HOGAN RESEARCH DIVISION

TECHNICAL REPORT

Validity of the Hogan Personality Inventory, Hogan Development Survey, and the Motives, Values, Preferences Inventory for Selecting Sales Representatives at ABC Company

Documentation of Evidence for
Job Analysis and Validity Generalization

March 2016

SUMMARY

This report outlines results of the job analysis and validity generalization research conducted for Sales Representatives at ABC Company. ABC Company collaborated with Hogan to validate the use of the Hogan Personality Inventory (HPI), Hogan Development Survey (HDS), and Motives, Values, Preferences Inventory (MVPI) for screening applicants into the Sales Representative job. The Hogan Research Methodology (HRM) addendum describes the Hogan tools and defines the scales that compose these assessments. Hogan designed the screening process to identify applicants possessing the personal characteristics associated with optimal job performance for the ABC Company Sales Representative job. The research involved two steps:

I. Job Analysis
   - We reviewed the ABC Company Sales Representative job description.
   - ABC Company identified Subject Matter Experts (SMEs; *N* = 9) capable of defining ideal Sales Representative performance.
   - We conducted focus groups with Sales Representative SMEs.
   - The SME panel completed the Job Evaluation Tool (JET).

II. Validity Generalization
   - Hogan used validity generalization strategies including job family meta-analysis and synthetic/job component validity to identify the HPI- and HDS-based predictors of successful performance in the Sales Representative job.

Hogan's validation findings support the predictive validity of the HPI Adjustment, Ambition, Sociability, Interpersonal Sensitivity, Prudence scales, the HDS Excitable, Cautious, and Skeptical scales, and the MVPI Commerce and Power scales.

The remainder of this document describes (a) the research process, (b) the recommended applicant screening guidelines, and (c) the estimated impact of using the assessments to screen Sales Representative applicants.

For more detailed information about the processes detailed in the following pages, please consult the HRM addendum. The addendum contains non-company specific details regarding all research steps available to clients.

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TABLES & FIGURES

1. OVERVIEW

1.1. Problem and Setting

ABC Company's selection process is critical for identifying talented employees who will contribute to the long-term success of the company. The complexities of recruiting and the dynamic job market warrant continuous evaluation and improvement of ABC Company's selection process.

A review of alternative candidate selection techniques prompted ABC Company to conclude that an assessment of personality characteristics could enhance the current procedures used to screen and select candidates into the Sales Representative job. ABC Company contacted Hogan and initiated research to evaluate the validity of the HPI, HDS, and MVPI for predicting Sales Representative job performance. If the inventory scales demonstrated validity, ABC Company planned to use the assessments to screen Sales Representative applicants.

Our research conforms to standards outlined in the *Uniform Guidelines on Employee Selection Procedures* (Equal Employment Opportunity Commission, 1978; hereafter "*Uniform Guidelines*"), *The Principles for the Validation and Use of Personnel Selection Procedures* (Society for Industrial and Organizational Psychology, 2003; hereafter "*Principles*"), and the *Standards for Educational and Psychological Testing (*American Educational Research Association, 2014; hereafter "*Standards*"). In areas where the *Uniform Guidelines, Principles* and/or *Standards* proved vague or inapplicable, the research approach relies on the broader scientific/professional literature for guidance.

1.2. Users, Location(s), and Dates of Study

ABC Company is a markets operator and provider of risk mitigation and information services, which is headquartered in San Francisco with locations throughout the United States (ABC Company, 2016). Hogan conducted research described in this report between November and March 2016. The job analysis process relied on input collected from Subject Matter Experts (hereafter, SMEs) – individuals highly familiar with the target job(s) and how they should ideally be performed. SMEs included sales representatives, account manages and desk managers at several locations. Hogan also conducted a validity generalization study by analyzing data in the Hogan archive for positions similar to Sales Representatives.

Hogan collaborated with ABC Company to conduct the research described in this document. Although most work occurred online or over the phone, participating individuals were located:

Hogan Assessment Systems 11 S. Greenwood Tulsa, OK 74120	ABC Company Fifth Avenue San Francisco, CA

For additional information regarding (a) the foundation, (b) rationale behind the steps described in this report, or (c) assessments used in this study, please consult HRM section A1.

2. JOB ANALYSIS

The *Uniform Guidelines* emphasizes the importance of conducting a complete job analysis for all content and construct validation studies. The guidelines require documentation of (a) work behaviors and/or outcomes, (b) the criticality of work behaviors or outcomes, and (c) the supporting evidence and rationale for grouping together two or more jobs (section 15, B, 3). This section describes the collaborative steps taken by Hogan and ABC Company to comply with these technical guidelines. For more information on Hogan's approach to Job Analysis, please consult the HRM Job Analysis chapter A2.

Hogan used personality-based job analysis procedures to identify scales predictive of Sales Representative performance. This included the following steps:

- We reviewed the Sales Representative job description.
- We conducted focus groups with Sales Representative SMEs.
- The SME panel completed the Job Evaluation Tool (JET).

2.1. Job Description & Focus Groups

Hogan experts' content review of the job description establishes that Sales Representatives sell goods for wholesalers or manufacturers and maintain client relationships. See Appendix A for a complete Sales Representative job description.

As seen in Appendix B, Hogan's content review of the focus group notes revealed that high-performing Sales Representatives can be described as having characteristics related to:

- delivering results and working hard (**higher HPI Ambition**)
- making a positive first impression (**higher HPI Sociability**)
- being dependable and detail-oriented (**higher HPI Prudence**)
- acting decisive and composed (**lower HDS Cautious**)
- acting considerate and socially adept (**lower HDS Reserved**)
- being cooperative and genuine (**lower HDS Leisurely**)

Finally, the focus groups showed that multiple MVPI scales are important for Sales Representative success. High performing Sales Representatives:

- value opportunities to make money and grow the business (**higher MVPI Commerce**)
- value achievement and accomplishment (**higher MVPI Power**)

Hogan's expert review revealed that personality characteristics make up a significant proportion of the important characteristics of the Sales Representative job. This provides support for using a personality-based job analysis method. Hogan also identified the appropriate DOL and O*NET codes as 41-4012 and 41-4012.03, respectively. For more information on Hogan's approach to focus groups and job description reviews, please consult the HRM section A2.1.

2.2. Job Analysis Survey

Hogan collected data from the SME panel via the JET. The four JET sections uncover personality-, motivational-, and competency-based requirements of jobs and include:

- The *Performance Improvement Characteristics* (PIC) aligns with the HPI and asks experts to identify characteristics critical for successful job performance.
- The *Derailment Characteristics Questionnaire* (DCQ) aligns with the HDS and asks experts to identify characteristics that impede or degrade job performance.
- The *Motivational Improvement Characteristics* (MIC) aligns with the MVPI and asks experts to rate the extent to which each characteristic describes the work group.
- The *Competency Evaluation Tool* (CET) uncovers the critical competencies related to successful performance.

The following sections provide the results from this survey. For more detailed JET item descriptions, refer to Tables A2, A4, A6 and A8 in the HRM.

2.2.1. PIC Results

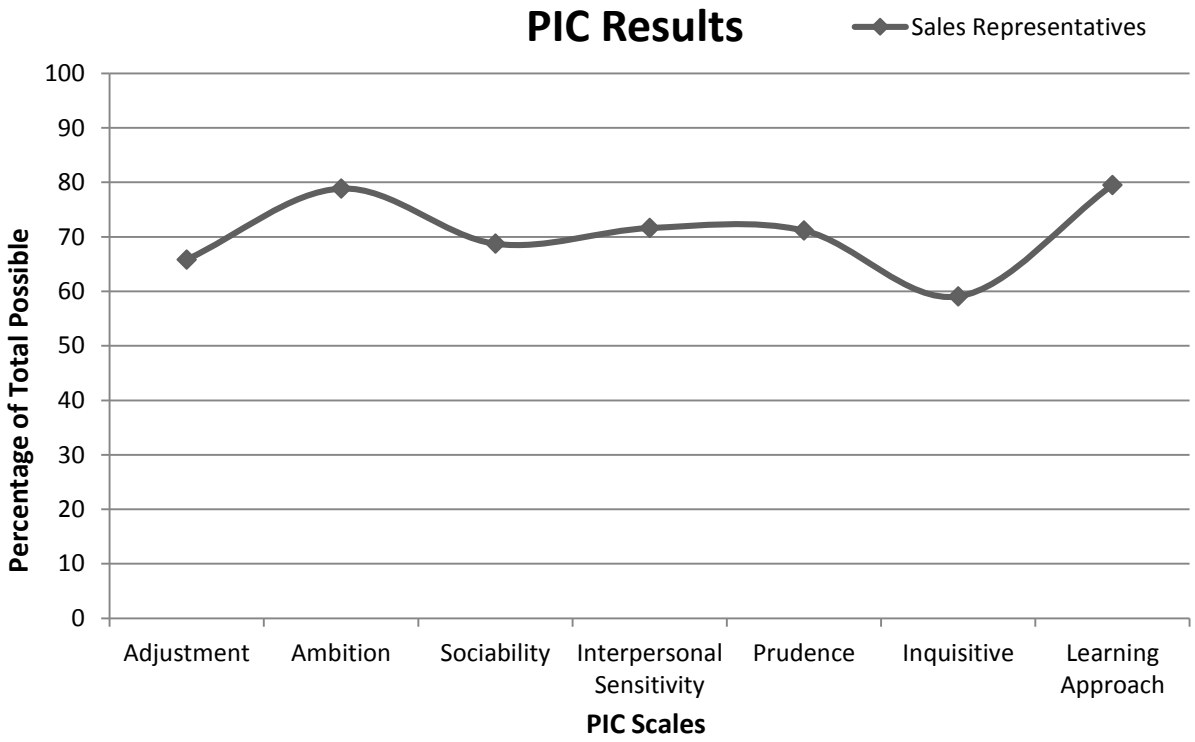
SMEs (*N* = 9) with knowledge of the Sales Representative job completed the PIC. Hogan conducted inter-rater reliability analyses to determine rater agreement. Including all raters yielded an inter-rater reliability coefficient of .92, indicating a strong degree of agreement among raters. Hogan averaged PIC scores across SMEs and converted to percentage of total possible. The number of items on each scale varies according to the number of personality facets associated with that scale. As a result, the total possible score on each scale ranges from 15 (Learning Approach) to 27 (Adjustment). Table 1 presents raw score results for each scale. Figure 1 presents scores converted to a percentage of total possible. For more detailed PIC information, please consult HRM section A2.2.a.

Table 1 Raw Score PIC Means and Standard Deviations

PIC Scale	Definition - *The degree to which a person seems…*	Total Possible	*M*	*SD*
Adjustment	Calm and self-accepting	27	17.78	2.67
Ambition	Self-confident and competitive	21	16.56	1.69
Sociability	To need or enjoy social interaction	18	12.37	2.32
Interpersonal Sensitivity	Perceptive, tactful, and sensitive	18	12.89	2.49
Prudence	Conscientious and conforming	24	17.07	3.00
Inquisitive	Creative and interested in problems	21	12.41	3.26
Learning Approach	Concerned with building job related knowledge	15	11.93	2.09

Note. *N* = 9. *M* = Mean; *SD* = Standard Deviation

Figure 1 PIC Profile



PIC results indicated each HPI scale is at least moderately important. Results suggest higher-performance in the Sales Representative role is associated with being calm and even tempered (Adjustment), energetic and goal oriented (Ambition), fond of social interaction (Sociability), perceptive and tactful (Interpersonal Sensitivity), rule abiding and conscientious (Prudence), and concerned with building job related knowledge (Learning Approach). Ambition and Learning Approach received the highest ratings.

2.2.2. DCQ Results

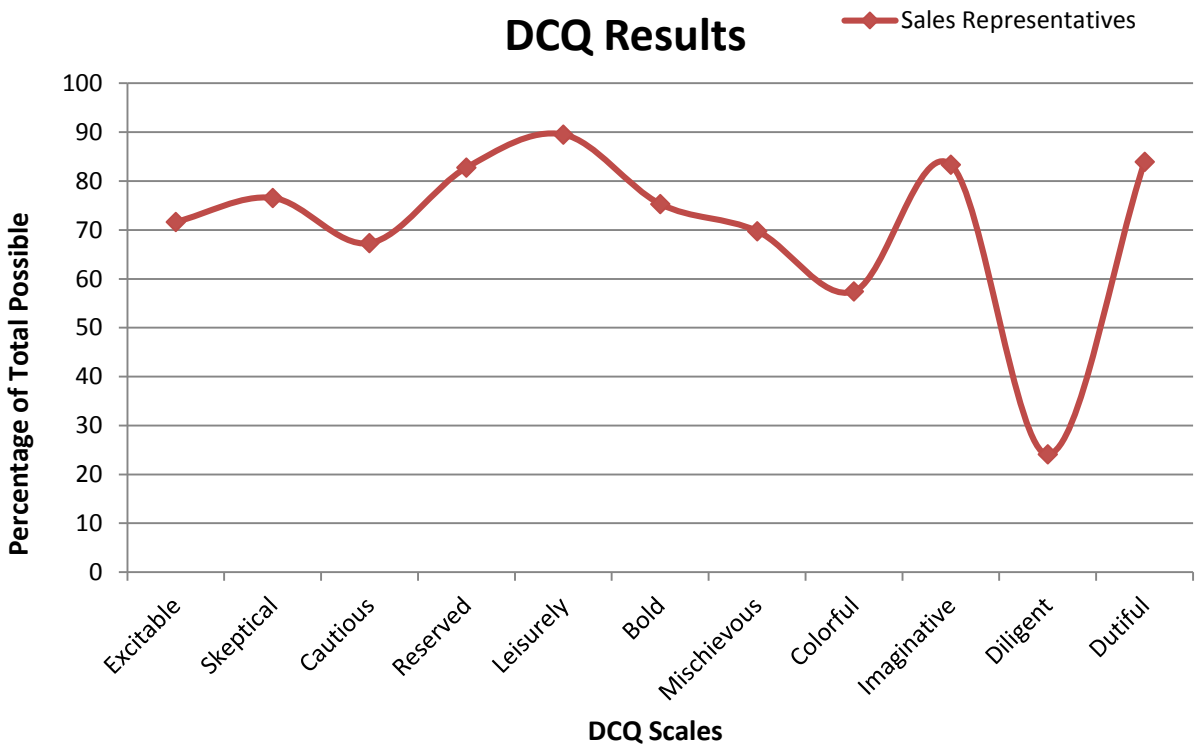
SMEs (*N* = 9) rated the 22 DCQ items. Each scale consists of two items resulting in a total possible raw score of 6 for each dimension. Including all raters in subsequent reliability analyses yielded an inter-rater reliability coefficient of .89, indicating a strong degree of agreement among raters. Table 2 presents raw score results for each scale. Figure 2 presents scores converted to a percentage of total possible. The DCQ instructions ask SMEs to rate personal characteristics based on the extent to which they *impair* job performance. Thus, characteristics with higher ratings are likely to detract from or inhibit effective Sales Representative job performance. For more detailed DCQ information, please consult HRM section A2.2.b.

Table 2 Raw Score DCQ Means and Standard Deviations

DCQ Scale	Definition - *The degree to which a person seems…*	*M*	*SD*
Excitable	Moody and hard to please	4.30	1.10
Skeptical	Cynical, mistrustful, and doubtful of others' true intentions	4.59	1.08
Cautious	Reluctant to take risks due to fear of failure or criticism	4.04	1.16
Reserved	Aloof, detached, and not interested in the feelings of others	4.96	0.90
Leisurely	Independent and resistant to feedback	5.37	0.63
Bold	Unusually self-confident and reluctant to admit shortcomings	4.52	1.53
Mischievous	Impulsive, manipulative, and exploitive	4.19	1.47
Colorful	Expressive, dramatic, and attention-seeking	3.44	1.40
Imaginative	Creative yet eccentric and impractical	5.00	1.00
Diligent	Meticulous, perfectionistic, and overly critical	1.44	1.42
Dutiful	Eager to please and reliant on others for guidance	5.04	0.94

Note. *N* = 9. *M* = Mean; *SD* = Standard Deviation

Figure 2 DCQ Profile



DCQ results indicated lower performance is associated with being volatile and impulsive (Excitable), suspicious of others' true intentions (Skeptical), reluctant to try new methods (Cautious), withdrawn and uncommunicative (Reserved), stubborn and unwilling to confront others (Leisurely), arrogant and resistant to feedback (Bold), impulsive and rule bending (Mischievous), distractible and unconventional (Imaginative), and reluctant to take independent action (Dutiful). This is an interpretable pattern based on the constructs assessed by the HDS and is consistent with the duties of the Sales Representative job.

2.2.3. MIC Results

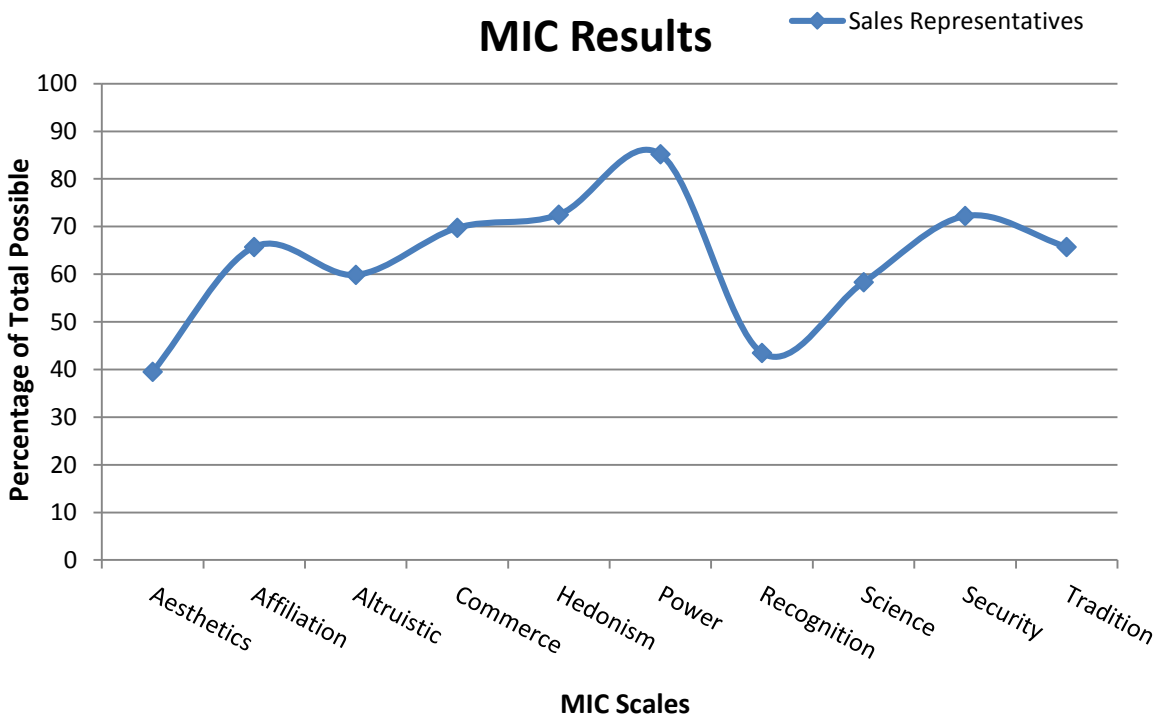
SMEs (*N* = 9) rated the 40 MIC items, comprising 10 scales, each with a total possible raw score of 12. Including all raters in subsequent reliability analyses yielded an inter-rater reliability coefficient of .85, indicating a strong degree of agreement among raters. Table 3 presents raw score results for each scale. Figure 3 presents scores converted to a percentage of total possible. The resulting percentile scores illustrate the characteristics the SME panel judged important for the Sales Representative job. For more detailed MIC information, please consult HRM section A2.2.c.

