

A Longitudinal Analysis of Assessment Center Factors: Changes in Importance of Managerial Potential Criteria

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Abstract

Reviews of assessment centers have provided widespread support for their usage. However, an issue not previously considered is the degree to which the relationships among assessment factors and contributions of individual factors remain stable longitudinally. The present investigation provides evidence to show that while the factors are useful in differentiating among levels of management potential, the importance and contributions of any one factor changes over time.

Introduction

Beginning with the seminal "Management Progress" Study at AT&T in the 1950s (Bray & Grant, 1966) through recent meta-analyses (Gaugler, Rosenthal, Thornton & Bentson, 1987; Hunter & Hunter, 1984; Schmitt, Gooding, Noe & Kirsch, 1984), research has consistently shown that assessment centers accurately predict a variety of job performance criteria (Thornton & Byham, 1982). Although many studies show that assessment centers have predictive validity, less is known about their construct validity (Klimoski & Brickner, 1987) and the importance of individual factors. Furthermore, few studies have sought to determine the contributions of assessment center factors to overall ratings over time. Changing the importance of specific factors used to identify management potential can be a valuable method for human resource managers to ensure congruency between organizational needs and managerial skills. The purpose of the current research was to investigate potential longitudinal changes in the relative importance given to assessment center factors by assessors.

Stability of Dimensions

One indicator of the construct validity of dimension ratings is their factor structure (Shore, Thornton, & Shore, 1990). Although there have been a number of factor analytic studies of assessment center dimension ratings (Klimoski & Brickner, 1987; Thornton & Byham, 1982), only a few studies have investigated the stability of assessment center factors over time (King & Boehm,

1980; Sackett & Hakel, 1979; Schmitt, 1977). Schmitt (1977) found evidence that the rating strategy used by assessors may change over time. Factor score regression equations for judgments by a single assessor team over three equal time periods were computed. Results indicated a lower multiple correlation for the first time period which was interpreted as evidence that the initial group of candidates was rated less consistently than the second and third groups.

Sackett and Hakel (1979) conducted a study of the temporal stability of the interrelationships among assessors' ratings. These investigators divided ratings made by each assessor and assessor team into thirds, with each third covering a time span of about two months. The small sample size precluded comparisons of factor structures. However, comparisons of correlation matrices revealed a fairly consistent pattern of ratings over time. These findings suggest that assessor information use remains fairly stable throughout an assessor's tenure.

In research which examined the temporal stability of factor structures in an assessment center, King and Boehm (1980) divided data from sixty assessment center sessions conducted between 1969 and 1978 into three time periods and factor analyzed twelve final dimension ratings and several cognitive ability tests. The first factor was always comprised of the cognitive ability tests, the second factor was comprised of dimensions representing performance style and the third factor consisted of

dimensions representing interpersonal style. The pattern of factor loadings was consistent across the three time periods.

The Current Study

While some research shows that assessment center factors are relatively stable over time (Adams & Thornton, 1988), the relationships among factors that make up the underlying structure of the assessment center have not been investigated. Changes in the relationship among factors over time within the same assessment center would imply subtle changes in the judgment processes of assessors regarding the importance of factors. Changes in the criteria used for identification of managers may result from either conscious or unconscious judgments on the part of assessors. As Schein (1978; 1984) explains, cultural changes can be facilitated by selecting managers whose skills are commensurate with the cultural requirements of the organization. Skill requirements for managers may also change as the firm adapts to environmental shifts (Gerstein & Reisman, 1983) or changes its strategic direction (Greer, Jackson, & Fiorito, 1989). Thus, changing the importance of criteria used to identify management potential in an assessment center can be an effective tool for enhancing the fit between managers and organizations.

In the present study the underlying structure of an assessment center was investigated longitudinally. Specifically, we sought to (1) determine the temporal stability of factors making up the structure of the assessment center and (2) examine the relative contributions of each factor, over time, to identification of management potential.

Method

Subjects

Participants were 724 employees of a large midwestern petroleum company assessed between 1970 and 1986 (1970-76, $n = 235$; 1978-81, $n = 196$; 1983-86, $n = 293$). All candidates were exempt employees who performed in a variety of technical, professional, or lower-level supervisory positions in various company divisions throughout the United States.

Measures

Performance Style. Participants were rated on work drive, need for structure, recognizing priorities, thoroughness, and work quality. Definitions for each performance style dimension are in the appendix.

