issues, key topic areas can be addressed for discussion and reviewed by faculty. In essence, course topic areas may be highlighted for attention. The stability of the revealed factors can be confirmed through additional studies. Alternatively, the sample can be split into even- and odd-numbered halves, and comparisons of the factor structures in each half can be conducted. To accomplish this comparison, the use of the F-match procedure or a confirmatory factor analysis [3] is recommended.

A subsequent depth analysis can also reveal areas of under- and overemphasis. Clearly, a gap analysis can be a definitive start for program review and assessment as to program relevancy.

## 8. CONCLUSION

This study has shown how factor analysis can be employed to reveal the dimensions of normative emphases and how these dimensions can be compared with descriptive emphases. A lack of correspondence yields a signal as to areas of attention. Additionally, the revealed similarities can be assessed through F matching to confirm factor structures and to help validate study results.

The results of factor analysis can also lead to variable combinations in *t*-test assessments of differences. Regardless, factor analyses are a useful precursor to individual variable difference assessments and should be a part of traditional gap analysis. Hopefully, this study will stimulate such thinking.

As can be seen, the actual course topic emphasis is significantly lower than the desired course topic coverage in every instance. Clearly, issues of breadth and depth have been revealed.

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