Table 3 Raw Score MIC Means and Standard Deviations

MIC Scale	Definition - *The degree to which a person values…*	*M*	*SD*
Aesthetics	Work quality and artistic endeavors	4.74	2.54
Affiliation	Friendship and social interaction	7.89	2.26
Altruistic	Helping and caring for others	7.19	2.87
Commerce	Business and financial matters	8.37	2.57
Hedonism	Fun and having a good time	8.70	1.98
Power	Accomplishment and competition	10.22	1.60
Recognition	Praise and recognition	5.22	2.90
Science	The pursuit of knowledge	7.00	2.34
Security	Certainty and predictability in life	8.67	1.41
Tradition	History and old-fashioned virtues	7.89	2.08

Note. *N* = 9. *M* = Mean; *SD* = Standard Deviation

Figure 3 MIC Profile



MIC results indicated that higher performance is associated with the following MVPI scales: Commerce, Hedonism, Power and Security. This pattern of scores suggests an environment characterized by valuing financial considerations (Commerce), fun and entertainment (Hedonistic), achievement and influence (Power), and certainty and structure (Security). Conversely, SMEs rated characteristics associated with appearance and creativity (Aesthetics), social interaction and networking (Affiliation), concern for others (Altruistic), public acknowledgment (Recognition), data-driven decision-making (Science), and established conventions and codes of conduct (Tradition) as being the least relevant to ABC Company Sales Representative performance.

2.2.4. CET Results

SMEs (*N* = 9) rated the 62 CET competencies. Including all raters in subsequent reliability analyses yielded an inter-rater reliability coefficient of .94, indicating a strong degree of agreement among raters. The CET asks SMEs to indicate the degree to which each of the 62 listed competencies are related to successful performance in the Sales Representative job. For more detailed CET information, please consult HRM section A2.2.d.

A full list of CET definitions is located in HRM table A8. CET results based on SME ratings appear in Table 4. As seen in this table, the competencies rated as most critical (one standard deviation above the mean) include Relationship Building, Sales Focus, Leveraging People Skills, Self Management, Handling Stress, Decision Making, Integrity, Accountability, Verbal Communication, Dependability, and Teamwork.

Definitions for these competencies are found in Table 5. These competencies outline personal characteristics and professional competencies required for successful performance in the Sales Representative job at ABC Company.

Table 4 Raw Score CET Means and Standard Deviations

Competency	*M*	*SD*	Competency	*M*	*SD*
Relationship Building	3.74	0.45	Dealing with Ambiguity	2.96	0.81
Sales Focus	3.70	0.47	Flexibility	2.96	0.76
Leveraging People Skills	3.63	0.49	Taking Smart Risks	2.89	1.05
Self Management	3.59	0.57	Business Insight	2.89	0.97
Handling Stress	3.59	0.50	Team Building	2.85	1.20
Decision Making	3.59	0.64	Anticipating Problems	2.85	0.91
Integrity	3.56	0.51	Leading Others	2.85	0.91
Accountability	3.52	0.58	Inspiring Others	2.81	0.88
Verbal Communication	3.48	0.58	Influencing Others	2.81	0.83
Dependability	3.48	0.58	Driving Change	2.78	1.05
Teamwork	3.48	0.51	Driving Performance	2.70	0.67
Working Hard	3.44	0.70	Leveraging Diversity	2.70	1.03
Overcoming Obstacles	3.44	0.58	Engagement	2.67	0.96
Professionalism	3.41	0.75	Time Management	2.63	0.79
Negotiating	3.41	0.69	Quality Focus	2.59	1.28
Customer Focus	3.41	0.80	Attracting Talent	2.59	1.25
Driving for Results	3.33	0.62	Setting Goals	2.59	1.05
Networking	3.33	0.68	Driving Innovation	2.56	0.93
Rule Compliance	3.30	0.87	Planning and Organizing	2.48	0.98
Competing with Others	3.30	0.67	Developing People	2.37	0.79
Displaying Confidence	3.26	0.71	Organizational Citizenship	2.33	0.83
Staying Alert	3.26	0.81	Caring about People	2.30	0.78
Managing Conflict	3.22	0.70	Delegating	2.26	0.90
Taking Initiative	3.22	0.75	Political Savvy	2.26	0.81
Listening to Others	3.22	0.89	Processing Information	2.22	0.85
Positive Attitude	3.19	0.74	Managing Resources	2.19	1.04
Detail Focus	3.15	0.82	Safety Focus	2.15	1.26
Industry Insight	3.04	0.90	Financial Insight	2.11	1.09
Solving Problems	3.04	0.90	Driving Strategy	2.07	1.00
Self Development	3.00	0.83	Presenting to Others	1.89	1.15
Leveraging Work Skills	3.00	0.73	Written Communication	1.74	0.86

Note. $N = 20$. *M* = Mean; *SD* = Standard Deviation.

Table 5 Critical CET Definitions

CET Dimension	Definition
Relationship Building	Develops collaborative relationships to facilitate current and future objectives.
Sales Focus	Generates revenue by promoting products and services to others.
Leveraging People Skills	Gets along well with others, is tactful, and behaves appropriately in social situations.
Self Management	Demonstrates appropriate motivation, attitude, and self-control.
Handling Stress	Manages pressure without getting upset, moody, or anxious.
Decision Making	Uses sound judgment to make timely and effective decisions.
Integrity	Acts honestly in accordance with moral or ethical principles.
Accountability	Accepts responsibility for one's actions regardless of outcomes.
Verbal Communication	Expresses ideas and opinions effectively in spoken conversations.
Dependability	Performs work in a reliable, consistent, and timely manner.
Teamwork	Collaborates with others to achieve goals.

2.3. Job Analysis Summary

Job analysis evidence indicates that attributes assessed by the HPI, HDS and MVPI are important for Sales Representative job performance at ABC Company.

- PIC results emphasized the importance of characteristics associated with being calm and even tempered (high HPI Adjustment), competitive and goal-oriented (high HPI Ambition), fond of social interaction (high HPI Sociability), perceptive and tactful (high HPI Interpersonal Sensitivity), rule-abiding and conscientious (high HPI Prudence), and concerned with building job-related knowledge (high HPI Learning Approach).

- DCQ results emphasized the importance of *not* being volatile and impulsive (high HDS Excitable), suspicious of others' true intentions (high HDS Skeptical), reluctant to try new methods (high HDS Cautious), withdrawn and uncommunicative (high HDS Reserved), stubborn and resistant to authority (high HDS Leisurely), arrogant and resistant to feedback (high HDS Bold), impulsive and rule-bending (high HDS Mischievous), distractible and unconventional (high HDS Imaginative), and reluctant to take independent action (high HDS Dutiful).

- MIC results helped define the ideal environment in which ABC Company Sales Representatives work. Research indicated successful Sales Representatives value environments where financial considerations (high MVPI Commerce), fun and entertainment (high MVPI Hedonism), achievement and influence (high MVPI Power), and certainty and structure (high MVPI Security) are emphasized and encouraged.

- CET results supported the importance of the Relationship Building, Sales Focus, Leveraging People Skills, Self Management, Handling Stress, Decision Making, Integrity, Accountability, Verbal Communication, Dependability, and Teamwork competencies.

- Focus groups emphasized the importance of several Hogan scales, as seen below:

HPI - *Characteristics*	HDS - *Derailers*	MVPI - *Values*
Ambition Driven, Competitive (higher)	**Cautious** Decisive, Composed (lower)	**Commerce** Finance (higher)
Sociability Approachable, Outgoing (higher)	**Reserved** Considerate, Socially Adept (lower)	**Power** Achievement (higher)
Prudence Dependable, Detail Oriented (higher)	**Leisurely** Cooperative, Genuine (lower)	

The close correspondence between job analysis components provides support for using predictor measures capable of identifying candidates likely to demonstrate these characteristics.

3. VALIDITY GENERALIZATION

The following section presents three types of Validity Generalization evidence: (1) Meta-Analytic Validity Generalization, (2) Transportability of Validity, and (3) Synthetic/Job Component Validity. For more information on Hogan's approach to VG research, please consult the HRM Validity Generalization chapter A3.

3.1. Meta-Analytic Validity Evidence

The Hogan archive contains results from over 400 criterion-related validation studies that represent a variety of jobs, organizations, and industries. Hogan classifies each study into one of seven job families:

- Managers & Executives
- Professionals
- Technicians & Specialists
- Operations & Trades
- Sales & Customer Support
- Administrative & Clerical
- Service & Support

To classify a job into a Hogan job family, three Hogan researchers review job descriptions, focus group information, ONET codes, and other job information. Then they compare the job to each job family, working toward consensus across researchers. For more information on Hogan's job families, please consult HRM table A12.

Validity evidence for these job families serve as a foundation for establishing the ability of the HPI and HDS to predict performance. To determine the relationships between Hogan scales and job performance, Hogan meta-analyzed correlations between the Hogan scales and supervisory ratings of job performance. For more information on Hogan's meta-analytic procedures, please consult HRM section A3.1d.

3.1.1. HPI Meta-Analytic Validity Evidence

Using job analysis information, we classified the ABC Company Sales Representative job into the "Sales and Customer Support" job family, encompassing those jobs that include employees who are responsible for selling and/or supporting products and services through interaction with prospects and clients using knowledge of the industry product. Hogan has accumulated a number of criterion-related studies for this job family. Hogan identified 51 relevant criterion-related studies in the Hogan archive that served as a foundation for establishing meta-analysis evidence of the validity of the HPI for predicting job performance.

Table 6 contains the operational validities between overall performance and each HPI scale. Consistent with previous research (see HRM section A3.1c), the HPI Adjustment, Ambition, and Sociability (FFM Emotional Stability, Extraversion) scales best predict overall performance. Interpersonal Sensitivity, Prudence, Inquisitive, and Learning Approach (FFM Agreeableness, Conscientiousness, and Openness scales may also predict performance for some Sales and Customer Support jobs.

Table 6 Meta-Analysis Results from HPI-Performance Correlations for Sales and Customer Support Jobs

Job Family	*K*	*N*	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Sales and Customer Support	51	3,763	.10	.28	.12	.06	.06	.05	.07

Note. Results presented in the table are operational validities; *K* = number of studies; *N* = number of participants across *K* studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

3.1.2. HDS Meta-Analytic Validity Evidence

Hogan identified relevant criterion-related studies in the Hogan archive and used the same procedures as outlined in the HPI meta-analytic section above. Table 7 presents these results for the Sales and Customer Support job family.

Table 7 Meta-Analysis Results from HDS-Performance Correlations for Sales and Customer Support Jobs.

Job Family	*K*	*N*	EXC	SKE	CAU	RES	LEI	BOL	MIS	COL	IMA	DIL	DUT
Sales and Customer Support	6	297	-.16	-.10	-.16	-.08	-.05	.14	.00	.06	.06	.03	-.07

Note. Results presented in the table are operational validities; *K* = number of studies; *N* = number of participants across *K* studies; EXC = Excitable; SKE = Skeptical; CAU = Cautious; RES = Reserved; LEI = Leisurely; BOL = Bold; MIS = Mischievous; COL = Colorful; IMA = Imaginative; DIL = Diligent; DUT = Dutiful.

The HDS Excitable, Skeptical, and Cautious scales had the strongest negative relationships with overall performance and the HDS Bold scale had the strongest positive relationship with overall performance for Sales and Customer Support jobs.

3.2. Transportability Validity Evidence

Transportability of validity involves transporting validity evidence previously established in a similar job to the current job. Hogan establishes similarity through alignment of job descriptions, O*NET codes, and JET profiles. In the present study, Hogan was unable to identify a specific job in the archive that met the stringent requirements of single-study transportability. In addition, Hogan was unable to identify studies in the Hogan archive sufficiently similar to the Sales Representative job in respect to the tasks and responsibilities associated with performing the job. In this case, Hogan defers to the meta-analytic and synthetic/job component validation results. For more information on Hogan's approach to transportability of validity research, please consult HRM section A3.2.a.

3.3. Synthetic Validity Evidence

Synthetic validation involves: (a) identifying the important components of a job; (b) reviewing prior research on the prediction of each component; and (c) aggregating correlations across multiple studies for each component of the job to form a test battery. The CET results described in section A2.2.4 identified the most important components of the current job. Table 8 displays meta-analysis results for each component. The average correlations provide the aggregated synthetic validity evidence for each HPI scale. For more information on Hogan's approach to synthetic validity research, please consult HRM section A3.3.a. For a complete list of CET definitions, please consult HRM section A2.2.d.

Table 8 HPI Correlations with Critical Competencies

CET Dimension	*K*	*N*	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Relationship Building	31	3,326	.14	.07	.00	.15	.14	-.04	-.01
Sales Focus	23	2,405	.15	.33	.07	.14	.10	.02	.06
Leveraging People Skills	63	7,047	.24	.10	.00	.18	.16	.01	.02
Self-Management	9	738	.05	.21	.25	.07	-.02	.14	-.01
Handling Stress	74	7,854	.29	.12	-.03	.11	.15	.01	.06
Decision Making	28	3,474	.15	.19	.00	.06	.10	.06	.11
Integrity	36	3,774	.21	.05	-.04	.14	.25	-.02	.02
Accountability	43	4,422	.17	.07	-.06	.08	.16	-.02	-.01
Verbal Communication	64	6,171	.17	.21	.03	.11	.12	.06	.10
Dependability	54	4,980	.18	.06	-.10	.05	.24	-.06	.04
Teamwork	65	7,310	.19	.10	.00	.16	.16	-.02	.01
Average			.18	.14	.01	.11	.14	.01	.03

Note. Results presented in the table are operational validities; *K* = number of studies; *N* = number of participants across *K* studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

The HPI Adjustment, Ambition, Interpersonal Sensitivity, and Prudence scales had the strongest relationships with performance. Note that these scales more effectively predict those performance dimensions with a common underlying construct (e.g., Handling Stress and Adjustment; Sales Focus and Ambition; Leveraging People Skills and Interpersonal Sensitivity; Integrity and Prudence). This finding is important because it underscores (a) the usefulness of aligning predictors and criteria and (b) the importance of using job components rather than overall ratings of performance as criterion measures.

Also, Hogan employed a synthetic validation process to uncover the HDS-based predictors of critically-rated Sales Representative competencies. As shown in Table 9, average synthetic validity values indicate lower scores on the HDS Excitable, Skeptical, and Imaginative scales lead to stronger Sales Representative performance. As with the HPI, note that these scales more effectively predict those performance dimensions with a common underlying construct (e.g., Handling Stress and Excitable; Decision Making and Skeptical; Dependability and Imaginative).

For additional information regarding the calculation and methodological consideration driving these synthetic results, please consult HRM section A3.3.

Table 9 HDS Correlations with Critical Job Competencies

CET Dimension	*K*	*N*	EXC	SKE	CAU	RES	LEI	BOL	MIS	COL	IMA	DIL	DUT
Relationship Building	6	742	-.17	-.19	-.13	-.14	-.09	.00	-.06	.13	.04	-.05	.04
Sales Focus	4	314	-.12	-.10	-.09	.05	-.10	-.05	.06	.03	-.16	-.08	-.11
Leveraging People Skills	4	302	-.38	-.15	.03	-.05	.06	.01	.00	.04	-.18	-.16	.19
Self-Management	2	363	-.06	-.23	-.07	-.09	.08	.07	-.03	.05	-.04	.08	.01
Handling Stress	12	1,043	-.22	-.12	-.08	-.08	-.03	-.03	.01	-.01	-.10	-.08	.07
Decision Making	6	379	-.20	-.25	-.08	-.14	-.21	-.13	-.19	-.13	-.18	.01	-.04
Integrity	8	395	.03	-.08	-.01	.06	-.02	-.17	-.28	-.18	-.13	.06	.12
Accountability	7	682	-.11	-.10	-.02	.00	-.03	-.02	-.01	.02	-.05	-.01	-.02
Verbal Communication	11	1,004	-.17	-.15	-.17	-.25	-.04	.04	-.06	.09	-.08	-.07	-.03
Dependability	6	455	-.11	-.17	-.03	-.08	-.07	-.13	-.13	-.11	-.26	-.11	.04
Teamwork	5	339	-.25	-.21	-.07	-.02	-.08	-.30	-.07	-.06	-.14	-.21	.04
Average			-.16	-.16	-.07	-.07	-.05	-.06	-.07	-.01	-.12	-.05	.03

Note. Results presented in the table are operational validities; *K* = number of studies; *N* = number of participants across *K* studies; EXC = Excitable; SKE = Skeptical; CAU = Cautious; RES = Reserved; LEI = Leisurely; BOL = Bold; MIS = Mischievous; COL = Colorful; IMA = Imaginative; DIL = Diligent; DUT = Dutiful.

4. CRITERION-RELATED VALIDITY EVIDENCE

By adhering to the guidelines set forth by the *Uniform Guidelines* and *Principles*, Hogan is not always able to conduct a local validation study. Many factors influence whether a company has the resources available for conducting a criterion-related validity study. Furthermore, when determining a study's feasibility, the *Principles* suggest companies consider:

- Accessibility of relevant criterion measures
- Access to and adequate participation from a representative research sample
- Statistical power considerations

Assuming a criterion-related validity study is feasible, it is important to next consider the research design of the study. For example, one solution involves a predictive design where job applicants complete the assessment prior to their hire date and then provide performance metrics after being on the new job for some time. Given the time delay and other operational considerations, companies rarely have the opportunity to conduct this type of study and often rely on Hogan to use a concurrent design.

In a concurrent design, Hogan collects job performance data at the same time as current incumbents take the assessments. Although this is a more practical approach, there are still resource considerations to take into account when deciding whether the company should conduct a local validation study. Hogan recommends moving forward with a criterion-related validity study when an organization can (1) identify enough incumbents (e.g., generally greater than 100) to take the assessments and (2) identify supervisors to evaluate each incumbent using a performance rating form developed by Hogan.

Many organizations choose not to conduct a local validation when they either do not have enough incumbents in a role or are concerned about the time commitment involved for their incumbents and their supervisors. In such cases, Hogan relies on validity generalization evidence in place of local validation to support the use of a selection procedure (Gatewood & Feild, 1994; Principles, 2003). Note that validity generalization research has proven itself a strong alternative to local validation studies (Hogan, Davies, & Hogan, 2007). For more information on the appropriateness of validity generalization research, see HRM section A3.

In the present study, the company decided not to move forward with a local validation study and instead, requested that Hogan rely solely on the job analysis and validity generalization evidence in the current selection research process. For more information on Hogan's rationale on conducting criterion-related validity studies, please consult HRM section A4.

5. RECOMMENDATIONS

Prior sections of this document summarize the job analysis and validation results employed to confirm the HPI, HDS, and MVPI's ability to predict performance as defined in terms of dimensions related to effective performance of ABC Company Sales Representatives. Job analysis results specified the personality-based requirements, the competencies associated with the Sales Representative job, and the work environment capable of supporting effective Sales Representative performance. The job analysis also confirmed that the HPI, HDS, and MVPI are capable of accurately measuring those requirements, competencies and environmental characteristics. VG methods used to evaluate the validity of personality measures for predicting job performance based on our archival validity evidence included meta-analysis and synthetic/job component validity. The VG evidence confirms the HPI, HDS, and MVPI's ability to predict critical performance dimensions associated with successful performance of ABC Company Sales Representative jobs.

Table 10 summarizes the support received for each HPI, HDS, and MVPI scale from the job analysis and each source of validity evidence. An expert review of these combined results as well as other qualitative information allows Hogan experts to determine the most appropriate scales used as a foundation for screening candidates into ABC Company Sales Representative jobs.

For additional information regarding Hogan's approach to interpretation and application of research recommendations, please consult HRM section A5.1.

Table 10 Summary of Research Results for Sales Representatives at ABC Company

Scale	Focus Group	JET	Meta-Analysis	Synthetic
HPI				
Adjustment	▲	▲	▲	▲▲
Ambition	▲▲	▲▲	▲▲	▲
Sociability	▲▲	▲	▲	
Interpersonal Sensitivity	▲	▲		▲
Prudence	▲▲	▲		▲
Inquisitive				
Learning Approach	▲▲	▲▲		
HDS				
Excitable	▼	▼	▼▼	▼▼
Skeptical		▼	▼	▼▼
Cautious	▼▼	▼	▼▼	
Reserved	▼▼	▼▼		
Leisurely	▼▼	▼▼		
Bold		▼	▲▲	
Mischievous		▼		
Colorful				
Imaginative		▼▼		▼
Diligent				
Dutiful		▼▼		
MVPI				
Aesthetics				
Affiliation	▲			
Altruistic				
Commerce	▲▲	▲		
Hedonism		▲		
Power	▲▲	▲▲		
Recognition				
Science	▲			
Security		▲		
Tradition				

Note. ▲ = Moderate Support; ▲▲ = Strong Support; ▼ = Moderate Negative Support; ▼▼ = Strong Negative Support; Grey shaded boxes indicate unavailable evidence.

Note that VG evidence for the MVPI is unavailable because the MVPI is not a generalizable predictor of job performance, as workplace culture and motivators are not consistent across companies or even specific job families.