Cognitive Ability. General Reasoning was assessed using the Miller Analogies Test (Miller, 1975) and the School and College Ability Test Verbal subtest (SCAT;

Educational Testing Service, 1961). Quantitative Ability was assessed using the SCAT Quantitative subtest. Reading speed and comprehension were assessed using the Davis Reading Test (Davis & Davis, 1957).

Interpersonal Style. Participants were rated on oral communication, amount of participation, impact, personal acceptability, and understanding of people. Definitions for each interpersonal style dimension are in the appendix.

Overall Assessment Rating (OAR). At the conclusion of the assessment center, the assessors assigned a rating to each individual indicating the highest management level (ranging from lower to upper) at which the candidate was perceived to be able to successfully perform.

Assessment Center Procedure

During each assessment center twelve candidates participated over three days in a variety of exercises including an interview, three leaderless group discussions (a selection exercise, a case analysis, and a manufacturing exercise), an oral presentation, and an in-basket. In addition, the four cognitive ability tests were administered.

At the conclusion of the assessment center, the integration committee, comprised of three management assessors and two psychologists evaluated each candidate. Candidates were rated on the five performance and five interpersonal style dimensions based on performance in all exercises. Cognitive ability test results were withheld from assessors until all dimensions were rated so as not to bias their ratings. After all dimensions were rated, an overall assessment rating of management potential was then assigned by the committee. All dimensions and the OAR were rated on a 1 (low performance) to 5 (high performance) point scale including half points. Dimension ratings and the OAR represent the mean rating across all committee members. Raw cognitive ability test scores were converted to the same 5-point scale using company norms.

Design and Analytic Techniques

Composite Measures. A factor analysis with varimax rotation using the full sample was conducted to confirm the existence of the three distinct factors labeled cognitive ability, interpersonal style, and performance style (see Table 1). Three factors with eigenvalues greater than 1.00 were extracted. Results provided confirmation of these factors identified in previous research (King & Boehm, 1980; Shore, Thornton, & Shore, 1990). No item in the analysis loaded less than .62 on its primary factor or higher than .49 on a secondary or tertiary factor. Internal consistency among dimensions comprising primary factors was moderately high for cognitive

ability ($\alpha = .86$), interpersonal style ($\alpha = .80$), and performance style ($\alpha = .86$). Based on these results composite factor-based scores (Kim & Mueller, 1978) were computed by multiplying each primary dimension in a factor by its loading and then summing across dimensions in the set.

Grouping. Participants were first segmented into three time periods which were based upon important external changes affecting the managerial characteristics needed by the organization (Ajuilar, 1988) and were constructed as follows: time period one 1970-76 (the sale of a large part of the organization for new oil resources); time period two 1978-81 (the completion of the Alaskan pipeline and significant increases in oil prices); and time period three 1983-86 (a diversification into non-oil-related business). Individuals with OARs less than or equal to 2.90 were classified as having lower level management potential, individuals with OARs above 2.90 and less than or equal to 3.25 were classified as having middle level management potential and individuals with an OAR greater than 3.25 were classified as having upper level management potential.

Analysis. Three analytic steps were followed. Multiple discriminant analysis was used to check on the ability of the cognitive ability, interpersonal style, and performance style composite factors to effectively classify participants into management level potential groups at each time period.

Coefficients of congruence (Harman, 1976) were computed between time periods one and two, one and three, and two and three based upon the canonical discriminant loadings for functions identified in the discriminant analysis. The relationship between each of the functions for each pair of time periods was reviewed for strength and significance using the method developed by Korth and Tucker (1975) and illustrated by Bedeian, Armenakis, and Randolph (1988). This technique allowed for comparison of the structure underlying assessment center factors. Magnitude of canonical discriminant loadings for each assessment center factor by time period and function identified in the discriminant analyses were reviewed to determine contributions of each individual factor to the overall structure (Klecka, 1980).

Results

Bivariate correlations between each pair of factors used in the analysis are shown in Table 2. The low to moderate correlations indicate the relatively small amount of shared variance among the factors. Multiple discriminant analysis results revealed that performance style, cognitive ability, and interpersonal style effectively classified participants into three management potential groups for each time period (1970-76: Wilks' Lambda = .37; $p < .01$; 1978-81: Wilks' Lambda = .42; $p < .01$; 1983-86:

Wilks' Lambda = .53; $p < .01$). The percent of correctly classified cases in each of the time periods was 75 percent for 1970-76, 67 percent for 1978-81, and 69 percent for 1983-86. This represents a moderately high classification rate and improvement over chance.

