Three Research Approaches to Aligning Hogan Scales With Competencies

Executive Summary

Organizations often use competency models to provide a common framework for aligning human capital initiatives such as recruitment and selection, training, and promotion. Hogan offers a variety of competency-related solutions that allow organizations to incorporate personality assessments into these programs.

Each approach begins by mapping client competencies to those from the Hogan Competency Model (HCM). We then rely on synthetic and content validity evidence to align assessment scales from the HPI and HDS with each competency. This helps us determine which personality characteristics drive performance related to the specific competency.

In this paper, we outline and compare the following approaches:

1. Scale-based profiles which predict competencies using traditional fit levels,
2. HIC-based algorithms which use mathematical algorithms of predictive HICs to score each competency, and
3. Scale-based algorithms which use mathematical algorithms of predictive scales to score each competency

Based on a review of multiple competencies that are both widely used in organizational competency models and representative of multiple higher-order competency domains, we found that:

1. Competency scores are highly consistent across methods, with average correlations between .57 and .72 across the three methods.
2. All three methods produce scores related to performance ratings for each competency.
3. Scale-based profiles and algorithms provide the easiest means for interpreting individual results.
4. Predictive validity is highest for algorithm-based methods.
5. Although scale-based algorithms produce results that maximize predictive validity and are easy to interpret, it is the only approach that requires the use of both the HPI and HDS. This increases administration times compared to the first two options, which may be used with the HPI only.

By offering multiple competency-based research solutions with consistent and predictive scores across methods, Hogan remains flexible in meeting the unique demands of each of our clients. The best competency-based solution for a client largely depends on what information is needed about each competency. By using these flexible and customized research-based solutions, Hogan clients can improve the recruitment, selection, and development of their employees using reliable, valid, accurate, and interpretable solutions tailored to the client's own competency framework.

Introduction

Organizations are increasingly using competencies to evaluate personnel for hiring, promotion, training, and other purposes. Although businesses continue to use job analysis to describe work activities, many have also adopted custom competency models to identify common performance themes across jobs, work groups, and divisions (Schippmann et al., 2000). Competencies provide a common framework practitioners can use to drive a variety of HRM applications (e.g., selection, development, succession planning, strategy and change initiatives; Schippmann, 2010).

Reflecting these shifts, Hogan has experienced a rapid increase in the number of requests from clients who want to link the power of personality to their competency-based frameworks. To meet this demand, the Hogan Research Division has developed a variety of competency-based solutions that align HICs and/or scales from the Hogan Personality Inventory (HPI; R. Hogan & Hogan, 2007), Hogan Development Survey (HDS; R. Hogan & Hogan, 2009), and Motives, Values, Preferences Inventory (MVPI; J. Hogan & Hogan, 2010) to a company's existing competency model.

All competency-based research solutions start with mapping each client competency to a matching competency from the Hogan Competency Model (HCM; Hogan Assessment Systems, 2009). Those competency mappings allow Hogan researchers to identify the Hogan HICs or scales that are empirically or theoretically related to a client's competency and use those HICs or scales to predict the client's competency.

Competencies from the HCM fall into four broad domains: Intrapersonal, Interpersonal, Work, or Leadership (Hogan & Warrenfeltz, 2003). These domains form a natural developmental sequence with competencies from latter domains (e.g., Leadership) depending on development of competencies from former domains (e.g., Interpersonal). Although this model can provide a desktop reference, its real purpose is facilitating Hogan's use of archival validity evidence to align HICs and scales to client competencies. Based on client needs and other factors, the Hogan Research Division typically uses one of three different approaches to align Hogan assessments to client competencies:

- Scale-Based Profiles – This approach uses synthetic and content validity evidence to identify scales that predict each competency. We recommend cutoff scores for each scale to create a traditional profile for each competency.
- HIC-Based Algorithms – This approach also relies on synthetic and content validity evidence, but uses HPI HICs that predict each competency. Combining these HICs, we create mathematical algorithms to predict each competency.
- Scale-Based Algorithms – This approach is similar to HIC-based algorithms, but uses Hogan scales to predict each competency. Combining scales across assessments, we create mathematical algorithms to predict each competency.

The following sections present each approach using competency examples from each domain. We describe pros and cons associated with each approach, the similarity of scores across methods, and the predictive validities of each method. We conclude with recommendations for the best competency-based research solution for various purposes.

Scale-Based Profiles

Creating scale-based profiles starts with mapping each client competency to one from the HCM and identifying the assessment scales with empirical and/or theoretical linkages to the competency. Using those scales, we then set normative percentile-based cutoff scores to place candidates into fit levels on each competency. As with traditional selection profiles, the assessments included, norms, levels of fit, percentage of candidates in each fit level, and reporting output are largely based on client needs.