5.1. Minimum-Fit Cutoff Scores

On each scale for which validity evidence was established, Hogan recommends a Minimum cutoff score; these Minimum Fit screening guidelines will screen out candidates who lack a minimal degree of the personal characteristics deemed most critical to effective performance of ABC Company Sales Representative jobs. The cutoff scores shown in Table 11 will help ABC Company screen out candidates who are likely to overreact or react negatively in response to setback and inconveniences (lower HPI Adjustment), lack self-assurance, initiative, or persistence (lower HPI Ambition), have difficulty with and are drained when engaging in social interactions (lower HPI Sociability), and lack appropriate reverence for standard protocol and are prone to taking inadvisable risks (lower HPI Prudence). Hogan suggests using these scale cutoff scores to select employees for the Sales Representative job.

Table 11 Recommended Minimum Cutoff Scores

Accept	Reject
Adjustment ≥ 10%	Adjustment < 10%
Ambition ≥ 15%	Ambition < 15%
Sociability ≥ 10%	Sociability < 10%
Prudence ≥ 10%	Prudence < 10%

For each scale, we recommend a cutoff score that represents a Minimum level of fit. In addition, we recommend a Pass-Plus decision cutoff score (i.e., Higher Fit) for additional scales.

5.2. Pass-Plus Cutoff Scores

In addition to offering Minimum Fit candidate screening guidelines, Hogan also recommends Pass-Plus decision guidelines for selecting strong potential candidates into the Sales Representative job, as shown in Table 12. These Pass-Plus candidate screening guidelines involve more stringent requirements on the scales composing the Minimum Fit candidate screening guidelines, as well as minimum requirements on scales identified as (a) predictive of specific Sales Representative performance domains and (b) capable of identifying candidates possessing work related values consistent with ABC Company's idealized Sales Representative work environment. This Pass-Plus profile identifies individuals who possess greater levels of the characteristics needed to perform the job successfully. Pass-Plus profiles provide one source of information for distinguishing between applicants who otherwise meet minimal requirements on both personality and other assessments; thus, it is a tool for distinguishing between multiple qualified candidates.

Collectively, Pass-Plus guidelines will help ABC Company identify applicants who are likely to possess greater levels of characteristics most closely related to overall successful performance within Sales Representative jobs, plus characteristics related to:

- Building and maintaining relationships (**higher HPI Interpersonal Sensitivity**)
- Showing intensity and energy without becoming volatile and unpredictable (**lower HDS Excitable**)
- Being careful and thorough without becoming risk-averse and fearful of failure (**lower HDS Cautious**)
- Being perceptive and insightful without becoming cynical and defensive (**lower HDS Skeptical**)

Furthermore, work-related values most consistent with ABC Company's idealized Sales Representative work environment are also a part of the Pass-Plus guidelines. This includes:

- Seeking opportunities to make money and grow the business (**higher MVPI Commerce**)
- Seeking achievement and influence (**higher MVPI Power**)

Table 12 Recommended Pass-Plus Cutoff Scores

Scale	Low Fit	Moderate Fit	High Fit
HPI Adjustment	Fails to Meet Moderate Fit Cutoff Scores	≥ 10%	≥ 20%
HPI Ambition		≥ 15%	≥ 25%
HPI Sociability		≥ 10%	≥ 15%
HPI Prudence		≥ 10%	≥ 15%
HPI Interpersonal Sensitivity			≥ 15%
HDS Excitable			≤ 90%
HDS Cautious			≤ 90%
HDS Skeptical			≤ 90%
MVPI Commerce			≥ 25%
MVPI Power			≥ 15%
Estimated Pass Rates based on Global Norms (*N* = 38,458)	33.3%	34.0%	32.7%

Note that these recommendations reflect guidelines only and should be used in conjunction with other available relevant information to screen otherwise qualified candidates. For additional information regarding the interpretation of these results, please consult HRM section A5.1.

6. APPLICATION OF PROFILE

6.1. Simulated Adverse Impact Analysis

Hogan evaluated selection rates for the various gender, age, and ethnic groups using an archive sample (*N* = 42, 753). These analyses serve only as estimates of potential selection rates in lieu of actual applicant data. Table 13 shows the selection rates based on data from the U.S. HPI archival sample by demographic group, where males, White applicants, and applicants under 40 years of age are considered the majority groups.

Table 13 Effects of Applying Minimum Cutoff Scores to the Hogan Archival Sample—Selection Rates and Adverse Impact Ratios by Demographic Group

		Fails to Meet Cuts		Meets Cuts		A.I. ratio
		Fail	%	Pass	%	
Total		12,774	30%	29,979	70%	NA
Gender	Male	6,447	29%	16,005	71%	NA
	Female	3,786	30%	9,043	70%	0.99
Age	< 40	4,463	27%	11,985	73%	NA
	≥ 40	5,060	33%	10,195	67%	0.92
Race/	Black	701	28%	1,798	72%	1.03
Ethnicity	Hispanic	699	27%	1,858	73%	1.04
	Asian	541	33%	1,084	67%	0.96
	American Indian/A.N.	143	28%	363	72%	1.03
	Native Hawaiian/P.I.	39	17%	186	83%	1.19
	White	6,541	30%	14,935	70%	NA

Note. A.I. = Adverse Impact; A.N. = Alaskan Native; P.I. = Pacific Islander; NA = Not Applicable.

Based on the 4/5ths rule described in the *Uniform Guidelines,* our findings suggest that the minimum cutoff scores should not result in adverse impact against any group. For additional information regarding Hogan's approach to adverse impact, please consult HRM section A6.1.

6.2. Validity Estimates

Table 14 presents the results from the various research approaches used to establish validity evidence for the HPI's ability to predict critical ABC Company Sales Representative performance dimensions by predictor and validity source. While differences do exist, they emphasize the importance of using information collected from multiple sources to determine the estimated validity of the recommended selection battery. To accomplish this, Hogan calculated overall validity estimates for each validity source using the equation provided by Nunnally (1978). Averaged across the three sources, the estimated validity of the recommended selection battery is .31, supporting the use of this battery for the selection of Sales Representatives at ABC Company.

Table 14 Combined Validity Generalization Results

Validity	Adjustment	Ambition	Sociability	Prudence	Total Validity
Meta-Analysis	.10	.28	.12	.06	.34
Synthetic	.18	.14	.01	.14	.28
Average Validity	.14	.21	.07	.10	**.31**

Combinations of personality variables are more predictive of many work related outcomes than are single personality scales (Ones, Dilchert, Viswesvaran, & Judge, 2007; Tett & Christiansen, 2007). Consistent with this idea, personality profiles combine multiple personality scales to maximize the prediction of job performance. Based on the job analysis, job family meta-analysis, and synthetic/job component validity, Hogan recommends that ABC Company use the HPI Adjustment, Ambition, Sociability and Prudence scales as a first level screen for candidates applying for ABC Company Sales Representative jobs. For additional information regarding Hogan's approach to validity estimates, please consult HRM section A6.2.

6.3. Uses and Applications

There is no indication that selection using the HPI, HDS, and MVPI will result in adverse impact against any group. Therefore, because all three assessments are valid and do not discriminate unfairly, Hogan recommends that ABC Company administer all three assessments to Sales Representative applicants and score the assessments using the recommended scales and cutoff scores. Employment suitability should be determined, in part, by assessing scores on the recommended HPI, HDS, and MVPI scales. When handling and sharing assessment score data, applicant confidentiality should always be maintained and security procedures put in place to ensure data integrity and applicant privacy.

The following procedures will help ABC Company use and monitor the selection process. First, the applicant flow should be examined closely to determine if the recommended cutoff scores allow enough applicants to pass while screening out applicants who are likely to be poor performers. Cutoff scores on which everyone fails are just as ineffective as those on which everyone passes. Second, ABC Company should maintain records of test scores by demographic group, as indicated in the *Uniform Guidelines,* to monitor the possibility of adverse impact resulting from the use of the HPI. Third, the appropriate administrative personnel at ABC Company should review the entire selection process to determine if any procedures can be improved. Test validation experts recommend that the results obtained in a validation study should be reviewed and updated after five years (Schmit, Lundquist, & Beckham, 2008). Finally, performance appraisal and/or monitoring data should be maintained, if possible, on new incumbents who are hired using this selection procedure. These data will provide a check on the validity of the selection procedure and will help determine utility. In addition, Hogan recommends conducting follow-up analyses on the people who were hired using the HPI and exploring the utility and bottom-line impact of the proposed selection system. For further information concerning this research or the results provided, please contact:

Hogan Assessment Systems
11 S. Greenwood
Tulsa, Oklahoma 74120
(918) 749-0632

6.4. Accuracy and Completeness

Hogan completes all procedures within the requirements of both the *Uniform Guidelines* and the *Principles*. Hogan derives results strictly from data and archived study results and does not embellish, falsify, or alter results in any manner.

Hogan attests to the accuracy of the data collection, analysis, and reporting procedures used in all validity studies. Hogan enters the job analysis data into a database and computes results using the latest version of SPSS statistical software.

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Appendix A: Sales Representative Job Description

ABC Company's Sales Representative Job

Overview of role:

ABC Company is looking to add a Sales Representative to its San Francisco office. The Sales Representative must have sales experience and help maximize the current team's strength while providing first class service to clients. Broad based knowledge in sales and marketing is required, but not limited to any specific product expertise from past experience. Candidate will be required to work within team here in the US.

Competencies:

Strong ability to multitask
Strong attention to detail
Strong client relationship skills for both existing and new customers
Ambitious and driven to succeed
Entrepreneurial and resilient

Qualifications & Experience

2+ years of experience as a Sales Representative

Appendix B: Sales Representative Focus Group Notes

- Role Performance
  - What are the essential work activities in the Sales Representative job?
    - Work in teams, have desire to be a team player
    - Numerically strong
    - They are in competition amongst themselves – got to make themselves stand out amongst their colleagues
    - Obsessive about their clients – care about what happens to their clients
    - Driven by financial achievement, by winning
    - Driven to be at the top, go getter
    - Self-starter

  - What are the key behaviors of successful Sales Representatives at ABC Company?
    - Humble enough to understand what the customers need
      - Be humble to client and team
      - People are willing to teach you if you are humble enough
      - If you are kind and humble, you will come across as hungry to learn
    - Objective
    - Up to date on technology
    - Combination of technical skills and a highly focused EQ as well
      - Reading their customer and understanding their needs at any given
    - Hard working

  - What characteristics do people that exhibit these key behaviors share in common?
    - Never satisfied, always driven to get to the next trade
    - Good set of social skills, personable
    - Good at making conversation

  - What qualities differentiate good vs. excellent Sales Representatives as performance is defined today?
    - Obsessive about client relationships
    - Strong attention to detail – stay behind at the end of the day, double checking everything
    - Whoever did the most – best producers – get best bonuses
    - Would rather have a bunch of good Sales Representatives than one star performer who may jeopardize the team success

- Stressors or Challenges
  - What types of behaviors tend to derail Sales Representatives or are signs of poor performance?
    - Laziness
    - Fear
    - Being timid
    - Try to rush it too quickly…need to work through things methodical
    - They end up biting off more than they can chew

  - What characteristics do people who turnover from this role (fired, resign, etc.) share in common?
    - Too impulsive/too risk tolerant
    - Don't have drive/aggressive desire

- Values and Drivers
  - What are some common motivators or values that Sales Representatives hold?
    - Want to be successful
    - Competitive drive
    - Money/commercial
    - Feeling to be a part of the team
    - Production/drive – want success
    - Strong work ethic
    - Money – monetary reward
    - Recognition of performance

  - Describe the culture and environment of ABC Company or your work group.

    Culture of Work Group
    - Strong ethical background, want to make more money for firm, but not to cross any ethical lines
    - Responsible
    - Respect for control
    - Compliance

    Culture of ABC Company
    - Take pride to working for the company
    - Uphold highest moral ethics
    - Represent the company outside of company hours
    - Collaborative – if someone steps out of line, team squashes it quickly
    - Competitive, hard working
    - Commercial business

- Additional Questions
  - How are Sales Representatives held accountable for their performance? What metrics are used to measure job performance?
    - Revenue that they produce
    - How they conduct themselves with clients
    - How ABC Company is perceived through their actions

  - Is there additional information that you would like to share about the role that was not covered in the previous questions?

    - Work life balance

ADDENDUM: Hogan Research Methodology (HRM)

Addendum Summary

This addendum summarizes the research procedures Hogan uses to establish the validity of the Hogan Personality Inventory (R. Hogan & J. Hogan, 2007; hereafter "HPI"), the Hogan Development Survey (R. Hogan & J. Hogan, 2009; hereafter "HDS"), and the Motives, Values, Preferences Inventory (J. Hogan & R. Hogan, 2010; hereafter "MVPI") for predicting job performance. All methods used to (a) identify the job's key requirements, (b) accumulate validity evidence, and (c) select scales to predict performance are included in this guide and outlined below. Not all clients choose or need to complete all of the listed steps.

Our research conforms to standards outlined in the *Uniform Guidelines on Employee Selection Procedures* (Equal Employment Opportunity Commission, 1978; hereafter "*Uniform Guidelines*"), *The Principles for the Validation and Use of Personnel Selection Procedures* (Society for Industrial and Organizational Psychology, 2003; hereafter "*Principles*"), and the *Standards for Educational and Psychological Testing (*American Educational Research Association, 2014; hereafter "*Standards*"). In areas where the *Uniform Guidelines, Principles* and/or *Standards* proved vague or inapplicable, the research approach relies on the broader scientific/professional literature for guidance.

Hogan evaluates the validity of the HPI, HDS, and MVPI using three processes: (a) job analysis, (b) validity generalization, and (c) criterion-related validation. A job analysis identifies the knowledge, skills, abilities, and other characteristics important for job performance. Hogan uses this information to establish content validity for the use of the HPI, HDS, and MVPI. In order to establish the validity, or appropriateness of using personality traits to predict the desired job performance, Hogan uses validity generalization and criterion-related validation. Both of these processes establish validity but do so using different approaches.

Validity generalization is a process of establishing validity using archival research. When possible, Hogan recommends a criterion-related validation study in order to gather local validation evidence to combine with the archival evidence. Validity generalization applies meta-analytic procedures, which combines results across multiple archival studies, to predict job performance. Alternatively, criterion-related validation uses incumbent or applicant data to predict job performance. Regardless of the method, both approaches rely on a firm understanding of the job and, ultimately, correlate personality traits with performance specific to the job at hand. The following sections provide more background and detail pertaining to the typical steps Hogan takes when executing these processes.

A1. PERSONALITY MEASUREMENT AND PREDICTION

A1.1. Approach and Rationale

Validating any selection instrument relies on accurate measurement. Measurement consists of any procedure that assigns numbers systematically to characteristic features of people according to explicit rules (Ghiselli, Campbell, & Zedeck, 1981). Professionals use these numbers to make predictions or forecast future behavior(s). Assigning numbers in a systematic fashion to characteristics is a necessary, but not sufficient, requirement of any pre-employment selection tool. Every instrument should also provide evidence to support (a) the reliability of the instrument and (b) relationships between scores on the instrument and job-relevant behaviors or outcomes (Equal Employment Opportunity Commission, 1978). At a minimum, professionals should evaluate the reliability of assessments in terms of the degree to which (a) items or questions on a scale relate to one another (internal item consistency) and (b) results or scores remain stable over time (test-retest reliability).

Test publishers should document an assessment's ability to predict job-relevant behaviors or outcomes in credible scientific sources. The supporting evidence should include significant and interpretable relations between scores on the instrument and indices of job performance. Moreover, evidence should also demonstrate that scores on the instrument predict job performance criteria critical to success in the job of interest, rather than an ability to predict performance outcomes unrelated to critical work or behaviors.

Assessment instruments should also be "fair," in that they should not discriminate unfairly on the basis of gender, age, or race (Equal Employment Opportunity Commission, 1978). As such, professionals must validate selection procedures that result in adverse impact in accordance with the *Uniform Guidelines*. Unfortunately, many instruments used in applied contexts fail to meet the criteria outlined above (R. Hogan, J. Hogan, & Trickey, 1999).

A1.2. What to Measure and Why

For personality assessment, the most important question is "*What should we measure?*" Historically, the answer depended on an author's personal interests (e.g., Locus of Control; Rotter, 1966), practical concerns (e.g., Minnesota Multiphasic Personality Inventory; Hathaway & McKinley, 1943), or theory (e.g., Myers-Briggs Type Indicator; Briggs-Meyers, McCaulley, Quenk, & Hammer, 1998; Thematic Apperception Test; Morgan & Murray, 1935). Multi-dimensional personality inventories developed during the 1940s and 1950s measured traits, or hypothetical structures believed to underlie differences in social behavior (cf. Allport, 1937). Early approaches to personality inventory construction led to more advanced test development strategies and improved the quality and interpretability of the instruments.

Current thinking in personality assessment converges on the idea that most personality characteristics reflect five broad personality dimensions (Hough & Dilchert, 2010). The Five-Factor Model (FFM; cf. Digman, 1990; Goldberg, 1992; John, 1990, p. 72; McCrae & Costa, 1987), which emerged from 50 years of factor analytic research on the structure of observer

ratings (cf. Norman, 1963; Thurstone, 1934; Tupes & Christal, 1961), suggests that we think about and describe others and ourselves in terms of five themes (Goldberg, 1990):

I. *Surgency/Extraversion* - The degree to which a person is outgoing and talkative.

II. *Agreeableness* - The degree to which a person is rewarding to deal with and pleasant.

III. *Conscientiousness* - The degree to which a person complies with rules, norms, and standards.

IV. *Emotional Stability* - The degree to which a person appears calm and self-accepting.

V. *Intellect/Openness to Experience* - The degree to which a person seems creative and open-minded.

The FFM provides the starting point for several prominent personality inventories constructed within the last 30 years (e.g., NEO-PI: Costa & McCrae, 1992; HPI: R. Hogan & J. Hogan, 1995, 2007; Personal Characteristics Inventory: Mount & Barrick, 2001; FFMQ: Gill & Hodgkinson, 2007; IPIP: Donnellan, Oswald, Baird, & Lucas, 2006). The five dimensions provide a useful taxonomy for classifying individual differences in social behavior (i.e., reputation). Evidence suggests that all existing multidimensional personality inventories conform, with little difficulty, to these five dimensions (Wiggins & Pincus, 1992). Consequently, the FFM represents the dominant paradigm for current research in personality assessment (De Raad & Perugini, 2002; R. Hogan & J. Hogan, 1995, 2007).

The FFM rests on observer's descriptions of others. These observations form the basis of one's reputation, or how people describe coworkers or peers (R. Hogan, 1983, 2005). Reputations grow from social consensus regarding consistencies in a person's behavior, and develop from behavior during social and occupational interaction. These behaviors consist, at least in part, of actions designed to establish, defend, or enhance that person's identity, or view of him or herself (cf. Goffman, 1958). Reputations are public, tell us about observable tendencies and behavior, can be measured reliably, and can be used to forecast future behavior (cf. Emler, 1990). Consequently, a person's reputation represents an invaluable source of information about work-related strengths and shortcomings and influences the direction of careers.

A1.3. Personality as a Predictor of Important Outcomes

Personality assessment samples self-presentational behavior, or how a person portrays him or herself to others on the job. Using a personality assessment allows us to aggregate these behavioral samples, assign them numbers according to certain agreed-upon rules, and then use these numbers or scores to make predictions about a person's future behavior. More importantly, personality measurement provides highly meaningful information, as previous research shows that personality predicts numerous work and non-work related outcomes. Recently, Hough and Oswald (2008) provided a summary of the value of applied personality assessment.

For example, personality predicts a number of major life outcomes, such as academic achievement, mortality, divorce, subjective well-being, and occupational attainment (Lievens, Ones, & Dilchert, 2009; O'Connor & Paunonen, 2007; Poropat, 2009; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007; Rothstein, Paunonen, Rush, & King, 1994; Steel, Schmidt, & Shulz, 2008). Research also demonstrates that personality predicts health-related behaviors including the use of drugs and alcohol (Bogg & Roberts, 2004; Cooper-Hakim & Viswesvaran, 2002; Paunonen, Haddock, Forsterling, & Keinonen, 2003; Roberts, Chernyshenko, Stark, & Goldberg, 2005). Illustrating the value of personality across contexts, Ozer and Benet-Martinez (2006) noted that, at an individual level, personality dispositions relate to happiness, physical and psychological health, spirituality, and identity. At an interpersonal level, the authors also found personality related to the quality of peer, family, and romantic relationships. Finally, at a social/institutional level, personality relates to occupational choice, satisfaction, performance, community involvement, criminal activity, and political ideology.