Two significant ($p < .05$) functions with eigenvalues greater than 1.00 were extracted for each time period. Table 3 shows the coefficients of congruence between each pair of functions for each pair of time periods. The first functions for time period one and three were strongly and significantly congruent ($\phi = .98$; $p < .05$). The second functions for time period one and three were also strongly and significantly congruent ($\phi = .99$; $p < .05$). The congruency of function one between time periods one and two, and time periods two and three, were weak and nonsignificant. When function one for time period two was compared to function one for time period one and function one for time period three there were weak and nonsignificant congruencies. Similar weak and nonsignificant results were obtained for the same comparisons made on function two between time periods two and one and again between time periods two and three.

Next, comparisons were made between the first functions for time periods one and three and the second function for time period two (see Table 3). These comparisons indicated strong and significant congruence ($\phi \geq .98$; $p < .05$). Finally, the second functions for time periods one and three were compared to the first function for time period two. Again, both comparisons were strong and significant ($\phi = .99$; $p < .05$). All other congruence coefficients computed were weak and nonsignificant. Implied by the results is that function one and two match each other for time periods one and three. Function one for time period two matches function two for both time periods one and three. Function two for time period two matches function one for both time periods one and three.

A review of the canonical discriminant loadings for each function revealed which factors were accounting for the discrimination among the three management potential level groups (see Table 4). At time period one, performance style had the highest loading on the first function, with a moderate loading for interpersonal style on the same function. The second function appears to be defined primarily by cognitive ability, with a weak loading for interpersonal style. For time period two, the first function has cognitive ability loading the highest. The second function is primarily performance style, as shown by its strong loading. Interpersonal style loaded moderately on both functions. In time period three performance style loaded the highest on the first function followed by a moderate loading for interpersonal style. For function two cognitive ability had the highest loading with a weak loading for interpersonal style. These

Table 1
Principal Components Factor Analysis of Assessment Center Dimension Ratings

Dimension	Factor 1 ¹	Factor 2	Factor 3
Thoroughness	<u>.82</u> ²	.14	.19
Work Quality	<u>.81</u>	.31	.21
Work drive	<u>.78</u>	.26	-.05
Need for structure	<u>.76</u>	.34	.15
Recognizing priorities	<u>.76</u>	.42	.30
Understanding of people	.31	<u>.82</u>	.06
Personal acceptability	.07	<u>.76</u>	-.09
Impact	.49	<u>.73</u>	.11
Oral communication	.39	<u>.69</u>	.18
Amount of participation	.42	<u>.62</u>	.13
Reading speed	.11	.14	<u>.89</u>
General reasoning	.14	.09	<u>.88</u>
Reading comprehension	.08	.14	<u>.86</u>
Quantitative ability	.20	-.13	<u>.69</u>

¹Factors 1, 2, & 3 are Performance Style, Interpersonal Style, and Cognitive Ability, respectively.

²Primary loadings are underlined.

Table 2
Bivariate Correlations Among the Three Classification Factors for Each Time Period

Factor	Time Periods								
	1970-1976			1978-1981			1983-1986		
	Factor			Factor			Factor		
	1	2	3	1	2	3	1	2	3
1. Cognitive Ability	-	-	-	-	-	-	-	-	-
2. Interpersonal Style	-.18	-	-	-.12	-	-	-.01	-	-
3. Performance Style	-.09	.43	-	.15	.35	-	.11	.53	-

Table 3
Coefficients of Congruence between pairs of Canonical Functions at Different Time Periods¹

Function 1	Function 1			Function 2		
	Time Period			Time Period		
	1	2	3	1	2	3
Time Period						
1	-	.17	.98*	-	.99*	.04
2	.16	-	.33	.99*	-	.99*
3	.99*	.13	-	.29	.98*	-

¹Time Period 1 = 1970-1976; Time Period 2 = 1978-1981; Time Period 3 = 1983-1986.

*p < .05; MINVAL = .92.

Table 4
Canonical Discriminant Loadings Assessed Over Three Discrete Time Periods

Factor	Time Period					
	1970-1976		1978-1981		1983-1986	
	Function		Function		Function	
	1	2	1	2	1	2
Performance Style	.99	-.00	.66	.99	.99	-.04
Cognitive Ability	-.13	.82	.81	.04	.09	.85
Interpersonal Style	.54	.38	.41	.41	.64	.35
% Variance	66%	34%	50%	50%	84%	16%

results demonstrate that the importance of the three assessment factors to differentiation among management potential levels, is relative to the time period.