In tables 1 through 4 below, we present scale-based profiles for one competency from each domain. Each profile uses a combination of HPI and HDS scales, global normative cutoff scores, and three levels of fit.

Table 1. Intrapersonal Domain – Achievement Orientation Profile

Scale	Low Fit	Moderate Fit	High Fit
Ambition		≥ 46	≥ 58
Prudence		≥ 14	≥ 14
Excitable		≤ 90	≤ 85
Dutiful		≤ 85	≤ 73
Leisurely			≤ 88
Skeptical			≤ 87
Imaginative			≤ 75

Table 2. Interpersonal Domain – Building Relationships Profile

Scale	Low Fit	Moderate Fit	High Fit
Interpersonal Sensitivity		≥ 29	≥ 47
Prudence		≥ 19	≥ 26
Excitable		≤ 90	≤ 85
Imaginative		≤ 85	≤ 75
Skeptical			≤ 87
Diligent			≤ 85

Table 3. Work Domain – Innovation Profile

Scale	Low Fit	Moderate Fit	High Fit
Ambition		≥ 23	≥ 37
Inquisitive		≥ 24	≥ 31
Excitable		≤ 90	≤ 85
Imaginative		≤ 85	≤ 85
Skeptical			≤ 87
Cautious			≤ 86

Table 4. Leadership Domain – Strategic Planning Profile

Scale	Low Fit	Moderate Fit	High Fit
Ambition		≥ 19	≥ 23
Learning Approach		≥ 06	≥ 10
Diligent		≤ 85	≤ 69
Skeptical			≤ 53
Cautious			≤ 70

Scale-Based Profiles (CONT.)

Pros

- Placement of candidates into fit categories makes this approach most intuitive
- Can use any combination of HPI, HDS, and MVPI scales for each competency
- Profiles can also show candidates where they would most benefit from feedback/coaching

Cons

- Ease of interpretation and use may come with some loss of predictive validity
- Inflexible and non-compensatory; candidates fail if they miss even one moderate fit cutoff score
- Added costs associated with report customization and IT programming

HIC-Based Algorithms

To address the most significant limitations associated with scale-based profiles (i.e., predictive validity, inflexibility), we offer HIC-based algorithms. This approach also begins with mapping the client's competencies to those from the HCM. However, instead of identifying which scales are empirically-related to each competency, we use synthetic validation evidence to identify the most predictive HPI HICs for each competency. Using those HICs, we then create mathematical algorithms for each competency. Because HICs include different numbers of items, we divide each HIC score by the number of items in that HIC so that all HICs are unit weighted. Based on client needs, we can also include HDS and/or MVPI scales and customize reporting output.

Below, we present HIC-based algorithms for one competency from each domain. Each algorithm uses a combination of HPI HICs and HDS scales.

- Achievement Orientation = (((Trusting/3) – (Curiosity/3) + (Not Spontaneous/4) + (No Guilt/6) + (Competitive/5) + (Leadership/6) + (Generates Ideas/5) + (Identity/3) – (Dutiful/14) – (Skeptical/14) + 3) / 10) * 50
- Building Relationships = (((Empathy/5) + (Even Tempered/5) + (Likes Parties/5) - (Exhibitionistic/5) + (Caring/4) + (Virtuous/5) - (Leisurely/14) + 2) / 7) * 50
- Innovation = (((Trusting/3) + (Leadership/6) + (Not Anxious/4) + (Avoids Trouble/5) + (Generates Ideas/5) + (Moralistic/5) + (Curiosity/3) + (Imaginative/14) - (Cautious/14) - (Skeptical/14) + 2) / 10) * 50
- Strategic Planning = (((Trusting/3) + (Competitive/5) + (Self Confidence/3) + (Experience Seeking/6) - (Culture/4) - (Diligent/14) - (Skeptical/14) - (Cautious/14) + 4) / 8) * 50

Pros

- High predictive validity due to inclusion of most predictive HICs for each competency
- Flexible and compensatory; candidates don't "fail" by having a low score on any HPI HIC
- Can also include HDS and/or MVPI scales with HPI HICs

Cons

- Continuous scores make interpretation more difficult and do not facilitate feedback/coaching
- Using raw scores in algorithms not as directly interpretable as using normative scores
- Added costs associated with report customization and IT programming

Scale-Based Algorithms

To retain the benefits (i.e., predictive validity, flexibility) and address the most significant limitations (i.e., interpretation, use of HDS and MVPI) associated with HIC-based algorithms, we also offer scale-based algorithms. Like the scale-based profile approach, this solution begins with mapping client competencies to those from the HCM and identifying scales with empirical and/or theoretical linkages to each competency. However, instead of building profiles, we create mathematical algorithms for each competency. Scale-based algorithms also use normative percentile scores instead of raw scores, which unit weights the scales included in each algorithm and facilitates interpretation. With scale-based algorithms, the assessments included and reporting output can be customized to meet client needs.