Additional research illustrates the value of personality for predicting work-related outcomes. For example, researchers consistently find that personality predicts overall job performance (e.g., Barrick, Mount, & Judge, 2001; Dudley, Orvis, Lebiecki, & Cortina, 2006; J. Hogan & Holland, 2003), task performance (Dudley et al., 2006; Hurtz & Donovan, 2000), expatriate performance (Mol, Born, Willemsen, & Van Der Molen, 2005) and performance in teams (Peeters, Van Tuijl, Rutte, & Reymen, 2006). Also, personality predicts a range of contextual performance variables including Organizational Citizenship Behaviors (OCBs), altruism, job dedication, interpersonal facilitation, and generalized compliance (Borman, Penner, Allen, & Motowidlo, 2001; Dudley et al., 2006; Hurtz & Donovan, 2000; LePine, Erez, & Johnson, 2002; Organ & Ryan, 1995; Chiaburu, Oh, Berry, Li, & Gardner, 2011).

Regarding specific work skills and individual competence, researchers report that personality predicts training performance and skill acquisition (Barrick & Mount, 1991; Barrick et al., 2001; Colquitt, LePine, & Noe, 2000; Major, Turner, & Fletcher, 2006), goal setting (Judge & Ilies, 2002; Steel, 2007), creativity and innovation (Feist, 1998; Furnham, Crump, Batey, Chamorro-Premuzic, 2009; Hough, 1992; Hough & Dilchert, 2007), teamwork (Barrick, Mount, & Gupta, 2003; J. Hogan & Holland, 2003), and job and career satisfaction (Judge, Heller, & Mount, 2002; Ng, Eby, Sorensen, & Feldman, 2005). Among leaders and managers, personality shows significant correlations with overall managerial effectiveness, promotion, and managerial level (Hough, Ones, & Viswesvaran, 1998; Oh & Berry, 2009), as well as leader emergence and effectiveness (Bono & Judge, 2004; Judge, Bono, Ilies, & Gerhardt, 2002).

Organizations can also use personality measures to identify employees likely to engage in Counterproductive Work Behaviors (CWBs), or behaviors that violate the norms of an organization and cause harm to the organization itself, specific members of the organization, or both (Berry, Ones, & Sackett, 2007; Gruys & Sackett, 2003). In comparison to overt integrity tests, personality-based integrity tests predict more specific negative outcomes such as theft, disciplinary actions, and absenteeism (Ones, Viswesvaran, & Schmidt, 1993, 2003).

Considering the applied value of personality in predicting a range of important business-related outcomes, as well as the robustness of these measures against the pitfalls of adverse impact and faking, it is advantageous for organizations to use personality assessment to predict meaningful job performance outcomes. In addition, evaluations of an assessment inventory's predictive effectiveness and operational validity are essential to demonstrate business necessity. As such, Hogan uses rigorous procedures to provide clients with validity evidence for our instruments.

A1.4. Advantages of Using Personality Assessments

In comparison to other methods often employed as a foundation for candidate screening, personality testing offers several advantages. Consider the following:

- Including personality measures within traditional selection batteries is one way to decrease the likelihood of adverse impact against minority groups (Campbell, 1996); using personality measures results in smaller group differences than those found for ability measures (Foldes, Duehr, & Ones, 2008).

- Cognitive ability measures tend to predict technical performance, not interpersonal skills or initiative. These tools also tend to discriminate in terms of gender, age, and race/ethnicity (Hausdorf, LeBlanc, & Chawla, 2003). Further, much of the performance variation is thought to lie in noncognitive factors (i.e. personality), as cognitive ability at the upper levels is narrow (Hollenbeck, 2009).

- There is little empirical support for a link between subjective reviews of resumes and job performance; reviewing a resume does not appear to predict subsequent job performance (O'Leary, 2009).

- Biodata measures tend to be custom-developed tools (Bliesener, 1996), not readily available in an off-the-shelf form, and tend to lack the structure and interpretability necessary to enable professional development.

- Work sample measures and assessment centers, while valid, tend to discriminate in terms of race and ethnicity much more than previously thought (Dean, Roth, & Bobko, 2008; Roth, Bobko, McFarland, & Buster, 2008).

- Integrity tests predict counterproductive work behaviors, yet appear highly related to existing FFM measures and begs the question: "what is left in integrity beyond the Big Five?" (Berry, Sackett, & Wiemann, 2007, p. 278).

- Although face valid and expected as part of the selection process, interviews tend to be subjective and need structure in order to be a strong predictor of job performance (Macan, 2009).

- Empirical research clearly demonstrates that personality assessments are strong incremental predictors of work outcomes; yet personality may also play a role in predicting team performance and organizational culture shifts (Church et al., 2015).

A1.5. Assessments

Hogan offers three personality based assessments – the HPI, HDS, and MVPI. The following sections provide a summary of each measure's purpose, development, and content.

A1.5a. The Hogan Personality Inventory

Quick Facts

- True/false items
- 7 personality scales,
  41 subscales, 1 validity scale
- 4th grade reading level
- Carefully screened to minimize invasion of privacy
- 15-20 minute completion time
- Designed for ages 18 and older
- Internet administration and reporting

Based on the FFM, development of the HPI began in the late 1970s, with assessment construction and validation conducted in accordance with professional *Standards* and the *Uniform Guidelines.* The HPI was the first measure of normal personality developed explicitly to assess the FFM in occupational contexts. The measurement goal of the HPI is to predict real-world outcomes. As such, it is an original and well-known measure of the FFM and considered a marker instrument.

Initial item generation for the HPI reflected the standard FFM dimensions. However, analyses revealed seven factors, two more than prescribed by the FFM. Analyses suggested that the standard FFM dimension called Surgency has two components that are conceptually unrelated. One component is Sociability, which concerns impulsivity and the need for social interaction – or a lack of shyness. The other component is Ambition, which concerns a desire for status, power, recognition, and achievement. Additionally, we found that the FFM dimension called Intellect/Openness to Experience has two components; one component concerns an interest in culture and ideas, and the other concerns interest in acquiring new knowledge.

The seven scales and related FFM dimensions are as follows:

- **Adjustment**: steady in the face of pressure (FFM: Emotional Stability)
- **Ambition**: appearing leader-like, status-seeking, and achievement-oriented (FFM: Extraversion)
- **Sociability**: needing and/or enjoying social interaction (FFM: Extraversion)
- **Interpersonal Sensitivity**: having social sensitivity, tact, and perceptiveness (FFM: Agreeableness)
- **Prudence**: conforming, dependable, and has self-control (FFM: Conscientiousness)
- **Inquisitive**: imaginative, adventurous, and analytical (FFM: Intellect/Openness)
- **Learning Approach**: enjoying academic activities and valuing education as an end in itself (FFM: Intellect/Openness)

In the final stages of item development, researchers produced a pool of 420 true/false items containing no psychiatric or mental health content. These items were later refined using factor

analysis and empirical validation procedures to assign 206 of the initial 420 items to one of the seven construct scales. The items form small composites (i.e., facets) that represent themes with the larger constructs. The number of composites per scale ranges from four (Learning Approach) to eight (Adjustment).

In addition to the seven primary scales, Hogan also developed a validity scale. The validity scale consists of 14 items focused on detecting careless or random responding. Initial research suggests that 99% of the research sample answered the same way for a particular validity item. Therefore, a contrary response to one of these items is an infrequent occurrence; a contrary response to five of these items (validity cutoff score) places a person in the 5.7th percentile of a large representative sample (N = 65,535), suggesting that random or careless responding may be occurring. Additionally, recent research indicates that real job applicants who completed the HPI as part of the job application process did not/could not "fake" their scores on a second occasion having been rejected the first time (J. Hogan, Barrett, & Hogan, 2007). Further, McGrath, Mitchell, Kim, & Hough (2010) found no evidence that participants distort results just for the sake of it.

In order to develop scores for the HPI, researchers first needed to identify a frame of reference for score interpretation. Researchers refer to this process as "norming" the scores (Nunnally, 1967). For this purpose, Hogan designed the Global Norm as a globally representative norm combining data from multiple countries and languages into a single dataset. To build this dataset, we started with over 1.4 million cases of HPI data (N = 1,481,024) collected between April 2001 and October 2010.

We eliminated cases based on three criteria. First, we removed cases missing responses to more than 33% of HPI assessment items. Next, we eliminated cases for which we could not identify the assessment language. Finally, we eliminated all test cases, such as those used for quality assurance or demonstration purposes. The resulting sample contained 1,151,902 cases of data.

Next, we examined representation across languages. Some languages, such as the original U.S. English forms and other well-established translations (e.g. Australian English, Spanish) were overrepresented. Other newer and less frequently used translations (e.g., Estonian, Macedonian) were underrepresented. To ensure that the normative dataset did not contain an overrepresentation of any one language, we set a maximum threshold of 10,000 cases per language. When more than 10,000 cases of data were available, we randomly identified cases based on availability of HDS and MVPI data, workforce composition, assessment purpose (i.e., personnel selection, employee development), age, and gender. The resulting dataset included 145,792 cases of data. While Hogan recommends using the Global norm, clients can also use a local norm for situations where a single-language norm is available and applicants are likely to come from a concentrated geographic area, being assessed in the same language. For more information, please see the Global Norm technical report (Hogan Research Division, 2011).

The HPI Global Norms include data from 144,877 cases of working adults across multiple countries, industries, organizations, and jobs. The normative sample is representative across all ISCO-88 major job codes. These data include supervisory and non-supervisory personnel

and strikes a balance between selection and development cases. The Global Norm technical report documents the norm development process in further detail (Hogan Research Division, 2011). Additionally, over 450 validity generalization studies and 400 criterion-related validation studies used the HPI to evaluate occupational performance across jobs and industries. Jobs studied represent 95% of the industry coverage of the Dictionary of Occupational Titles (U.S. Department of Labor, 1991).

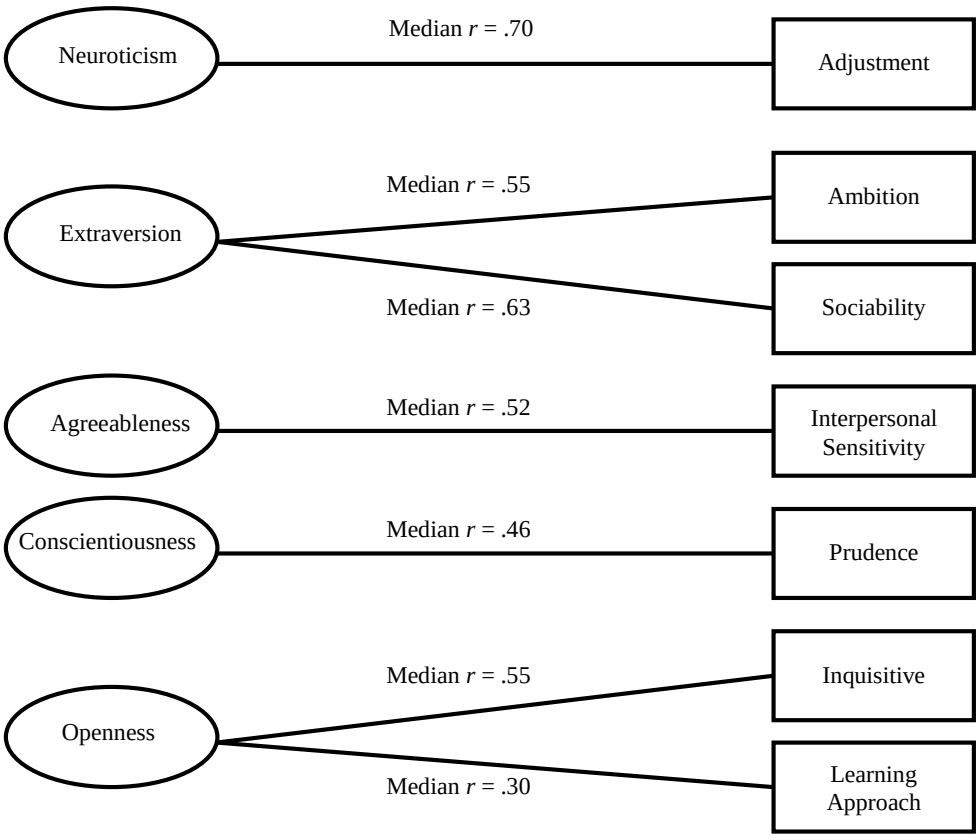
Hogan gathered validation evidence by identifying relationships between the HPI and other well-known measures of FFM. Table A1 presents correlations between the HPI and other assessments of the FFM. Figure A1 shows median correlation coefficients that summarize HPI relations with Goldberg's (1992) Big-Five Markers (R. Hogan & J. Hogan, 2007), the Personal Characteristics Inventory (Mount & Barrick, 1995), the Inventario de Personalidad de Cinco Factores (IP/5F: Salgado & Moscoso, 1999), and the NEO PI-R (Goldberg, 2000).

Table A1 Correlations between HPI Scales and other FFM Assessments

	Hogan Personality Inventory						
	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Extraversion/Surgency							
Goldberg Big Five	.04	.55*	.44*	.31*	-.24*	.29*	-.03
PCI	.04	.39*	.64*	.26*	-.09	.18*	N/A
IP/5F	.24*	.60*	.62*	.35*	.04	.41*	N/A
NEO-PI-R	.16*	.54*	.63*	.44*	-.06	.22*	.08*
Agreeableness							
Goldberg Big Five	.13	-.11	.02	.56*	.23*	-.12	-.17*
PCI	.50*	.25*	.09	.61*	.21*	-.03	N/A
IP/5F	.22*	-.12	-.10	.37*	.25*	-.10	N/A
NEO-PI-R	.31*	-.12*	-.24*	.47*	.46*	-.20*	-.08*
Conscientiousness							
Goldberg Big Five	.10	.24*	-.26*	-.07	.36*	-.17	-.08
PCI	.24*	.39*	-.06	.17*	.59*	.08	N/A
IP/5F	.22*	.35*	.08	.30*	.49*	.19*	N/A
NEO-PI-R	.24*	.37*	-.05	.08	.42*	.05	.16*
Neuroticism/Emotional Stability							
Goldberg Big Five	.70*	.39*	-.04	.27*	.01	.28*	.11
PCI	.69*	.59*	-.02	.46*	.25*	.06	N/A
IP/5F	-.66*	-.50*	-.16*	-.31*	-.32*	-.26*	N/A
NEO-PI-R	-.72*	-.53*	-.08*	-.27*	-.22*	-.15*	-.17*
Openness							
Goldberg Big Five	.05	.22*	-.04	-.01	.03	.33*	.35*
PCI	.12	.36*	.15	.17*	-.05	.57*	N/A
IP/5F	.11	.44*	.51*	.25*	-.15*	.69*	N/A
NEO-PI-R	.01	.20*	.38*	.19*	-.31*	.52*	.24*

Note. Data taken from tables in the HPI Manual (R. Hogan & J. Hogan, 2007). Goldberg Big Five N = 168; PCI N = 154; IP/5F N = 200; NEO-PI-R N = 679. * $p < .05$

Figure A1 Relationships between FFM Inventories and the HPI Scales



Note. Median correlation coefficients summarize HPI relations with the NEO PI-R (Goldberg, 2000), Goldberg's (1992) Big-Five Markers (R. Hogan & J. Hogan, 2007), Personal Characteristics Inventory (Mount & Barrick, 2001), and the Inventario de Personalidad de Cinco Factores (Salgado & Moscoso, 1999). The coefficient ranges are as follows: Adjustment/Emotional Stability/Neuroticism (.66 to .72); Ambition/ Extraversion/Surgency (.39 to .60); Sociability/Extraversion/Surgency (.44 to .64); Interpersonal Sensitivity/Agreeableness (.37 to .61); Prudence/Conscientiousness (.36 to .59); Inquisitive/Openness/Intellect (.33 to .69); Learning Approach/Openness/Intellect (.24 to .35). Reprinted with permissions from the authors. All rights reserved.

Empirical validation research conducted over the last 30 years provides a firm understanding of construct validity and the nature and range of job performance prediction. Meta-analyses of HPI scales indicate that the estimated true scale validities for predicting job performance are as follows: Adjustment (.43), Ambition (.35), Interpersonal Sensitivity (.34), Prudence (.36), Inquisitive (.34), and Learning Approach (.25) (J. Hogan, & Holland, 2003). Internal consistency reliabilities (Cronbach's α) range from .57 to .83. Test-retest reliabilities range from .69 to .87 suggesting consistent results for the same individuals over subsequent occasions. Research to date also shows that the HPI produces no adverse impact against any racial/ethnic, gender, or age group. Overall, the HPI is a well-validated and reliable instrument that predicts job performance across occupations and organizations (Axford, 1998; J. Hogan & Holland, 2003). The HPI manual documents the development and psychometric properties in further detail (R. Hogan & J. Hogan, 2007).

Favorable reviews of the HPI appear in several sources including the Buros Institute of Mental Measurements' Thirteenth Mental Measurements Yearbook (Lobello, 1998; Axford, 1998), the British Psychological Society Psychological Testing Centre Test Reviews (Creed & Shackleton, 2007; Marshall & Lindley, 2009), and the Oregon Research Institute (Goldberg, 2008). The research conducted by the Oregon Research Institute (using the HPI) compiled longitudinal data on major personality assessments from a community sample in Eugene-Springfield, Oregon in 1997 and 2007. The data is a comprehensive and objective source of validity evidence for the HPI. The results of these two studies indicate that the HPI has sufficient convergent and discriminant validity with other FFM measures (Goldberg, 2008).

A1.5b. The Hogan Development Survey

Quick Facts

- Agree/Disagree items
- 11 primary scales 33 subscales
- 6th grade reading level
- Not interpretable in terms of medical or psychiatric disability
- 15-20 minute completion time
- Designed for ages 18 and older
- Internet administration and reporting

In contrast to the FFM, which evaluates normal, day-to-day personality, there are also personality scales that measure dysfunctional interpersonal themes (R. Hogan & J. Hogan, 2009). These dysfunctional dispositions represent flawed interpersonal strategies that (a) reflect one's distorted beliefs about others and (b) negatively influence careers and life satisfaction (Bentz, 1985; J. Hogan, R. Hogan, & Kaiser, 2010; R. Hogan & J. Hogan, 1997, 2009; Leslie & Van Velsor, 1996). These behavioral tendencies emerge when people encounter stressful or novel situations and when they let down their guard — or stop considering how their actions affect others. These deeply ingrained personality characteristics reflect maladaptive coping strategies that coexist with normal, day-to-day personality.

Dysfunctional personality characteristics reflect flawed interpersonal strategies people use to negotiate for status and acceptance. These tendencies develop during childhood as strategies for dealing with criticism or feelings of inadequacy. Horney (1950), in what may be the first taxonomy of flawed interpersonal outcomes, identified three major domains of flawed dispositions: (a) managing personal inadequacies by forming alliances (i.e., moving toward people), (b) managing personal insecurities by avoiding others (i.e., moving away from people), and (c) managing personal insecurities by dominating or intimidating others (i.e., moving against people). Over time, these behavioral strategies become associated with a person's reputation and can impede job performance and career success.

Researchers conceptualize poor employee performance in at least two mutually exclusive ways. One view argues that failure is synonymous with the absence of the requisite characteristics needed for success (Bray & Howard, 1983). A second view contends that failure has more to do with exhibiting undesirable qualities (i.e., derailing characteristics) than lacking the requisite ones (J. Hogan et al., 2010; R. Hogan & J. Hogan, 2001). This second position is intriguing because it suggests a different perspective from which to understand causes of employee failure.

The Five-Factor Model is a cross-section of personality at the competent end of the distribution. At the opposite end of the spectrum of personality are clinical disorders, or sustained patterns of maladaptive feeling, thinking, and behavior. However, personalities do not exist as opposite extremes, where each individual is either "clinically disordered" or "competent." Rather, these descriptors exist as anchors on opposite ends of a continuum of functioning. Between these extremes lies a gray area previously ignored by personality researchers. In this gray area, an individual's personality may be considered "normal," though that person may exhibit certain quirks or "dysfunctional dispositions" that, while flawed, do not rise to the level of clinically disordered functioning. The HDS serves as a measure of these "dysfunctional disorders," or the negative characteristics of personality that may adversely affect the lives of otherwise normal adults. In the context of personnel selection, the HDS identifies applicants whose behavior, over time, will erode relationships with others because of flawed interpersonal strategies.