Collectively, the results indicate that management level potential at all three time periods is differentiated accurately using the three assessment factors. However, the order of importance and associated meaning of the functions derived is only similar between time periods one and three. Order of importance and meaning of the functions derived at time period two is almost exactly opposite of what was derived for the other two time periods as shown by a review of the congruence coefficients and loadings. This can also be observed from an inspection of the amount of variance accounted for by each function (see Table 3). At time periods one and three function one is dominant while at time period two both functions account for equal amounts of variance.

Discussion

The purposes of this study were to determine the temporal stability of factors making up the underlying structure of the assessment center and examine the relative contributions of each factor to the identification of management level potential. Using all three factors, individuals were accurately classified into management level potential groups. The results also showed that for this assessment center, the underlying structures for time periods one, two, and three were similar, though the importance of individual factors changed. Performance style contributed much more strongly to identification of management level potential in time periods one and three, and cognitive ability was a stronger contributor in time period two. Interpersonal style made a relatively stable and weak to moderate contribution to identifying management potential in each of the three time periods.

These results suggest that cognitive ability, interpersonal style, and performance style factors are able to accurately differentiate among different

levels of management potential. This finding is consistent with previous research showing that an administrative skills factor, an interpersonal skills factor, and an activity factor are typical of factor structures identified for assessment centers (Adams & Thornton, 1988; Schmitt, 1979). However, while the factors are able to differentiate among management levels with acceptable accuracy it appears that the importance of the underlying factors, when assessed longitudinally at discrete time periods, is subject to subtle changes.

Specifically, the relationship between underlying structures at various time periods may increase or decrease in magnitude. In addition, the contribution of any one assessment center factor to differentiation among management potential levels changes over time. Previous research has demonstrated evidence for stability of assessment center factors over time (King & Boehm, 1980; Sackett & Hakel, 1979). Results of the present study indicate that although factors have been found to be stable over time, their relative importance and contributions to overall assessment ratings change. Thus, while the temporal stability of assessment center factors is not in question, the temporal stability of the relationships among the functions derived from those factors, both within and across time periods, appears to be variable.

Managerial Implications

Although we are reporting only an observed set of phenomena, literature in the areas of organizational culture, human resource management, and external environment may be useful in explaining the present study's results. Given that an organization's culture may change over time (Smircich, 1983; Hirschorn & Gilmore, 1989) it is tenable that the importance of specific managerial selection criteria may parallel changes in dynamic organizational processes (Cohen & Pfeffer, 1986; Gerstein & Reisman, 1983). For example, identification of future managers through the assessment center process may be a formal mechanism for instilling change within a managerial hierarchy. Through either implicit or explicit instructions to assessors, the importance or lack of importance, of particular assessment dimensions may shift over time as organizational needs dictate.

The finding that the importance of assessment center factors varies over time also has implications for improving the efficacy of human resource development programs. The assessment center may be viewed as a tool for improving the fit between intraorganizational human resources and business strategy. Assessors can be trained to weight (or weights can be generated statistically) specific factors which are congruent with the strategic needs of the organization. Training and development programs can then be targeted to skills that were found to be deficient in assessment center participants (Schein, 1978, 1984; Devanna, Fomburn, & Tichy, 1981).

Administrators of assessment center programs would be well-advised to periodically check the relationship among and importance of underlying factors. This should be done to ensure that the criteria being used by assessors to identify managerial level potential conforms to specific organizational needs.

In the present study results revealed there are subtle changes, longitudinally, in the criteria used to make managerial potential judgments. This finding is important as it shows that the assessment center process is dynamic and may reflect specific organizational needs. The results of this study are limited to one organization and one set of assessment dimensions. Replication of these findings in other organizations with similar and different dimensions is necessary. Future research would do well to focus on identification of specific cultural, environmental, and strategic variables which may affect the importance and/or contribution of individual factors to judgments of overall managerial level potential within the assessment center.

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Appendix

Interpersonal-Style Dimensions

1. Amount of participation - how active the individual would be in business discussions.
2. Impact - the degree to which the individual will influence the activities of others.
3. Personal acceptability - how well the individual will be liked by those with whom he/she has repeated business contact.
4. Understanding of people - the degree to which the individual is aware that people do not all think and feel alike, and the ability to use these differences to accomplish business goals.
5. Oral communication - the ability to clearly present information orally.

Performance-Style Dimensions

1. Work drive - the degree to which the individual will persist in completing relatively difficult and demanding tasks.
2. Need for structure - the need for guidance and direction in carrying out assignments.
3. Recognizing priorities - the ability to recognize and respond to priorities in work assignments.
4. Thoroughness of performance - the ability to recognize and consider all the relevant factors in carrying out assignments.
5. Work quality - the quality of the individual's work performance.