Below, we present scale-based algorithms for one competency from each domain. Each algorithm uses a combination of HPI and HDS scales.

- Achievement Orientation = (Ambition + Prudence + (100 - Skeptical) + (100 - Cautious) + (100 - Imaginative))/5
- Building Relationships = (Interpersonal Sensitivity + Prudence + (100 - Excitable) + (100 - Skeptical) + (100 - Reserved))/5
- Innovation = (Ambition + Inquisitive + (100 - Skeptical) + (100 - Cautious) + Imaginative)/5
- Strategic Planning = (Ambition + Inquisitive + Learning Approach + (100 - Skeptical) + (100 - Diligent))/5

Pros

- Scale-based algorithms provide both predictive validity and interpretability
- Flexible and compensatory; candidates don't "fail" by having one low score on any given scale
- Can use any combination of any scales from the HPI, HDS, and MVPI

Cons

- May need to use HDS and/or MVPI scales in addition to HPI when predicting more than a few competencies to ensure differentiation of scales and scores
- Continuous competency scores do not facilitate feedback/coaching
- Added costs associated with report customization and IT programming

How Similar Are Scores Across Research Solutions?

Because we offer multiple research options for delivering competency-based solutions, a logical question concerns how similar scores are expected to be across these solutions. For example, if a person earns a high Innovation score derived from a scale-based profile, how likely is it that he/she will also earn a high score for Innovation derived from a HIC- or scale-based algorithm?

To answer that question, we used a large matched dataset of HPI and HDS data to score each competency using the scale-based profiles, HIC-based algorithms, and scale-based algorithms previously described. We then correlated competency scores across methods to determine how consistent the scores are across research solutions. Tables 5 through 8 below present results for each competency.

Table 5. Achievement Orientation Competency Solution Correlations

	1	2	3
1. Scale-Based Profile	1.00	.51**	.55**
2. HIC-Based Algorithm		1.00	.73**
3. Scale-Based Algorithm			1.00

Note: N=1,822; **Correlation is significant at .01 level.

Table 6. Building Relationships Competency Solution Correlations

	1	2	3
1. Scale-Based Profile	1.00	.58**	.65**
2. HIC-Based Algorithm		1.00	.78**
3. Scale-Based Algorithm			1.00

Note: N=1,818; **Correlation is significant at .01 level.

Table 7. Innovation Competency Solution Correlations

	1	2	3
1. Scale-Based Profile	1.00	.57**	.53**
2. HIC-Based Algorithm		1.00	.83**
3. Scale-Based Algorithm			1.00

Note: N=1,823; **Correlation is significant at .01 level.

Table 8. Strategic Planning Competency Solution Correlations

	1	2	3
1. Scale-Based Profile	1.00	.47**	.53**
2. HIC-Based Algorithm		1.00	.54**
3. Scale-Based Algorithm			1.00

Note: N=1,825; **Correlation is significant at .01 level.

Across competencies, scores from scale-based profiles and HIC-based algorithms show an average correlation of .58. This strong positive correlation reflects the fact that the same scales often appear across solutions.

How Similar Are Scores Across Research Solutions? (CONT.)

Scores from scale-based profiles and scale-based algorithms show an average correlation of .57 across competencies, indicating that scale-based profiles relate equally as strong to HIC- and scale-based algorithms. As expected, many of the same scales appear in profile and algorithm solutions for each competency, though the scoring method for each scale may vary across research solutions.

Finally, scores from HIC-based algorithms and scale-based algorithms show an average correlation of .72 across competencies. This association is the strongest positive relationship between competency-based research solutions, reflecting both consistency in the scales included and the methods used to score each HIC or scale.

In summary, competency scores are highly consistent across scale-based profiles, HIC-based algorithms, and scale-based algorithms, showing average correlations between .57 and .72 across research solutions.

Which Research Solution is Most Predictive?

A critical question concerns how well each research solution predicts performance. Because researchers commonly evaluate predictive validity by correlating predictor scores to job performance ratings, this requires complete datasets including scores on both predictors and outcome variables. To examine predictive validity of competency-based research solutions, we followed recommendations by Johnson, Carter, and Tippins (2001) and developed correlation matrices between scale components (i.e., HPI HICs and scales, HDS scales) and performance ratings for each competency across multiple studies in the Hogan archive. These matrices allow us to examine relationships between predictors and competency-based performance ratings.

We obtained correlations between HPI HICs, HPI scales, and HDS scales from a global normative dataset (Hogan Assessment System, 2011), and derived meta-analytic correlations between competency-based performance ratings and HPI HICs, HPI scales, and HDS scales from studies in the Hogan archive. We followed meta-analysis procedures outlined by Hunter and Schmidt (2004), using zero-order product-moment correlations (r) as effect sizes for all studies, a random-effects model allowing the population parameter to vary across studies, and one criterion measure per study to represent each competency.