Hogan consulted three primary sources for scale development: (1) unique themes of behavior that are suggested by the personality disorders but that are common expressions of normal personality, (2) managerial derailment literature (cf. J. Hogan et al., 2010), and (3) performance appraisals (Millikin-Davies, 1992; Shipper & Wilson, 1992; Sorcher, 1985; White & DeVries, 1990). These sources suggested 11 dysfunctional dispositions that can impede job performance and lead to career difficulties. These 11 dysfunctional dispositions are defined as follows:

- **Excitable:** volatile and inconsistent, being enthusiastic about new persons or projects and then becoming disappointed with them
- **Skeptical:** cynical, distrustful, overly sensitive to criticism, and questioning others' true intentions
- **Cautious:** resistant to change and reluctant to take even reasonable chances for fear of being evaluated negatively
- **Reserved:** socially inept and lacking interest in or awareness of the feelings of others
- **Leisurely:** autonomous, indifferent to other people's requests, and becoming irritable when they persist
- **Bold:** unusually self-confident and, as a result, reluctant to admit mistakes or listen to advice, and has difficulty learning from experience
- **Mischievous:** enjoys taking risks and testing the limits
- **Colorful:** expressive, dramatic, and wanting to be noticed
- **Imaginative:** acting and thinking in creative and sometimes unusual ways
- **Diligent:** careful, precise, and critical of others' performance
- **Dutiful:** eager to please, reliant on others for support, and reluctant to take independent action

Dr. Robert Hogan wrote the items for the 11 HDS dimensions to reflect the core elements of each construct. This focus on the core of each construct is unique and contrasts with other existing inventories of personality disorders where items reflecting anxiety and depression appear on several scales simultaneously, making scale interpretation difficult. Six cycles of item writing, testing, analysis, and further revision took place over a three-year period. In

1995, Hogan defined a final item pool based on item analyses, scale-level factor analyses, correlations between scale scores and other psychometric measures, and correlations with non-test behavior. Final scales on the HDS consist of 14 agree/disagree items each. There is no item overlap among the 11 scales. The items were screened for content that might seem offensive or invade privacy. In 2014, Hogan added subscales to the HDS, which allows for deeper exploration of how each derailer manifests itself; each 14-item HDS scale is represented by three subscales with two subscales having five items and one subscale having four items (Hogan Assessment Systems, 2014).

Initial principle components analysis of the HDS yields three clearly defined factors that support interpreting the inventory using Horney's (1950) taxonomy of flawed interpersonal characteristics (R. Hogan & J. Hogan, 2001). In 2014, Hogan retested the factor structure, resulting in a four-factor model. This split Horney's 'moving toward people' dimension into two distinct factors, where individual's manage insecurities by either (a) building alliances or (b) minimizing the threat of criticism (Hogan Assessment Systems, 2014). These dispositions extend the FFM personality dimensions, defining the ends of the various five dimensions. Although the scales of the HDS relate to the dimensions of the FFM, each HDS scale reflects a syndrome with various related components, as seen in the scale definitions. As such, these dysfunctional dispositions lie at the intersection of normal personality and personality disorders.

As with the HPI, researchers first needed to identify a frame of reference for score interpretation. This process, termed "norming", includes 67,614 working adults spanning across multiple countries, industries, organizations, and jobs. These data include supervisory and non-supervisory personnel and strikes a balance between selection and development cases. The Global Norm technical report documents the (a) norm development process in further detail (Hogan Research Division, 2011) and (b) displays the HDS norms by gender, age, and race/ethnicity. Additionally, researchers have used the HDS in hundreds of validity generalization and criterion-related validation studies to predict occupational performance across a range of jobs and industries, especially in management and leadership in roles (i.e., Fleming, 2004; Khoo & Burch, 2008).

Empirical validation research conducted over the last 10 years provides a firm understanding of the construct validity and the nature and range of job performance outcomes predicted by the HDS scales. Hogan reports construct validity evidence in the assessment manual. Scale correlations with non-test behavior and observer ratings appear in R. Hogan and J. Hogan (2001, 2009). The alpha reliabilities for the scales range from .43 to .68 and short-term test-retest reliabilities, calculated using Pearson correlations, range from .64 to .75 (R. Hogan & J. Hogan, 2009). Test-retest reliabilities using normalized Euclidean similarities, a measure of the distance between the scores, range from .76 to .85 (R. Hogan & J. Hogan, 2009). Additionally, research indicates no adverse impact associated with the HDS against any racial/ethnic, gender, or age groups. The HDS manual documents the development and psychometric properties in further detail (R. Hogan & J. Hogan, 2009).

Favorable reviews of the HDS appear in the Buros Institute of Mental Measurement' *The Nineteenth Mental Measurements Yearbook* (Axford & Hayes, 2014), the British Psychological

Society Psychological Testing Centre *Test Reviews* (Hodgkinson & Robertson, 2007), and the Oregon Research Institute (Goldberg, 2008). The Oregon Research Institute research on the HDS compiled longitudinal data on a variety of personality assessments from a community sample in Eugene-Springfield Oregon in 2007. Results show desirable convergent and discriminant validity of the HDS with other personality measures (R. Hogan & J. Hogan, 2009).

It is important to note that the HDS is neither intended to, nor appropriate for, diagnosing mental illness; rather, the HDS is a measure of normal personality characteristics that hinder the ability to build relationships and accomplish goals in organizational contexts. Because of this, a primary consideration shaping the development of the HDS concerned the actual content of the items. Because the HDS is intended for use in employment contexts — as opposed to being used to make medical or mental health status evaluations — the items reflect themes from the world of work. That is, the item content revolves around how one is perceived at work, how one relates to supervisors and co-workers, one's attitudes about competition and success, etc. Further, Hogan did not validate the HDS against clinical diagnoses, but against descriptions provided by participants' close working associates (Fico, R. Hogan, & J. Hogan, 2000; R. Hogan & J. Hogan, 2009). Aside from these linear relations between the HDS and observers' ratings and descriptions, Benson and Campbell (2007) demonstrated curvilinear relations between HDS factors and observer evaluations of managers. This has clear practical implications, as taking a strength to the extreme is often detrimental to performance, and in some cases, performance suffers even when managers show a slight tendency to exaggerate their strengths (Kaplan & Kaiser, 2009).

A1.5c. The Motives, Values, Preferences Inventory

Quick Facts

- Agree/uncertain/disagree items
- 10 primary scales, 5 themes per scale
- 3rd grade reading level
- 15-20 minute completion time
- Designed for ages 18 and older
- Internet administration and reporting

The MVPI (J. Hogan & R. Hogan, 1996; 2010) serves two distinct purposes. First, it allows for an evaluation of fit between an individual and an organization, an important index given that greater similarity between individual and organizational values facilitates successful person-organization fit. Person-organization fit is important because, no matter how talented and hard-working a person may be, if the individual's values are incompatible with those of the larger culture, then he or she will not be as effective as his or her talent might predict. Second, the MVPI is a direct reflection of those areas that serve as motivators for an individual. Such information can be beneficial in a variety of organizational functions (e.g., placing individuals, building teams, designing reward systems, etc.).

MVPI scales represent dimensions with a historic presence in the literature on motivation, as Hogan reviewed 80 years of theory and research on motives, values, and interests (i.e. Spranger, 1928; Allport, 1961; Murray, 1938; Allport, Vernon, and Lindzey, 1960; Holland, 1966; 1985). The MVPI is comprised of items derived rationally from hypotheses about the likes, dislikes, and aversions of the "ideal" exemplar of each motive. Each scale is composed

of five themes: (a) Lifestyles, which concern the manner in which a person would like to live; (b) Beliefs, which involve "shoulds", ideals, and ultimate life goals; (c) Occupational Preferences, which include the work an individual would like to do, what constitutes a good job, and preferred work materials; (d) Aversions, which reflect attitudes and behaviors that are either disliked or distressing; and (e) Preferred Associates, which include the kind of persons desired as coworkers and friends. The resulting 10 scales are defined as follows:

- **Aesthetics:** creative and artistic self-expression
- **Affiliation:** frequent and varied social interaction
- **Altruistic:** actively helping others and improving society
- **Commerce:** business activities, money, and financial gain
- **Hedonism:** fun, good company, and good times
- **Power:** competition, achievement, and being influential
- **Recognition:** fame, visibility, and publicity
- **Science:** ideas, technology, and rational problem solving
- **Security:** certainty, predictability, and risk free environments
- **Tradition:** history, rituals, and old-fashioned virtues

The MVPI is an organization-specific performance predictor (J. Hogan & R. Hogan, 1996; 2010). There are no correct or incorrect responses for the MVPI scales; therefore, there is no need for validity or faking keys. There is no item overlap among the 10 scales. The items were screened for content that might seem offensive or invade privacy.

As with the HPI and HDS, researchers needed to identify a frame of reference for score interpretation. This "norming" process include over 48,267 working adults spanning across multiple countries, industries, organizations, and jobs. These data include supervisory and non-supervisory personnel and strikes a balance between selection and development cases. The Global Norm technical report (a) documents the norm development process in further detail (Hogan Research Division, 2011) and (b) displays the MVPI norms by gender, age, and race/ethnicity.

The scales demonstrate adequate psychometric qualities with internal-consistency reliability coefficients ranging between .70 (Security) and .84 (Aesthetics). Test-retest reliability coefficients (assessed over an eight-week period) range from .71 to .85. Additionally, researchers have used the MVPI in hundreds of validity generalization and criterion-related validation studies to predict occupational performance across a range of jobs and industries (e.g. Shin & Holland, 2004). The MVPI manual documents the development and psychometric properties in further detail (J. Hogan & R. Hogan, 2010).

Favorable reviews of the MVPI appear in the Buros Institute of Mental Measurements' *The Fourteenth Mental Measurements Yearbook* (Roberts, 2001; Zedeck, 2001) and the British Psychological Society's Psychological Testing Centre's *Test Reviews (*Feltham & Loan-Clarke, 2007*).* The Oregon Research Institute included the MVPI in its 2007 data collection effort involving the community population in Eugene-Springfield, Oregon. This research effort is the largest of its kind and compiles longitudinal data on major personality and culture fit assessments.

A2. JOB ANALYSIS

This section describes the potential steps conducted to identify the critical aspects of a job. In some cases, all of these steps are completed. In other instances, circumstances may prevent or obviate completion of certain processes. As such, this section should be taken as a general overview of possible steps that Hogan may take when conducting a job analysis.

A2.1. Job Description & Focus Groups

Hogan first reviews the job description provided by the client and focus group notes (either conducted by the client or Hogan) in order to determine (a) the degree to which personal characteristics are important for the job, (b) the Department of Labor (DOL) and Occupational Information Network (O*NET, http://online.onetcenter.org) job codes, and (c) the degree to which the job is similar to other jobs in the Hogan archive for which prior validation research has been conducted. If Hogan's expert review reveals that personal characteristics make up a significant proportion of the important characteristics of the job at hand, this provides support for using a personality-based job analysis method. At this stage, Hogan also identifies the appropriate DOL and O*NET codes.

A2.2. Job Analysis Survey

Hogan designed a standardized on-line job analysis survey to identify the critical worker-oriented requirements in terms of the key personal requirements and critical competencies required for effective performance. The Job Evaluation Tool ("JET"; Hogan Assessment Systems, 2000) consists of four components: (a) the Performance Improvement Characteristics (PIC) survey, (b) the Derailment Characteristics Questionnaire (DCQ) survey, (c) the Motivational Improvement Characteristics (MIC) survey, and (d) the Competency Evaluation Tool (CET). Hogan administers the JET to Subject Matter Experts (hereafter, SMEs) – individuals highly familiar with the target job(s) and how they should ideally be performed. SMEs generally include both supervisors and high performers in the job(s) at hand.

As described by Foster, Gaddis, and Hogan (2012), we use intra-class correlations as the basis for computing inter-rater reliability estimates. However, we now use a two-way random model to test for the absolute agreement among ratings. Our rationale for using a two-way "random" model stems from the typical use case where (a) we have a sample of 8-10 SMEs ratings each section of the JET, (b) our SME sample is randomly drawn from a larger SME population, and (c) it's important to control for SME rater effects as we assume rater variance is only adding noise to the reliability estimate. We also follow Foster et al.'s .80 or higher reliability requirement. In cases where estimates fall short of this benchmark, we either (a) ask for additional raters to complete the JET or (b) run outlier analyses to see if problematic raters can be removed from the reliability analyses.

A2.2a. Performance Improvement Characteristics

As indicated by Foster et al. 2012:

> "The FFM provides a systematic method for classifying individual differences in social and work behavior. These five dimensions, which are based on observers' descriptions of others, capture the content of virtually any personality assessment (Wiggins & Pincus, 1992). As a result, the FFM represents the paradigm for modern personality research and is particularly relevant for job analysis because it provides a taxonomy of observer ratings. Applications of the FFM for job analysis tell us about the reputation of individuals who exhibit behaviors associated with successful job performance." (p.251-253)

Foster et al. provide additional justification for the development of the PIC:

> "The development of the PIC was based on research using the FFM structure with adjective checklist item content to indicate worker requirements (Hogan & Arneson, 1987). SMEs used this checklist to describe the characteristics of an ideal employee in a specific job. This method yielded positive results and suggested that a similar approach could identify important worker characteristics required for a range of jobs. For example, researchers found that the checklist reliably differentiated between jobs, both supervisors and high-performing incumbents agreed on the profile of the ideal workers, and the profile of the ideal *worker* differed from that of the ideal *person* (Hogan & Rybicki, 1998). Based on these findings, professionals can use the PIC, in conjunction with test validation research for personnel selection and development, for any job where people interact with others." (p.253)

The PIC job analysis identifies (a) the personal characteristics needed to successfully execute the requirements of a job and (b) the degree to which possession of these personal characteristics improves job performance (Foster et al., 2012; J. Hogan & Rybicki, 1998). SMEs rated the 48 PIC items using a scale ranging from 0 (*Does Not Improve Performance*) to 3 (*Substantially Improves Performance*). For more detailed PIC item descriptions, see Table A2.

Table A2 PIC Items

1	Is steady under pressure	25	Is kind and considerate
2	Is not easily irritated by others	26	Understands others' moods
3	Is relaxed and easy-going	27	Likes being around other people
4	Doesn't worry about his/her past mistakes	28	Is good-natured - not hostile
5	Stays calm in a crisis	29	Is self-controlled and conscientious
6	Rarely loses his/her temper	30	Supports the organization's values
7	Doesn't complain about problems	31	Is hard-working
8	Trusts others – is not suspicious	32	Does as good a job as possible
9	Gets along well with supervisors and authority figures	33	Pays attention to feedback
10	Takes initiative – solves problems on his/her own	34	Likes predictability at work
11	Is competitive	35	Rarely deviates from standard procedures
12	Is self-confident	36	Respects authority
13	Is positive	37	Is imaginative and open-minded
14	Takes charge of situations	38	Is interested in science
15	Has clear career goals	39	Is curious about how things work
16	Enjoys speaking in front of groups	40	Likes excitement
17	Seems to enjoy social interaction	41	Enjoys solving problems and puzzles
18	Likes social gatherings	42	Generates good ideas and solutions to problems
19	Likes meeting strangers	43	Likes cultural activities
20	Needs variety at work	44	Keeps up on advances in their profession
21	Wants to be the center of attention	45	Likes to learn new things–enjoys training
22	Is witty and entertaining	46	Is good with numbers
23	Is warm and friendly	47	Remembers details
24	Is tolerant (not critical or judgmental)	48	Reads in order to stay informed

The PIC is not intended for use in pre-employment decision-making. It is a job analysis tool designed solely to help identify the personal characteristics that are critical for success in a given job. Regardless, job analysis tools such as the PIC should provide documentation supporting the reliability and accuracy of scores. Results reported in the manual indicate that PIC scales' internal consistency reliability estimates range between .76 (Adjustment) and .87 (Interpersonal Sensitivity); average internal consistency is .83. Test-retest reliability estimates based on at least a 1-month interval, range between .60 (Learning Approach) and .84 (Inquisitive); the average test-retest reliability is .71. Research indicates that the PIC differentiates between jobs, and scores on the PIC scales correspond to scales on the Hogan Personality Inventory (HPI; R. Hogan & J. Hogan, 1995, 2007) that predict successful job performance (Foster et al., 2012; Meyer & Foster, 2007; Rybicki, 1997).

The 48 PIC items align conceptually and empirically with the Five-Factor Model and the HPI (refer to Table A3). Hogan computes scale scores on the PIC by (a) summing the item

responses that correspond to each of the seven scales, (b) averaging the scores for each scale across raters, and (c) converting the average scale scores to a percentage of total possible points. The resulting percentile scores illustrate the characteristics the SME panel judge as important for the job under evaluation.

Table A3 HPI and PIC Scale Definitions

Scale Name	Definition - *The degree to which a person seems….*
Adjustment	calm and self-accepting
Ambition	self-confident and competitive
Sociability	to need or enjoy social interaction
Interpersonal Sensitivity	perceptive, tactful, and sensitive
Prudence	conscientious and conforming
Inquisitive	creative and interested in problems
Learning Approach	concerned with building job related knowledge

Because we use PIC scores to identify personal characteristics important for success in a job, it is essential that scores on the PIC identify HPI scales that are predictive of job performance. Meyer, Foster, and Anderson (2006) evaluated the validity of the PIC using multiple samples from the Hogan archive. They found that HPI profiles created using PIC results were more effective at predicting performance for target jobs than for other jobs. This research indicates that the PIC differentiates between jobs, and scores on PIC scales identify the HPI scales that predict job performance.

Providing validation results for a job analysis technique surpasses the guidelines and requirements described in either the *Uniform Guidelines* or *Principles*. In fact, the scientific literature contains virtually no discussion concerning empirical validation of a job analysis tool.

A2.2b. Derailment Characteristics Questionnaire

Over 25 years ago, Bentz (1985) identified leadership styles associated with managerial derailment in the retail industry (e.g., playing politics, moodiness, and dishonesty). Researchers in several prominent U.S. consulting firms similarly concluded that others view managers who are technically competent, but who fail, as arrogant, vindictive, untrustworthy, selfish, emotional, compulsive, over-controlling, insensitive, abrasive, aloof, overly ambitious, or unable to delegate (Benson & Campbell, 2007; Dotlich & Cairo, 2003; McCall, Lombardo, & Morrison, 1988). Bentz's observations overlap substantially with those from other organizational psychologists — that individuals with leadership responsibilities who demonstrate dysfunctional dispositions leading to an inability to build an effective team will ultimately fail or become less than optimally effective in their roles.

To tap these constructs, the DCQ identifies personal characteristics that can inhibit performance in a job, and assesses the degree to which these personal characteristics degrade job performance. Although different attributes are associated with effectiveness across different jobs, some common attributes are associated with incompetence and derailment across jobs, particularly those that require teamwork and leadership behaviors (J.

Hogan et al., 2010). These attributes coexist with good interpersonal skills and technical competence, and may be difficult to detect in brief interactions, such as an interview. The DCQ asks SMEs to identify characteristics that inhibit performance and, therefore, constitute personality-based performance risk factors.

The DCQ contains 22 items across 11 dimensions. All items are rated using a scale ranging from 0 (*Does Not Degrade Performance*) to 3 (*Substantially Degrades Performance*), resulting in a total possible raw score of 6 for each dimension. For more detailed DCQ item descriptions, see Table A4.

Table A4 DCQ Items

1	Becomes emotional when dealing with difficult people	12	Treats others disrespectfully
2	Becomes irritable when frustrated	13	Pushes the limits by bending the rules
3	Mistrusts others and questions their motives	14	Acts impulsively
4	Resents criticism and takes it personally	15	Shows off at work
5	Resists needed changes in job procedures	16	Interrupts others when they are speaking
6	Avoids taking any risks	17	Lacks common sense
7	Makes decisions without consulting or informing others	18	Has trouble solving practical problems
8	Is typically silent and uncommunicative	19	Is extremely meticulous and precise
9	Ignores any feedback about performance	20	Is a perfectionist
10	Is deliberately slow finishing tasks	21	Won't take initiative to solve problems
11	Won't share credit for success with other team members	22	Won't make decisions when problems occur

Hogan computes scale scores on the DCQ by (a) summing the item responses that correspond to each of the 11 scales, (b) averaging the scores for each scale across raters, and (c) converting the average scale scores to a percentage of total possible points. The resulting percentile scores illustrate the characteristics the SME panel judged important for the job under evaluation. In contrast with the PIC, the DCQ instructions ask SMEs to rate personal characteristics based on the extent to which they *impair* job performance. Thus, characteristics that receive high ratings on the DCQ are more likely to detract from or inhibit effective job performance. The items align with the 11 HDS scales, as shown in Table A5.

Table A5 HDS and DCQ Scale Definitions

Scale Name	Definition - *The degree to which a person seems…*
Excitable	volatile and hard to please, enthusiastic about new persons or projects and then becoming disappointed with them
Skeptical	cynical, mistrustful, and doubtful of the true intentions of others
Cautious	to be conservative, careful, worried about making mistakes, and reluctant to take initiative for fear of being criticized
Reserved	to keep to oneself, to dislike working in teams, and to be indifferent to the moods of others
Leisurely	independent, refusing to be hurried, ignoring other peoples' requests, and becoming irritable if they persist
Bold	unusually self-confident, having strong feelings of entitlement, and reluctant to admit mistakes, listen to advice, or attend to feedback
Mischievous	to enjoy taking risks and testing the limits, being easily bored, and seeking excitement
Colorful	lively, expressive, dramatic, and wanting to be noticed
Imaginative	to act and think in creative and sometimes unusual ways
Diligent	meticulous, precise, and critical of the performance of others
Dutiful	eager to please, ingratiating, and reluctant to take independent action

A2.2c. Motivational Improvement Characteristics

Over the last 30 years, researchers (cf. Holland, 1973, 1985, 1997; Schneider, 1987) proposed that, to understand organizational behavior, it is necessary to understand the values, interests, and personalities of an organization's members. Holland argues, "The character of an environment reflects the typical characteristics of its members. If we know what kind of people make up a group, we can infer the climate the group creates" (1985, p. 35). Similarly, Schneider (1987) argues that organizations attract, select, and retain particular kinds of people, and the climate of an organization is a function of the kind of people it retains. Both Holland and Schneider define the climate of an organization in terms of the members' characteristics rather than their requisite tasks. As such, taxonomies of work environments based on worker characteristics may predict work outcomes better than taxonomies based on task characteristics. Put another way, a person-centered analysis should be more predictive of person-job fit than a task analysis of work requirements.

The MIC section of the JET assesses the environment in which an employee works and the values that help define ideal workgroup climate. These values include interests such as work quality, social interaction, helping others, profitability, enjoyment, accomplishment, recognition, technology, predictability, and adherence to established standards of conduct. The MIC provides a taxonomy that defines the organization's or the workgroup's occupational environment. The MIC contains 40 items across 10 dimensions that are rated using a scale ranging from 0 (*Does Not Describe the Work Group*) to 3 (*Substantially Describes the Work Group*), resulting in a total possible raw score of 12 for each dimension. For more detailed MIC item descriptions, see Table A6.

Table A6 MIC Items

1	Focus on bottom-line results	21	Avoid taking risky actions
2	Monitor budgets and spending closely	22	Analyze the risk involved before making a decision
3	Set clear financial goals for the work group	23	Seem concerned about job security
4	Evaluate staff needs in financial terms	24	Hate making mistakes
5	Do things to improve the appearance of offices and facilities	25	Enjoy meeting new people
6	Care about the appearance of company work products and work spaces	26	Enjoy social interaction at work
7	Work to improve the appearance of our marketing and advertising material	27	Enjoy holding meetings
8	Insist that equipment is clean and attractive	28	Enjoy spending time with the staff
9	Look for ways to apply new technology in the workplace	29	Like being the center of attention
10	Use data to forecast business trends	30	Talk about their achievements
11	Use data to evaluate financial performance	31	Try to impress others
12	Troubleshoot systems and business processes	32	Tend to show off
13	Encourage and support poor performers	33	Want to beat the competition
14	Show sympathy for those with personal problems	34	Are persistent in achieving goals
15	Believe everyone should have an equal opportunity for advancement	35	Take the initiative to solve problems
16	Put the needs of others above their own	36	Establish high standards for performance
17	Are strict about matters of right and wrong	37	Enjoy having a good time
18	Support family values	38	Like to entertain clients and customers
19	Are concerned about moral and ethical matters	39	Make the workplace fun
20	Seem to have old-fashioned or “old school” values	40	Organize special events and holiday parties

Hogan computes scale scores on the MIC by (a) summing the item responses that correspond to each of the 10 scales, (b) averaging the scores for each scale across raters, and (c) converting the average scale scores to a percentage of total possible points. The resulting percentile scores illustrate the characteristics the SME panel judged important for the job under evaluation. The 40 items align with the ten MVPI scales, as shown in Table A7.

Table A7 MVPI and MIC Scale Definitions

Scale Name	Definition – the degree to which a person values
Aesthetics	work quality and artistic endeavors
Affiliation	friendship and social interaction
Altruistic	helping and caring for others
Commerce	business and financial matters
Hedonism	fun and having a good time
Power	accomplishment and competition
Recognition	praise and recognition
Science	the pursuit of knowledge
Security	certainty and predictability in life
Tradition	history and old-fashioned virtues

A2.2d. Competency Evaluation Tool

Boyatzis (1982) extended the work of McClelland (1973) and introduced the concept of *competency*, which they defined as performance capabilities that distinguish effective from ineffective personnel. McClelland defined competencies empirically in terms of the requirements of particular jobs in particular contexts. The *Principles* recognize that competency modeling is used by many organizations as a means for describing broad requirements for a wide range of jobs. Every existing competency model can be organized in terms of a "domain model" first proposed by Warrenfeltz (1995). The domain model is composed of four domains: (a) Intrapersonal skills, (b) Interpersonal skills, (c) Technical skills, and (d) Leadership skills. R. Hogan and Warrenfeltz (2003) argued that these four domains form a natural, overlapping developmental sequence, with development of the later skills depending on the appropriate development of the earlier skills. These domains also form a hierarchy of trainability, in which the earlier skills are harder to train than the later skills.

Bartram (2005) analyzed the structure of the universe of competencies, which he defined as "sets of behaviors that are instrumental to the delivery of desired results" (Bartram, Robertson, & Callinan, 2002, p. 7). He began with two metaconcepts that corresponded with "getting along" and "getting ahead." He expanded the metaconcepts to include eight broad competency factors — the "Great Eight." Competencies that promote getting along include Supporting and Cooperating, Interacting and Presenting, Organizing and Executing, and Adapting and Coping; competencies that promote getting ahead included Leading and Deciding, Analyzing and Interpreting, Creating and Conceptualizing, and Enterprising and Performing. Bartram's competencies overlap with the generalized work activities that Jeanneret, Borman, Kubisiak, and Hanson (1999) proposed as a comprehensive taxonomy of work behaviors required in the US economy.

The CET is designed to serve as a comprehensive list of competencies that appear in (or can be translated from) the major taxonomic sources, including the Great Eight. The CET's development centered on a review of 21 competency models used across academic, commercial, and government settings. This development process ensured that the model is

comprehensive and that it can be easily compared to and used in conjunction with other competency models (Hogan Assessment Systems, 2009).

The CET asks SMEs to indicate the degree to which each of 62 listed competencies is related to successful performance in the job or job family under study. Each listed competency is accompanied by a brief definition in Table A8. Raters are asked to evaluate each competency using a five-point scale ranging from 0 (*Not associated with job performance*) to 4 (*Critical to job performance*). Generally, competencies considered critical are those that receive mean ratings greater than 3, where the scale anchor is labeled "*Important to performance*." The SME ratings provide a basis for structural models to examine comparability of job domains and their competencies across jobs within and across families (J. Hogan, Davies, & R. Hogan, 2007).

Table A8 CET Items

1	Financial Acumen: Demonstrates keen insight and application of budgeting, financial policies and procedures
2	Goal Setting: Identifies short-term objectives and steps to achieve them
3	Industry Knowledge: Demonstrates an understanding of industry knowledge and trends
4	Information Analysis: Gathers, organizes, and analyzes diverse sources of information
5	Innovation: Generates creative ideas and perspectives
6	Political Awareness: Recognizes and works within the political environment of an organization
7	Presentation Skills: Effectively presents ideas and information to others
8	Problem Identification: Detects errors, gaps, and potential flaws in goals and tasks
9	Problem Solving: Identifies solutions given available information
10	Quality Orientation: Emphasizes producing quality products and/or meeting quality standards
11	Safety: Follows safety precautions and displays safe on-the-job behavior
12	Sales Ability: Effectively demonstrates, promotes, and sells products and services
13	Written Communication: Effectively expresses him or herself through written communication
14	Work Skills: Uses existing technology and job-relevant abilities to perform tasks
15	Active Listening: Listens and restates the ideas and opinions of others to improve mutual understanding
16	Building Relationships: Develops collaborative relationships to facilitate current or future goals
17	Citizenship: Goes beyond job requirements to help the organization
18	Influence: Persuades others to a desired result
19	Negotiation: Explores alternatives to reach outcomes acceptable to all parties
20	Oral Communication: Expresses himself/herself effectively through verbal communication
21	Organizational Commitment: Demonstrates loyalty and dedication to the organization
22	Service Orientation: Creates customer loyalty through courteous, timely, and helpful service
23	Social Engagement: Enjoys and seeks out interactions with others
24	Teamwork: Collaborates with others to achieve goals
25	Valuing Diversity: Respects, values, and leverages individual differences
26	Interpersonal Skills: Gets along well with others, is tactful, and behaves appropriately in social situations
27	Building Teams: Assembles cohesive groups based upon required skills, goals, and tasks
28	Business Acumen: Demonstrates keen insight and application of business policies and procedures
29	Decision Making: Uses sound judgment to make timely and effective decisions
30	Delegation: Assigns work based on task and skill requirements
31	Employee Development: Provides support, coaching, training, and career direction to peers and subordinates
32	Managing Change: Effectively implements new methods and systems
33	Managing Conflict: Manages hostility between individuals or groups when disagreements occur
34	Managing Performance: Monitors performance providing feedback for improvement as needed
35	Motivating Others: Fosters energy for and provides direction towards organizational goals
36	Resource Management: Coordinates people and materials to maximize productivity and efficiency
37	Strategic Planning: Develops strategies to accomplish long-term goals
38	Talent Management: Recruits, rewards, and retains individuals with critical skills and abilities
39	Leadership: Demonstrates general leadership ability and effectiveness
40	Achievement Orientation: Driven to accomplish goals and complete tasks
41	Ambiguity Tolerance: Deals comfortably with unclear situations and problems
42	Caring: Displays sensitivity towards the attitudes, feelings, or circumstances of others
43	Competitive: Driven to exceed the performance of others
44	Dependability: Performs work in a consistent and timely manner
45	Detail Orientation: Performs work with care, accuracy, and attention to detail
46	Flexibility: Willing to receive and accept new ideas, approaches, and strategies
47	Following Procedures: Adheres to directions, policies, and/or legal guidelines
48	Initiative: Takes action without the direction of others
49	Perseverance: Pursues goals despite obstacles and/or challenges
50	Planning/Organizing: Coordinates and directs routine activities effectively
51	Professionalism : Acts in accordance with job-related values, principles, and standards
52	Responsibility: Accepts personal accountability for actions regardless of outcomes
53	Risk Management: Takes appropriate chances to achieve goals while considering possible negative consequences
54	Self Confidence: Believes in oneself to accomplish tasks/goals
55	Self Development: Actively acquires knowledge, skills, and abilities to remain current with job requirements
56	Stress Tolerance: Handles pressure without getting upset, moody, or anxious
57	Time Management: Plans work to maximize efficiency and minimize downtime
58	Trustworthiness: Acts with honesty and integrity
59	Vigilance: Remains alert and focused when performing monotonous tasks
60	Work Attitude: Displays a positive disposition towards work
61	Work Ethic: Exhibits hard work and diligence
62	Intrapersonal Skills: Demonstrates the appropriate motivation, attitude, and self-control to effectively perform on the job

A3. VALIDITY GENERALIZATION STUDIES

Prior to 1977, criterion-related validity research involved testing the hypothesis that a particular predictor variable (e.g., a cognitive ability measure) covaried reliably with a particular criterion variable (e.g., performance in training). Researchers then repeated this test using different samples, predictors, and criterion measures. Not surprisingly, results from these studies often differed between locations with similar jobs, and this variability made generalizations difficult. More importantly, this variability challenged the scientific integrity of the entire enterprise of personnel selection.

Researchers often explained the differences in study results in terms of situational specificity, the view that the validity of a measure is specific to the contexts and jobs under study (Gatewood & Feild, 1994; Ghiselli, 1966; Ghiselli & Brown, 1955); these differences required conducting separate validation studies for each organization, job, or group of employees. Using a large database, Schmidt and Hunter (1977) presented evidence showing that the variability in validity coefficients in single-location studies was due to statistical and procedural factors (Guion, 1998, p. 368) — idiosyncratic factors that could be ignored or statistically corrected.

Many psychologists now agree that "validity" is a unitary concept, not a type of method or an attribute of a test. Guion and Highouse (2006, p. 134) define validity as "a property of the inferences drawn from test scores." In addition, many psychologists now agree that more ways exist to assess the validity of inferences from test scores than a specific local study of their relationship with job relevant criteria (McPhail, 2007). When available, researchers may use Validity Generalization (hereafter, VG) evidence in place of local validation studies to support the use of a selection procedure (Gatewood & Feild, 1994; Society for Industrial and Organizational Psychology, 2003). As indicated by the *Principles*:

> At times, sufficient accumulated validity evidence is available for a selection procedure to justify its use in a new situation without conducting a local validation research study. In these instances, use of the selection procedure may be based on demonstration of the generalized validity inferences from that selection procedure, coupled with a compelling argument for its applicability to the current situation. Although neither mutually exclusive nor exhaustive, several strategies for generalizing validity evidence have been delineated: (a) transportability, (b) synthetic validity/job component validity, and (c) meta-analytic validity generalization. (p. 27)

Given this guidance from the *Principles*, Hogan employs all three methods for establishing VG evidence: (1) meta-analysis, (2) transportability of validity, and (3) synthetic/job component validity (J. Hogan, Davies et al., 2007). The following sections describe each VG method in more detail and outlines the conditions in which Hogan uses them in the research process.

A3.1. Meta-Analysis

Schmidt and Hunter (1977) introduced meta-analysis to psychometric research, which is a methodology for aggregating correlation coefficients from independent studies testing the same hypothesis. They argued that differences in a test's validity across studies reflect statistical artifacts (e.g., sampling deficiency) and measurement problems (e.g., predictor/ criterion unreliability, range restriction) and not unique jobs or situations. Subsequent research suggests that the correlations between performance measures and cognitive ability tests (Hunter, 1980; Schmidt & Hunter, 1977), biographical data inventories (Schmidt & Rothstein, 1994), personality inventories (Barrick & Mount, 1991; Barrick et al., 2003; Dudley et al., 2006; J. Hogan & Holland, 2003; Judge, Bono et al., 2002; Salgado, 1997, 1998; Tett, Jackson, & Rothstein, 1991), assessment center exercises (Arthur, Day, McNelly, & Edens, 2003; Meriac, Hoffman, Woehr, & Fleisher, 2008), and situational judgment tests (McDaniel, Morgeson, Finnegan, Campion, & Braverman, 2001) generalize across studies.

The *Principles* recognize the usefulness of meta-analysis and Aguinis and Pierce (1988) state that meta-analysis is a method:

> "That can be used to determine the degree to which predictor-criterion relationships are specific to the situations in which the validity data have been gathered or are generalizable to other situations, as well as to determine the sources of cross-situation variability." (p. 28)

Of the three VG methods, meta-analysis provides the most generalizable results, but relies exclusively on criterion-related validity studies. Transportability and synthetic/job component validity research is less generalizable, but can use either content or criterion-related research as source data. J. Hogan, Davies et al. (2007) demonstrate the use of all three methods in combination.

Meta-analysis averages findings from multiple studies of the same relationship to provide a best estimate of ρ (i.e., the population correlation) by controlling for error due to sampling, measurement range restriction, and unreliability in predictor and criterion measures (Smith & Glass, 1977). In addition, meta-analyses include carefully developed criteria for deciding which studies to include, what variables to code, effect size comparisons, and moderator identification. Ideally, a meta-analysis includes all relevant studies. However, this is often impossible because researchers are less likely to publish studies with insignificant results. Rosenthal (1979) notes that such omissions are problematic for meta-analysis research as they produce results based on too few studies, small sample sizes, and an atheoretical base.

According to the *Principles*, "reliance on meta-analysis results is more straightforward when they are organized around a construct or set of constructs" (p. 30). Schmidt and Hunter (1977) used a construct orientation in their well-known meta-analysis of cognitive ability measures. J. Hogan and Holland (2003) did the same using a domain skills model as the basis for a meta-analysis of the validity of personality predictors. A construct driven approach has two advantages. First, theory drives professional judgment, which is unavoidable when compiling data from multiple studies. Second, a theory-driven approach provides a framework for interpreting the results.

A3.1a. The Five-Factor Model and Job Performance

Table A9 presents the results of six large-scale meta-analyses summarizing relations between the FFM scales and overall job performance. Note that the correlations presented in the table are *uncorrected* estimates. Across studies, the Conscientiousness/Prudence scale appears to be the most consistent predictor of job performance. The Emotional Stability/Adjustment and Agreeableness/Interpersonal Sensitivity scales also predict performance across studies, although the correlation coefficients are generally smaller than those of the Conscientiousness/Prudence scale.

Table A9 FFM Meta-Analysis Results: Uncorrected Validity Estimates

	FFM Scales						
Study	ADJ	AMB	SOC	INP	PRU	INQ	LRN
A.	.15	.10	.10	.22	.12	.18	.18
B.	.05	.01	.01	.04	.12	.01	.01
C.	.09	.05	.05	.01	.10	.04	.04
D.	.09	.06	.06	.07	.14	.04	.04
E.	.25	.20	NA	.18	.22	.20	.15
F.	.17	.22	.22	.06	.20	.16	.16

Note. ADJ = Emotional Stability/Adjustment; AMB = Ambition/Extraversion; SOC = Extraversion/Sociability; INP = Interpersonal Sensitivity/Agreeableness; PRU = Conscientiousness/Prudence; INQ = Openness/Inquisitive; LRN = Openness/Learning Approach. A = Tett et al. (1991). Sample sizes = 280 (Agreeableness) to 2,302 (Extraversion). B = Barrick & Mount (1991). Sample sizes = 3,694 (Emotional Stability) to 4,588 (Conscientiousness). C = Salgado (1997). Sample sizes = 2,722 (Openness) to 3,877 (Emotional Stability). D = Hurtz & Donovan (2000). Sample sizes = 5,525 (Openness) to 8,083 (Conscientiousness). E = J. Hogan & Holland (2003). Sample sizes = 1,190 (Inquisitive) to 3,698 (Ambition). F = Judge, Bono, et al., (2002). Sample sizes = 7,221 (Openness) to 11,705 (Extraversion). NA = Not Available.

Unlike earlier meta-analyses, which evaluated the validity of the FFM in relation to indices of overall performance, J. Hogan and Holland (2003) aligned the FFM scales with performance criteria. Prompted by earlier calls for research to align predictors with criterion, (Ashton, 1998; J. Hogan & Roberts, 1996; Paunonen, Rothstein, & Jackson, 1999), J. Hogan and Holland (2003) meta-analyzed 43 independent samples (*N* = 5,242) that contained HPI and criterion data. For this analysis, J. Hogan and Holland aligned HPI scales with criterion measures reflecting FFM themes. As seen in Table A10, the relations between HPI scales and aligned performance ratings proved stronger than previous FFM research. Results indicated the following operational validities: Adjustment = .37, Ambition = .31, Interpersonal Sensitivity = .25, Prudence = .31, Inquisitive = .29, Learning Approach = .22. The fully corrected correlation coefficients ranged from .25 (HPI Learning Approach) to .43 (HPI Adjustment).

Table A10 Meta-Analysis Results for HPI Scales with Construct-Aligned Criteria

HPI Scale	*N*	*K*	r_{obs}	ρ_v	ρ
Adjustment	2,573	24	.25	.37	.43
Ambition	3,698	28	.20	.31	.35
Sociability	N/A	N/A	N/A	N/A	N/A
Interpersonal Sensitivity	2,500	17	.18	.25	.34
Prudence	3,379	26	.22	.31	.36
Inquisitive	1,190	7	.20	.29	.34
Learning Approach	1,366	9	.15	.22	.25

Note. *N* = number of participants across *K* studies; *K* = number of studies; r_{obs} = mean observed validity; ρ_v = operational validity corrected for range restriction and criterion unreliability; ρ = true validity at scale level corrected for range restriction and predictor-criterion unreliability; N/A indicates insufficient data to compute meta-analysis. All observed correlations are statistically significant at $p < .05$.