To examine the relationship between research solutions and aligned performance ratings, we followed the unit-weighting procedure recommended by Johnson et al. (2001). This procedure is based on an equation provided by Nunnally (1978) that calculates an estimate of the overall relationship from multiple predictors when each is unit weighted:

$$r_{yx_c} = \frac{\overline{r_{yx_i}}}{\sqrt{\overline{r_{xx}}}}$$

Where:

r_{yx_c} = the correlation of a unit-weighted sum of standardized scores x_i, with a variable y

$\overline{r_{yx_i}}$ = the mean correlation between a variable y and all scores x_i making up the composite

$\overline{r_{xx}}$ = the mean of all of all elements in the R_(xx)intercorrelation matrix

We corrected for criterion unreliability in supervisor ratings using the mean inter-rater reliability coefficient of .52 proposed by Viswesvaran, Ones, and Schmidt (1996). Although some (e.g., Mount & Barrick, 1995; Ones, Viswesvaran, & Schmidt, 1993) argue that predictor unreliability can also be corrected, we believe it is premature to estimate the validity of perfect constructs when there is no agreement regarding what they are. These calculations estimate the operational validities of our competency-based research solutions. Table 9 below presents observed and operational validity estimates for each competency based on analyses using the Nunnally (1978) equation. These observed and operational validities are also averaged across competencies for each competency-based research method.

Which Research Solution is Most Predictive? (CONT.)

Table 9. Validities for Hogan Competency-Based Research Solutions

Competency	Scale-Based Profile		HIC-Based Algorithm		Scale-Based Algorithm	
	Observed	Operational	Observed	Operational	Observed	Operational
Achievement Orientation	.11	.15	.22	.31	.23	.32
Building Relationships	.16	.22	.16	.22	.23	.32
Innovation	.15	.21	.28	.39	.25	.35
Strategic Planning	.12	.17	.25	.35	.22	.31
AVERAGE VALIDITY	.14	.19	.23	.32	.23	.33

Note: Operational = Observed validities after correcting for criterion unreliability.

Results suggest that each competency-based research solution produces scores related to performance ratings for each competency. However, average validities indicate that predictive validities are similar for HIC- and scale-based algorithms, and higher for competency-based algorithms than for profile-based solutions. Overall, these results support Hogan's competency-based research solutions, particularly HIC- or scale-based algorithms, to predict competency-related performance.

So Which Research Solution is Best?

Having multiple competency-based research solutions provides us flexibility in delivering customized competency information in a variety of reports. These reports are useful across HRM applications, including applicant selection, employee development, HIPO identification, succession planning, and other administrative initiatives.

Because we can predict competency-based performance with scale-based profiles, HIC-based algorithms, or a scale-based algorithms, a logical question concerns which approach is best. The answer largely depends on what information is needed about each competency. For example, if a client wants to provide interpretive feedback to help employees develop their competencies, a profile solution may work best. If the client is only interested in maximizing prediction and is not concerned about interpreting scores, HIC-based algorithms may be preferred. However, if a client is interested in both prediction and interpretation, we recommend scale-based algorithms.

Regardless of the chosen research solution, there are several benefits to using Hogan's competency-based reports:

- The client's competency model is the foundation for the report; this integrates the predictive power of the Hogan assessments with the client's competency language, increasing relevancy and stakeholder buy-in.
- Hogan's competency methodology is based on our robust domain model and evidence from hundreds of archived criterion studies; our competency approaches can also be used with local validation studies to increase precision.
- Hogan's competency reports are user-friendly with a flexible report engine. For example, reports can (a) be customized with three levels of fit for each competency, (b) provide hiring managers with an overall candidate score, and (c) include additional interview questions to probe areas of concern flagged in the competency report.

Other issues to consider when implementing Hogan's competency-based research solutions:

- Competency-based solutions are most useful when clients prefer the language of their competency model over Hogan's scale names. Although we can align our tools to any competency model, other assessment providers can step in and work behind the scenes within the client's competency framework.
- Research costs for these competency-based solutions are comparable to standard research projects (e.g., Validity Generalization studies), but our report development and programming costs are higher as a result of customization and including the client specific competency language. This is especially true for international reports that require multiple translations.
- Hogan's off-the-shelf competency product will alleviate the problem of high report development and programming costs by offering a research-based system for users to create their own competency-based reports.

The continuously growing use of competency models in organizations requires research solutions that are not only predictive, but also flexible and customized. Hogan's competency-based research solutions meet these challenges by providing accurate, interpretable personality information in a customized report, tailored to the client's own competency framework.

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