In application, organizations should use multiple personality scales to screen job applicants. Using multiple scales accounts for the various personal characteristics necessary for success, as any one scale is unlikely to map the entire performance domain of any job. J. Hogan and Holland (2003) also illustrate the value of using multiple scales. For example, to predict criteria concerning the ability to tolerate stress, the HPI Adjustment scale is the best single predictor. However, to predict resourceful problem solving or the ability to generate creative solutions, the HPI Inquisitive scale yields the largest validity coefficient. In addition to using multiple personality scales to predict performance, Schmidt and Hunter (1998) provided evidence supporting incremental validity of personality measures over General Mental Ability (GMA), or "g." In reviewing over 85 years of selection research, Schmidt and Hunter showed that adding a measure of Conscientiousness to GMA tests improved validity by 18%. Furthermore, the addition of an integrity measure to GMA improved validity by 27%, the largest increment across 18 other selection measures (e.g., work sample tests, interviews, job knowledge, biographical data, and assessment centers).

Across these studies, the meta-analysis results support the generalizability of the Conscientiousness / Prudence, Emotional Stability / Adjustment, and Agreeableness / Interpersonal Sensitivity measures to multiple occupations and industries. Moreover, the results from J. Hogan and Holland (2003) support the generalizability of every scale on the HPI except Sociability for predicting personality-saturated criteria. Empirical evidence supports validity generalization of three FFM measures (Conscientiousness, Emotional Stability, and Agreeableness) in general, and six of the seven HPI scales in particular.

A3.1b. Personality-Based Validity Coefficient Benchmarking

Criteria used to designate a "meaningful" predictor-criterion correlation remain poorly defined. Consequently, researchers define the meaningfulness of a correlation solely on its magnitude, which is reasonable but not sufficient. Interpreting the usefulness of a correlation coefficient based solely on magnitude is one strategy, since the percentage of variance accounted for in the criterion increases with the magnitude of the correlation. However, at what point does the magnitude of a correlation become "meaningful"? Is it .10, .20, .30, or

.70? Rather than focus exclusively on the magnitude of observed correlation coefficients, a benchmarking strategy is more appropriate.

The assessment literature includes many studies that evaluate the validity of the FFM personality measures across jobs, organizations, and industry types. Hough and Oswald (2008) summarize some of the major findings. These studies reflect the appropriate benchmark from which to evaluate the validity of the FFM scales. By comparing validity coefficients found in this technical report to the validity coefficients reported in the peer-reviewed literature, it is possible to derive some general conclusions about the validity and utility of potential personality predictors of job performance.

To establish a benchmark from which to compare the generalized validity coefficients presented in this report, Table A11 summarizes the sample-weighted validity coefficients of various predictors reported in the scientific literature. The sample-weighted validity of GMA tests, which are widely regarded as the "best" predictors of job performance, is only r = .21. Relative to the sample-weighted validity coefficients reported by J. Hogan and Holland (2003), the validity of GMA appears less predictive of construct-oriented criteria (not overall supervisory ratings of job performance) than the HPI Adjustment and Prudence scales.

Table A11 Comparative Validity of Assessments for Predicting Overall Job Performance

Study	Predictor	r_{obs}
A.	Conscientiousness Tests	.18
B.	Integrity Tests	.21
C.	Structured Interviews	.18
D.	Unstructured Interviews	.11
E.	Situational Judgment Tests	.20
F.	Biodata	.22
G.	General Mental Ability	.21
H.	Assessment Centers	.28
I.	Resumes	.18

Note. r_{obs} = mean observed validity; A = Mount & Barrick (2001). B = Ones et al. (1993). C & D = McDaniel, Whetzel, Schmidt, & Maurer (1994). E = McDaniel, Hartman, Whetzel, & Grubb (2007). F = Bliesener (1996). G = Pearlman, Schmidt, & Hunter (1980). H = Arthur et al. (2003). I = O'Leary (2009).

Also noteworthy are the validity coefficients of FFM scales reported in five other meta-analyses (see Table A9). Excluding J. Hogan and Holland's (2003) results, the validity of Emotional Stability measures ranges between .05 (Barrick & Mount, 1991) and .17 (Judge, Bono, et al., 2002). A similar pattern exists for Conscientiousness measures, with validity coefficients ranging between .10 (Salgado, 1997) and .20 (Judge, Bono et al., 2002). For the remaining FFM scales, only Tett et al. (1991) and Judge, Bono, et al. (2002) report validity coefficients at or above .10.

J. Hogan and Holland (2003) present validity coefficients (see Table A9) that are, on average, 24% larger in magnitude than the highest correlation coefficients reported in previous personality-based meta-analyses. There are three important differences between the J.

Hogan and Holland study and previous meta-analyses. First, they aligned predictors with indices of job performance. J. Hogan and Holland reasoned that personality scales are not designed to be omnibus predictors of job performance, but rather to predict *facets* of job performance. By matching predictors and performance criteria, the observed validities increased. Campbell (1990) articulated this construct alignment strategy, although it is seldom used. Second, most early studies evaluating the validity of FFM personality scales relied on classification schemes to translate scales from non-FFM instruments (e.g., California Psychological Inventory; Gough, 1987) into the FFM domains. During the classification process, raters misclassified scales into FFM dimensions. When errors like this occur, validity decreases. Finally, J. Hogan and Holland relied on a single personality tool (HPI), which eliminated the possibility of coding or classification errors. Together these three factors help untangle the personality literature and establish the appropriate benchmark from which to evaluate the validity of personality scales in occupational settings.

A3.1c. Summary of Meta-Analysis Results for Generalizing Validity of Five-Factor Model Personality Measures

Researchers are skeptical about the merits of some procedures used in meta-analyses. In particular, they believe corrections can be used inappropriately to overestimate predictor-criterion relationships. Nonetheless, the meta-analyses described above provide lower bound estimates of the validity of personality measures for predicting job performance. Reviewing the research on meta-analysis evidence permits certain conclusions. First, meta-analysis results strongly support the validity of Conscientiousness measures for predicting various job criteria, including overall job performance. Second, evidence to support the generalized validity of Emotional Stability and Agreeableness for job performance is moderate to strong, particularly as the criterion becomes more saturated with requirements for interpersonal skill(s). Lastly, the validity coefficients for Extraversion/Surgency measures (particularly the HPI Ambition scale) are strong for predicting criteria associated with achieving results and leading others. The remaining Five Factor dimension — Intellect/Openness to Experience — is not as generalizable as the others because it is relevant for a smaller range of jobs and criteria.

A3.1d. Gathering Meta-Analysis Evidence for Generalizing Validity of the HPI and HDS at the Job Family Level

When conducting a VG study, Hogan uses a meta-analysis procedure to identify HPI and HDS scales important to job performance at the job family level. The Hogan archive contains hundreds of studies examining jobs classified into one of seven job families (see Table A12 for a detailed description of each Hogan job family). As stated in the HPI technical manual (R. Hogan & J. Hogan, 2007):

> Job families are groups of occupations classified as similar based on work performed, skills, education, training and credentials required for competence. The seven job families used for this analysis were derived from nine "job classifications" used by the Equal Employment Opportunity Commission (EEO) for employers in the United States. These nine EEO classifications are used to capture information about an organization's

ethnic make-up. We used this scheme for two reasons: (a) a large percentage of employers within the United States are familiar with EEO job classifications; and (b) the job classifications are conceptually clear and easy to use for reporting purposes. (p. 79)

Table A12 Hogan Job Family Definitions

Hogan Job Family	Definition
Managers & Executives	Employees assigned to positions of administrative or managerial authority over the human, physical, and financial resources of the organization.
Professionals	Employees with little legitimate authority, but high status within the organization because of the knowledge and/or skills they possess. These employees are usually experts with a broad educational background and rely primarily on their knowledge and intellect to perform their duties.
Technicians & Specialists	Employees who rely on the application of highly specific knowledge in skilled manipulation (e.g., operation, repair, cleaning, and/or preparation) of specialized technology, tools, and/or machinery.
Sales & Customer Support	Employees who use appropriate interpersonal style and communication techniques to establish relationships, sell products or services that fulfill customers' needs and provide courteous and helpful service to customers after the sale.
Administrative & Clerical	Employees who plan, direct, or coordinate supportive services of an organization. The main function of these employees is to facilitate the function of professionals by completing jobs that require little formal education or skill to complete (e.g., professional assistants, secretaries, and clerks).
Operations & Trades	Employees who are craft workers (skilled), operatives (semi-skilled), and laborers (unskilled) whose job knowledge and skills are primarily gained through on-the-job training and experience; little prerequisite knowledge or skill is needed.
Service & Support	Employees that perform protective services for individuals and communities (e.g., police, fire fighters, guards) and non-protective services for individuals that require little to no formal training but a high degree of interaction with people (e.g., food service, recreation and amusement).

Using job analysis information (e.g., job descriptions, focus group information, ONET codes), multiple Hogan researchers classify a job into the appropriate job family and then identify relevant studies from the Hogan archive. Based on studies within each job family, we meta-analyze validity coefficients for each HPI and HDS scale.

Hogan uses the procedures specified by Hunter and Schmidt (1990) to accumulate results across studies and assess effect sizes. All studies use zero-order product-moment correlations, which eliminates the need to convert alternative statistics to values of *r*. We report operational validities, which we correct for sampling error, unreliability in the criterion measure, and range restriction. We do not correct correlation coefficients for predictor unreliability to estimate validity at the construct level. Although some (e.g., Mount & Barrick, 1995; Ones et al., 1993) argue this is a relevant artifact that can be corrected, Hogan believes

it is premature to estimate the validity of a perfect construct when there is no firm agreement on the definition of the construct itself. Results, therefore, represent relationships between HPI scales and job performance.

Hunter and Schmidt (1990) argue that different samples should contribute the same number of correlations to meta-analysis results to avoid bias. Thus, Hogan selected only one correlation per study so that each sample contributed only one point estimate per predictor scale. Hogan also computed a range restriction index for HPI scales. Following procedures described by Hunter and Schmidt (1990), Hogan divides each HPI scale's within-study standard deviation by the standard deviation reported by R. Hogan and J. Hogan (1995). This procedure produces an index of range restriction for each HPI scale for each study. We use mean replacement within job family to estimate range restriction correction factors when within study standard deviation is unavailable.

Although some researchers (e.g., Murphy & De Shon, 2000) argue against the use of rater-based reliability estimates, Hogan follows procedures outlined by Barrick and Mount (1991) and Tett et al. (1991), and uses the .52 reliability coefficient proposed by Tett et al. to estimate the reliability of supervisory ratings of job performance.

Note that meta-analysis evidence for the validity of the MVPI is unavailable because the MVPI is not a generalizable predictor of job performance, since workplace culture and motivators are not consistent across companies or even specific job families (Lock & Bourdreau, 2004).

A3.2. Transportability of Validity

The next step in the VG process involves transporting validity evidence established for one job and using it as a foundation for candidate screening in a similar job. The *Uniform Guidelines* supports transportability of validity and is the primary reference for determining when it is appropriate to transport validity evidence from one job to another. In addition, Hoffman, McPhail, and colleagues (Hoffman & McPhail, 1998; Tippins, McPhail, Hoffman, & Gibson, 1999) discuss the technical requirements that should be satisfied before transporting validity evidence in situations that preclude local validation. Finally, Johnson and Jolly (2000) provide an empirical demonstration of the method and note the lack of guidance for its appropriate use.

The *Principles* considers transportability of validity as one of three VG strategies capable of justifying the appropriateness and applicability of a selection procedure. This assumes that the original validation study is technically sound and the target and referent jobs can be described as "closely related" (*Bernard v. Gulf Oil Corp.,* 1981). Situations where transportability might apply include those in which organizations must choose a selection procedure for the same job across multiple locations and different companies or for different jobs with similar requirements. It might also be a useful strategy for validating screening guidelines for different job titles within a single job family (see Gibson & Caplinger, 2007).

The *Uniform Guidelines*, the *Standards*, and the *Principles* all recognize transportability of selection procedures (cf. Tippins, 2003). Although employment discrimination experts distinguish between these three documents, Hogan focuses on their common themes. For

example, all three require that the original research be technically adequate. The *Uniform Guidelines* emphasize the need for evidence regarding fairness, validity, and job similarity as criteria for transportability. Personality-based selection procedures typically yield no adverse impact, satisfying requirements set by the *Uniform Guidelines* and precedents set in many courts (Lindemann & Grossman, 1996). However, it should be noted fairness is considered a social rather than a psychometric issue.

The *Standards* emphasize the need for good cumulative research (e.g., meta-analysis) and discourage reliance on a single local validation study as a foundation for transportability of validity unless the referent study is "exceptionally sound." Interestingly, the original design for transportability of a selection procedure relies on a single referent validation study. The *Principles* emphasize the importance of establishing similarity between the original (referent) and target jobs. Researchers can establish evidence of similarity based on job requirements, job context, and job applicants. For personality-based selection systems, demonstrating job similarity has been challenging because few personality-related job analysis methods were available. Notable exceptions are Raymark, Schmit, and Guion (1997) and Hogan's JET methodology (Foster et al., 2012). Hogan estimates similarity using converging evidence and professional judgment.

A3.2a. Gathering Transportability Validity Evidence

Hogan conducts transportability of validity research by analyzing the current target job in qualitative and quantitative terms. First, Hogan identifies a marker job for which a criterion-related validity study already exists in the Hogan archive. Next, Hogan establishes similarity between the target and marker jobs through close alignment of job descriptions, O*NET codes, and JET profiles. The O*NET typology provides a standard external metric for rating job similarity.

Hogan uses PIC profiles to evaluate the similarity of the target job to the marker job in the Hogan archive. We determine similarity by calculating the standard error of the means (Mitchell & Jolly, 2010; SE_{mean}) for each of the seven PIC scales for the target job using the following formula:

$$SE_{mean} = \frac{S}{\sqrt{N}}$$

Where S is the standard deviation of the PIC scale SME ratings and N is the number of SMEs that complete the JET.

Next, we construct 95% confidence intervals for each scale by adding and subtracting 1.96 SE_{mean} to and from each raw score scale mean for the target job. We then compare each PIC scale mean for the marker job with the confidence interval for the same scale for the target job. The jobs are sufficiently similar for transportability of validity if most of the seven scale means for the marker job fall within the 95% confidence intervals of the target job.

In cases where Hogan cannot identify a specific job in the Hogan archive that meets the stringent requirements of single-study transportability, Hogan identifies multiple similar jobs

(i.e., very similar in respect to the tasks and responsibilities associated with performing the job, but not close enough for single-study transportability). Hogan nominates jobs in the archive that are similar enough to the target job to be used as a hybrid form of transportability validity evidence. Instead of using the results from a single study, Hogan meta-analyzes the results across all relevant studies to provide an alternative form of transportability of validity evidence. This procedure may also be used when multiple studies meeting the stringent requirements for single study transportability exist in the Hogan archive.

Some jobs are too complex to meet the stringent requirements necessary for transportability of validity. In these instances, Hogan defers to the meta-analysis and the synthetic/job component validation sections.

A3.3. Synthetic/Job Component Validity

The most specific validity generalizability evidence results from synthetic validity/job component validity research. Mossholder and Arvey (1984) noted that, where meta-analysis relies on global evaluations of job similarity, synthetic validity requires a more detailed examination of the work. The strategy is criterion driven and involves finding the best set of predictors comprehensively representative of the criterion space.

Lawshe (1952) introduced synthetic validity over 50 years ago. With a few notable exceptions (e.g., Guion, 1965; McCormick, DeNisi, & Shaw, 1979; Primoff, 1959), early researchers largely ignored the approach because they believed that assessment validity was specific to situations. The interpretive review and demonstration by Mossholder and Arvey (1984) is a rare exception. Mossholder and Arvey defined synthetic validity as "the logical process of inferring test-battery validity from predetermined validities of the tests for basic work components" (p. 323). If we know the key components of a job, we can review prior criterion-related studies predicting those components. We then "synthesize" the valid predictors of the key job components into an assessment battery for the new job (Balma, 1959; Lawshe, 1952). Since Mossholder and Arvey's initial demonstration, synthetic validity has gained more support and popularity (e.g. Hoffman, Holden, & Gale, 2000; Jeanneret & Strong, 2003; Johnson & Carter, 2010; Johnson, Carter, Davison, & Oliver, 2001; Johnson et al., 2010; McCloy, 1994; 2001; Scherbaum, 2005).

Brannick and Levine (2002) point out that synthetic validity approaches allow us to build up validity evidence from small samples with common job components. Johnson and Carter (2010) showed that synthetic validity (a) produced coefficients quite similar to coefficients obtained from more traditional local validation research and (b) may be more advantageous when developing selection batteries for newly created jobs, given that tenured job incumbents are needed for criterion-related validation studies.

The *Uniform Guidelines* are vague about technical requirements and documentation for synthetic/job component validity, but the *Principles* explicitly include this strategy. Synthetic validation involves (a) identifying the important components of a job or jobs composing a job family, (b) reviewing prior research on the prediction of each component, and (c) aggregating correlations across multiple studies for each component of the job to form a test battery

(Scherbaum, 2005). Mossholder and Arvey (1984) summarized these requirements as follows:

> When test battery validity is inferred from evidence showing that tests measure broad characteristics necessary for job performance, the process resembles a construct validation strategy. When scores are correlated with component performance measures, the process involves criterion-related validation. The nature of the tests used in the process (e.g., work sample vs. aptitude) may determine in part the appropriate validational strategy. (p. 323)

Job Component Validity (hereafter, JCV: McCormick et al., 1979) is one type of synthetic validity. Jeanneret (1992) described JCV as falling "within the rubric of construct validity" (p. 84). Researchers have primarily used JCV to study the cognitive demands of jobs by correlating job dimensions using Position Analysis Questionnaire data (Jeanneret, 1992; Hoffman, Rashkovsky, & D'Egidio, 2007). Hoffman and McPhail (1998) examined the accuracy of JCV for predicting the observed validity of cognitive tests in clerical jobs. Few similar analyses are available for personality predictors, although Mecham (1985) and D'Egidio (2001) provide notable exceptions. Because the concept of synthetic validity has evolved over the years, Hogan uses interchangeably the terms criteria, performance dimensions, job components, work components, competencies, and domains of work.

A3.3a. Gathering Synthetic Validity Evidence

The first step in synthetic validation is conducting a job analysis to determine the important components of the job. This involves identifying the most highly rated competencies across subject matter experts using the CET section of the JET. Next, Hogan maps these CET items to the updated Hogan Competency Model (HCM; Hogan Assessment Systems, 2012). A crosswalk between CET items and the updated competency model is displayed in table A13. Then, Hogan identifies predictor(s) for each competency deemed important for job performance. The Hogan archive provides a means to identify the best predictor(s) of each competency. Foster, Lemming, and Johnson (2010) mapped each of the criteria from over 250 criterion-related validity studies in the Hogan archive onto the HCM and conducted a meta-analysis for each scale-by-competency relationship. These meta-analyses provide stable estimates of the relationships between the 7 HPI scales, the 11 HDS scales, and the critical competencies as rated by SMEs. They report operational validities, which they corrected for sampling error, unreliability in the criterion measure, dichotomization (when necessary), and range restriction.

Table A13 Crosswalk between Competency Labels in CET and the Hogan Competency Model

CET Label	HCM Label	HCM Definition
Achievement Orientation	Driving for Results	Accomplishes goals, completes tasks, and achieves results.
Active Listening	Listening to Others	Listens and restates the ideas and opinions of others to improve mutual understanding.
Ambiguity Tolerance	Dealing with Ambiguity	Comfortably handles unclear or unpredictable situations.
Building Relationships	Relationship Building	Develops collaborative relationships to facilitate current and future objectives.
Building Teams	Team Building	Assembles productive groups based upon required skills, goals and tasks.
Business Acumen	Business Insight	Applies business knowledge to achieve organizational goals and objectives.
Caring	Caring about People	Displays sensitivity towards the attitudes, feelings, or circumstances of others.
Citizenship	Organizational Citizenship	Exceeds job requirements to help the organization.
Competitive	Competing with Others	Strives to exceed others' performance.
Decision Making	Decision Making	Uses sound judgment to make timely and effective decisions.
Delegation	Delegating	Assigns work to others based on tasks, skills, and workloads.
Dependability	Dependability	Performs work in a reliable, consistent, and timely manner.
Detail Orientation	Detail Focus	Performs work with care, accuracy, and attention to detail.
Employee Development	Developing People	Provides support, coaching, training, and career direction to others.
Financial Acumen	Financial Insight	Applies financial knowledge to achieve organizational goals and objectives.
Flexibility	Flexibility	Changes direction as appropriate based on new ideas, approaches, and strategies.
Following Procedures	Rule Compliance	Adheres to directions, policies, and/or legal guidelines.
Goal Setting	Setting Goals	Identifies short-term objectives and steps to achieve them.
Industry Knowledge	Industry Insight	Applies knowledge of industry trends and outlooks to achieve organizational goals and objectives.
Influence	Influencing Others	Persuades others to help achieve organizational goals and objectives.
Information Analysis	Processing Information	Gathers, organizes, and analyzes diverse sources of information.
Initiative	Taking Initiative	Takes action without needing direction from others.
Innovation	Driving Innovation	Stimulates creative ideas and perspectives that add value.
Interpersonal Skills	Leveraging People Skills	Gets along well with others, is tactful, and behaves appropriately in social situations.
Intrapersonal Skills	Self Management	Demonstrates appropriate motivation, attitude, and self-control.
Leadership	Leading Others	Demonstrates general leadership ability and effectiveness.
Managing Change	Driving Change	Champions new methods, systems, and processes to improve performance.
Managing Conflict	Managing Conflict	Resolves hostilities and disagreements between others.
Managing Performance	Driving Performance	Provides guidance and feedback to maximize performance of individuals and/or groups.
Motivating Others	Inspiring Others	Motivates others to accomplish organizational goals.
Negotiation	Negotiating	Explores alternatives to reach outcomes acceptable to all parties.
Oral Communication	Verbal Communication	Expresses ideas and opinions effectively in spoken conversations.
Organizational Commitment	Engagement	Demonstrates loyalty and commitment through enthusiasm and extra effort.
Perseverance	Overcoming Obstacles	Pursues goals and strategies despite discouragement or opposition.
Planning/Organizing	Planning and Organizing	Coordinates and directs activities to help achieve business objectives.

Table A13 Crosswalk between Competency Labels in CET and the Hogan Competency Model

CET Label	HCM Label	HCM Definition
Political Awareness	Political Savvy	Recognizes, interprets, and works within the political environment of an organization.
Presentation Skills	Presenting to Others	Conveys ideas and information to groups.
Problem Identification	Anticipating Problems	Forecasts and detects errors, gaps, and potential flaws.
Problem Solving	Solving Problems	Identifies solutions given available information.
Professionalism	Professionalism	Acts in accordance with job-related values, principles, and standards.
Quality Orientation	Quality Focus	Strives to meet quality standards and produce quality work products.
Resource Management	Managing Resources	Coordinates people and financial and material capital to maximize efficiency and performance.
Responsibility	Accountability	Accepts responsibility for one's actions regardless of outcomes.
Risk Management	Taking Smart Risks	Evaluates tradeoffs between potential costs and benefits and acts accordingly.
Safety	Safety Focus	Attends to precautions and proper procedures to guard against work-related accidents and injuries.
Sales Ability	Sales Focus	Generates revenue by promoting products and services to others.
Self Confidence	Displaying Confidence	Projects poise and self-assurance when completing work tasks.
Self Development	Self Development	Actively acquires new knowledge and skills to remain current with and/or grow beyond job requirements.
Service Orientation	Customer Focus	Provides courteous, timely, and helpful service to encourage client loyalty.
Social Engagement	Networking	Builds and maintains a system of strategic business connections.
Strategic Planning	Driving Strategy	Directs effort to achieve long-term business objectives.
Stress Tolerance	Handling Stress	Manages pressure without getting upset, moody, or anxious.
Talent Management	Attracting Talent	Recruits, rewards, and retains individuals with needed skills and abilities.
Teamwork	Teamwork	Collaborates with others to achieve goals.
Time Management	Time Management	Plans and prioritizes work to maximize efficiency and minimize downtime.
Trustworthiness	Integrity	Acts honestly in accordance with moral or ethical principles.
Valuing Diversity	Leveraging Diversity	Respects and values individual differences to obtain a desired effect or result.
Vigilance	Staying Alert	Remains focused when performing monotonous tasks.
Work Attitude	Positive Attitude	Displays a positive disposition towards work.
Work Ethic	Working Hard	Consistently strives to complete tasks and assignments at work.
Work Skills	Leveraging Work Skills	Applies technology and job-relevant abilities to complete work tasks.
Written Communication	Written Communication	Expresses ideas and opinions effectively in writing.

A4. CRITERION-RELATED VALIDITY EVIDENCE

Aguinis, Henle, and Ostroff (2001) described criterion-related validity in terms of the relationship between the predictor (e.g., HPI Scales) and some criterion measure (e.g., job performance), with the goal of answering the basic question: how accurate are test scores in predicting criterion performance? The *Uniform Guidelines* state "evidence of the validity of a test or other selection procedure by a criterion-related validity study should consist of empirical data demonstrating that the selection procedure is predictive of or significantly correlated with important elements of job performance" (29 C.F.R. § § 1607.5 (B)).

Although there are many organizational and logistical constraints that limit the usefulness of criterion-related validity studies (McPhail, 2007), the *Uniform Guidelines* and *Principles* suggest considering this approach when a) there is an adequate, representative sample of job incumbents willing to participate, and b) development of reliable, unbiased measures of job performance is possible. The *Principles* also recommends using a relevant criterion measure, one that "reflects the relative standing of employees with respect to important work behavior(s) or outcome measures(s)" (p. 14).

Additional factors should be taken into account and used as a guide when determining whether a criterion-related validity study is appropriate to use in any given selection situation. First, practitioners should consider the design when planning the study. A predictive design predicts scores on a criterion measured at some future occurrence. For example, *job applicants* complete the assessment before being hired and provide measures of performance after being on the job for some time. Concurrent designs are more practical because they do not require a time delay; instead, the organization collects job performance information at the same time *job incumbents* complete the assessment battery. Only one empirical study has examined the effects of these two strategies on criterion-related validity using personality measures. Van Iddekinge and Ployhart's (2008) review of criterion study design revealed that predictive designs produce slightly lower validity estimates than concurrent designs. Yet regardless of the strategy employed, the predictive value of the assessment is established by correlating assessment scores and job performance data, and other factors beyond study design may still influence this validity coefficient.

For example, the *Principles* note that this observed validity coefficient "may underestimate the predictor-criterion relationship due to the effects of range restriction and unreliability in the predictors and/or criterion." As a result, adjustments are available to account for these artificial reductions in variance. For instance, researchers often correct for criterion unreliability to estimate operational validity (Van Iddekinge & Ployhart, 2008). Note that Hogan corrects for measurement error, criterion unreliability, and range restriction where appropriate and reports both the observed and corrected validity coefficients in our technical documentation. Note that we do not correct correlation coefficients for predictor unreliability to estimate validity at the construct level

Another decision researchers face is whether to use a single criterion or multiple criteria during the data collection phase of the criterion study. The literature recommends that researchers "develop criterion measures that are conceptually aligned with the latent criterion constructs and that maximize the potential use of multiple criteria for predictor validation"

(Van Iddekinge & Ployhart, 2008, p. 906). Furthermore, J. Hogan and Holland (2003) provide strong support for using specific criteria to estimate the validity of specific predictors in operational use. Although support for using narrow criteria is growing, collecting overall performance composites still provide the best approach to estimating validity of global predictors (Guion, 1961) and prediction improves when criterion ratings cover the full spectrum of effective performance (Oh & Berry, 2009). Therefore, the use of global criteria in the design of performance rating forms is still appropriate; however, specific dimensions should also be used when circumstances allow for them.

Adhering to these guidelines, Hogan conducts criterion-related validity studies when an organization can (a) identify enough incumbents (e.g., generally greater than 100) to take the assessments and (b) identify supervisors to evaluate each incumbent using a performance rating form developed by Hogan. Many organizations choose not to conduct a local validation when they either do not have enough incumbents in a role or are concerned about the time commitment involved for their incumbents and their supervisors. In such cases, Hogan relies solely on VG evidence.

A4.1. Concurrent Criterion Related Validity Study

Hogan conducts concurrent criterion-related validity studies using a three-step process: (1) collecting Hogan assessment data, (2) collecting job performance data (i.e., supervisor and objective performance ratings), and (3) conducting analyses examining the relationships between the assessment and performance data.

In step one, the organization and Hogan work together to identify incumbents to participate in the research. Ideally, this sample should include at least 100 incumbents where we obtain matched predictor and criterion data. Additionally, this sample should represent the incumbent population in terms of performance, demographics, locations, work environments, and other contextual factors that may influence job performance. Last, incumbents should have enough tenure in the position to allow for reliable performance ratings by a supervisor. Identified incumbents then complete the relevant Hogan assessments.

In step two, Hogan uses information gathered from the job analysis and stakeholder conversations to develop a Performance Rating Form (PRF). This PRF usually includes items to assess overall performance, critical competencies, and other relevant behaviors. Incumbents' supervisors often participate in rater training (i.e., to reduce bias rating errors) prior to completing the PRF. This process may also include collecting objective performance metrics (e.g., sales, turnover, business unit performance) from the organization to help supplement the data available for step three.

In the final step, Hogan analyzes the incumbent assessment and performance data to identify the assessments and scales that are the strongest predictors of performance in the job. Hogan uses this information to create a multi-scale profile of successful performance on the job. The client may then implement this profile to aid in their candidate selection process.

A4.2. Predictive Criterion Related Validity Study

Predictive criterion related validity studies closely resemble concurrent criterion-related validity studies with one notable exception: the sample. The sample for predictive criterion related validity studies consists of job applicants, as opposed to job incumbents (Anastasi & Urbina, 1997). As such, the process for conducting a predictive study varies slightly from a concurrent study.

The first step in a predictive study involves administering the measure to job applicants. Candidates are then selected for the role without considering results from the administered measure. At a later date, Hogan collects performance data based on job analysis information for the hired applicants. Hogan analyzes the relationship between the administered scales and job performance to identify relevant scales for predicting job performance. Given practical and operational considerations, companies rarely have the opportunity to conduct this type of study and often rely on Hogan to use a concurrent design (as discussed in section A4.1).

A5. RECOMMENDATIONS FROM RESEARCH

A5.1. Interpretation and Application

In order to make screening decisions, Hogan assimilates all available information from the (a) job analysis, (b) validity generalization (i.e., meta-analysis, transportability of validity, and synthetic/job component validity), and, when available, (c) criterion-related validation. An expert review of these combined results as well as other qualitative information allows Hogan experts to determine the most appropriate scales to use as a foundation for screening candidates into jobs. Patterns across methods indicate that a personality trait or motivational driver may be particularly important to a role. Differences between the various sources of evidence emphasize the importance of using information from multiple sources to determine the validity of the recommended selection battery.

Combinations of personality variables offer better prediction of many work related outcomes compared to single personality scales (Ones, Dilchert, Viswesvaran, & Judge, 2007; Tett & Christiansen, 2007; Schmitt, 2014). Consistent with this idea, personality profiles combine multiple personality scales to maximize the prediction of job performance. After collecting validity evidence (e.g. validity generalization, criterion-related validation), Hogan provides profile recommendation for selecting employees into a particular job.

On each scale for which validity evidence was established, Hogan recommends a minimum cutoff score; these Minimum Fit screening guidelines screen out candidates lacking a minimal degree of the personal characteristics deemed most critical to effective job performance. Additionally, Hogan recommends Pass-Plus decision guidelines for selecting strong potential candidates. These Pass-Plus candidate screening guidelines involve more stringent requirements than the Moderate Fit candidate screening guidelines. This Pass-Plus profile identifies individuals who possess greater levels of the characteristics needed to perform the job successfully. Pass-Plus profiles provide one source of information for distinguishing between applicants who otherwise meet minimal requirements on both personality and other selection instruments; thus it is a tool for distinguishing between multiple qualified candidates. Pass-Plus profiles may consist of a single level, multiple levels, or even a compensatory approach to differentiating applicants.

A6. APPLICATION OF RESEARCH

This section describes potential applications of the research conducted by the Hogan Research Division. In some cases, not all research steps may be used to show the applicability of the Hogan profile (e.g., criterion-related validity study). In other instances, circumstances may prevent or may not call for the use of certain applications. As such, this section should be taken as a general overview of possible outcomes Hogan may communicate as part of the research findings.

A6.1. Adverse Impact

The employment discrimination literature focuses on two broad concepts: (1) disparate treatment and (2) disparate impact. Disparate treatment refers to intentionally treating an employee or applicant less favorably than coworkers or other applicants. Disparate impact refers to employment practices such as assessments and performance evaluations that appear neutral, but in fact adversely impact one group. Therefore, an examination of Adverse Impact (hereafter, AI) is critical for companies that use selection instruments to make personnel decisions. In such a system, companies use selection results to determine which applicants will advance to later stages in the selection process.

To examine AI, Hogan used the 4/5ths rule, as outlined in the *Uniform Guidelines on Employee Selection Procedures* (Equal Employment Opportunity Commission, 1978; hereafter "*Guidelines*"). The *Guidelines* state:

> A selection rate for any race, sex, or ethnic group which is less than 4/5ths (4/5, or 80%) of the rate for the group with the highest rate will generally be regarded by Federal enforcement agencies as evidence of adverse impact…(Section 4D, p.38297)

Since 1978, the 4/5ths rule has been the acceptable guideline in the U.S. for examining AI based on group selection rate differences (e.g., Bobko, Roth, & Potosky, 1999; Reilly & Chao, 1982; Reilly & Warech 1993; Schmitt, Rogers, Chan, Sheppard & Jennings, 1997). Some researchers are critical of the 4/5ths rule, arguing instead for significance testing (Morris & Lobsenz, 2000; Roth, Bobko, & Switzer, 2006; Shoben, 1978). However, a review of the *Guidelines* by Cascio and Aguinis (2001) outlined the controversies of significance testing. They state:

> The controversies surrounding significance testing seem to be due mainly to how significance testing is used. Stated differently, many researchers have noted that significance testing is abused and misused (e.g., Cohen, 1994; Schmidt, 1996). Significance testing allows us to infer whether the null hypothesis that selection rates are equal in the population is likely to be false. On the other hand, significance testing is incorrectly used when: (a) conclusions are made regarding the magnitude of selection rate differences across subgroups (e.g., a statistically significant result at the .01 level is interpreted as a larger difference than a result at the .05 level) and (b) failure to reject the null hypothesis is interpreted as evidence of lack of differences in selection rates in the population (i.e., not

detecting differences in the sample may be due to insufficient statistical power). (p. 204)

Cascio and Aguinis (2001) continue by stating that, since the *Guidelines'* inception in 1978, the Equal Employment Opportunity Commission (EEOC) has provided no supplemental information regarding appropriate statistical power, methodology, or significance testing levels for determining AI. Although some researchers argue for the use of significance tests to examine AI, the appropriate use of such analyses remains undefined by the EEOC. As a result, Hogan continues to use the EEOC's recommendation of the 4/5ths rule.

Calculations examining the potential for AI produce a ratio where (a) numbers greater than 1.00 indicate that results for minority group applicants fall within acceptable ranges more frequently than results for the majority group and (b) ratios below 1.00 indicate that results for minority group applicants fall within acceptable ranges less frequently than results for the majority group. According to the 4/5ths rule, evidence of AI exists when this ratio is less than .80.

Hogan evaluates potential selection rates for gender, age, and race/ethnicity groups using an archival sample of applicants who provided demographic characteristics. For these analyses, we compare individuals who fail the Minimum Fit screening guidelines to those who pass the Minimum Fit screening guidelines. The results of these analyses serve only as estimates of potential selection rates in lieu of actual applicant data. When available, incumbent data from a local validation is used for these simulations.

A6.2. Validity Estimates

For studies without local validation evidence, Hogan computes overall validity estimates for each validity source using the equation provided by Nunnally (1978). The equation is as follows:

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

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 elements in the R_{xx} predictor intercorrelation matrix, and $\overline{r_{yy}}$ = the mean of all elements in the R_{yy} criterion intercorrelation matrix.

For studies with local validation evidence, Hogan correlates the recommended profile with incumbent performance ratings provided by the company. Additionally, Hogan applies the "Pass-Plus" cutoff scores to the incumbent sample. Specifically, Hogan compares the recommended profile to the objective performance data provided by the company. Results indicate the profile's effectiveness in differentiating between high and low performers in the various performance measures.

A6.3. Odds Ratios

To obtain more interpretive information about results, Hogan computes odd ratios. Odds ratios represent a way of comparing the probability of an event for two different groups. Compared with other methods, odds ratios have two major advantages: (a) they are unaffected by sample size, and (b) they are unaffected by unequal row or column totals (Howell, 1997).

Hogan calculates odd ratios in a three-step process: (a) multiplying the true positives and true negatives, (b) multiplying the false positives and false negatives, and (c) dividing true hits (true positives*true negatives) by false hits (false positives*false negatives). Note that we use the terminology of true and false in terms of a 2 X 2 contingency table, where:

	High Performer?	
Fit Profile?	**Yes**	**NO**
Yes	True Positive	False Positive
No	False Negative	True Negative

Hogan compares incumbents who fit the proposed profile to incumbents who do not fit the proposed profile on various metrics of performance. Incumbents are coded based on if they meet the first and second level cutoff scores of the recommended profile (i.e. Moderate Fit cutoff scores). In addition, we code incumbents as above or below average performers based on the primary indicators of job performance.

Odds ratios are interpreted by comparing their values to 1. Specifically, values smaller than 1.0 indicate a negative relationship, whereas values greater than 1.0 indicate a positive relationship. The farther away the odds ratio is from 1.0 indicates the strength of the relationship. A strong relationship indicates a stronger probability that an individual meeting the profile will be rated as a strong performer compared to those not meeting the profile.

A6.4. Graphical Interpretation of Profile Results

To obtain more interpretive information about results, Hogan creates graphs. First, Hogan classifies incumbents as high or low performers by computing a mean or median split on key indicators of performance. We then create graphs to depict what percent of high performers fall into each bucket of the selection profile. Ideally, we like to see that a large majority of high performers pass the profile while low performers score lower on the profile or fail the profile.

A6.5. Uses and Applications

Once Hogan establishes that the assessments are valid and the recommended profile should not discriminate unfairly, we recommend that the client administer the assessments used to build the profile to applicants and score the assessments using the recommended scales and cutoff scores in the suggested profile. Therefore, employment suitability can be determined, in part, by assessing scores on the recommended assessment scales. When handling and sharing score data, applicant confidentiality should always be maintained and security procedures put in place to ensure data integrity and applicant privacy. Whenever possible, administration conditions should always be monitored and standardized. However, with online

assessments, standardized conditions are not guaranteed due to the nature of the remote testing environment.

The following procedures will help companies use and monitor the selection process. First, the applicant flow should be examined closely to determine if the recommended cutoff scores allow enough applicants to pass while screening out applicants who are likely to be poor performers. Cutoff scores on which everyone fails are just as ineffective as those on which everyone passes. Second, companies should maintain records of test scores by demographic group, as indicated in the Uniform Guidelines, to monitor the possibility of adverse impact resulting from the use of the assessments. Third, the company should choose the appropriate administrative personnel to review the entire selection process to determine if any procedures can be improved. This step should be taken after the selection process has been used for at least one year but not more than five years. Test validation experts recommend that the results obtained in a validation study be reviewed and updated after five years (Schmit, Lundquist, & Beckham, 2008). Finally, performance appraisal and/or monitoring data should be maintained, if possible, on new incumbents who are hired using this selection procedure. These data will provide a check on the validity of the selection procedure and will help determine utility. In addition, Hogan recommends conducting follow-up analyses on the people hired using the assessments and exploring the utility and bottom-line impact of the proposed selection system. For further information concerning our research process, please contact:

Hogan Assessment Systems
11 S. Greenwood
Tulsa, Oklahoma 74120
(918) 749-0632

A6.6. Accuracy and Completeness

Hogan completes all procedures within the recommendations of both the *Uniform Guidelines* and the *Principles*. Hogan derives results strictly from data and archived study results and does not embellish, falsify, or alter results in any manner.

Hogan attests to the accuracy of the data collection, analysis, and reporting procedures used in all validity studies. Hogan enters the job analysis data into a database and computes results using SPSS statistical software.

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