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Queensland University of Technology

QUT Business School

Test Review

Talegent PATH: Personality and Cognitive  
Assessments

Test Publisher: Talegent

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## Talegent PATH Review

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This review was conducted by Dr Peter O'Connor (PHD, Organisational Psychology) who is an expert in the area of personality and psychological testing. He has published a range of articles in several leading international, peer-reviewed psychometric journals including the Journal of Personality, the European Journal of Psychological Assessment, Personality and Individual Differences, Journal of Individual Differences, and Learning and Individual Differences. He currently teaches Working in Business and Quantitative Research Methodology at the QUT Business School.

The purpose of this report is to provide an independent review of the Talegent PATH. The PATH is a set of four psychometric tests that collectively assess personality and cognitive skills. The PATH was developed primarily for use in organisations to assess prospective candidates and develop existing employees. This review is designed to be comprehensive, and is structured around the British Psychology Society's (BPS) test review guidelines, which is based on the European federation of Psychologists Association's (EFPA) test review model. In addition to reviewing the areas specified by the EFPA, this review will also include a range of independent analyses of reliability and validity of each of the four tests.

## 1. Overview of the Instrument

### 1.1. Name, publisher and date of review

Name: Talegent PATH

Authors of the original test: Ken Alexander, Cameron Beazley, Stefanie Pollard, John Austin, Emily Rust, and Nicola Mitchell.

Test distributor/publisher: Talegent

Date of review: September 2015

### 1.2. Brief description of the test

The primary purpose of PATH is to predict work performance of job applicants and consequently to assist in employee selection decisions. The test can also be used for training and development purposes as well as team development. The PATH includes tests of cognitive ability as well as personality. The cognitive ability tests can be broken up into three sub tests, including verbal reasoning, numerical reasoning and logical reasoning. The cognitive ability tests are performance based tests, whereby responses to individual questions are assessed as either correct or incorrect and summed within each subtest to form total scores. The cognitive ability tests use computerized adaptive testing (CAT) and therefore not all participants are exposed to all questions. The personality test consists of 202 questions that measure 32 specific traits which can be reduced into 6 domain clusters. The personality questionnaire is a normative test; participants respond to a range of questions on a six point likert-type scale.

The four tests (i.e. one personality test and the three cognitive assessments) take approximately 20 minutes each to complete (80 minutes in total). Results from the personality test and cognitive

ability tests can be combined to create 25 *competencies*, which can be categorised into five competency clusters.

### 1.3. Areas assessed

#### 1.3.1. Cognitive ability

The three cognitive ability tests include 1) *Verbal Reasoning*, which assesses an individual's ability to understand complex written material and to form sophisticated arguments; 2) *Numerical Reasoning*, which assesses an individual's ability to understand numerical relationships and information from graph's, figures etc., and 3) *Logical Reasoning*, which assesses an individual's ability to integrate information from multiple sources and to use data to solve problems.

#### 1.3.2. Personality

The 32 personality scales organized according to the six clusters are summarised below.

1. *Interpersonal cluster*: influential, directing, motivating, amiable, empathetic, collaborative, sociable, socially aware, trusting, accepting
2. *Temperament cluster*: self-confident, adaptable, composed, optimistic
3. *Thinking cluster*: data driven, intuitive, analytical, strategic, theoretical, innovative, learning focussed
4. *Execution cluster*: compliant, risk-tolerant, work-focused, meticulous, and reliable
5. *Drive cluster*: energetic, competitive, driven, and decisive
6. *Self-presentation cluster*: receptive, self-aware

### 1.4. Theoretical basis

#### 1.4.1. Personality questionnaire

The constructs in the personality questionnaire were initially developed using the Big Five Factor model which comprises the five main personality traits (i.e. Extraversion, Conscientiousness, Openness to Experience, Agreeableness, Neuroticism)<sup>1</sup> Although not discussed (or recommended) in the PATH user manual, the item set can be reduced to a five factor solution that resembles the Big Five model . Based on what is currently known about the structure of personality, all good personality tests should have this ability to be factored/grouped into five overarching personality dimensions.

The selection of the 32 personality constructs was based on a literature review of work-related constructs spanning the Big Five dimensions of personality. Test authors developed a large number of items to measure each construct and reduced these based on irrelevant, unclear, or conceptually inappropriate items as identified by subject matter experts.

As expected, the test reviewed here has some similarities with other available personality tests including the Saville Wave and the Occupational Personality Questionnaire. For example 27 scales

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<sup>1</sup> This analysis was not conducted by the test publisher, but by the current reviewer based on large data-sets supplied by the publisher.

from the Saville Wave align reasonably well with the PATH Personality Questionnaire. The test developers do not argue for a comparatively more valid/reliable test than what is available, but instead differentiate the PATH as being more flexible, faster and efficient than alternative tests.

The test is intended to be used for staff selection and assessment decisions in an occupational context as well as for training and development. The detailed technical manual states that only accredited users by Talegent are allowed to administer the PATH. This is consistent with what is specified by publishers of currently available alternative personality and ability tests.

### **1.4.2 Cognitive ability**

At this stage, there is little published information detailing the theoretical basis of the three cognitive assessments. The selection of the three cognitive assessments does not seem to be based on any specific contemporary theory of intelligence (e.g. Sternberg or Gardner's theory). However, the three cognitive assessments (logical reasoning, numerical reasoning and verbal reasoning) map on quite well to psychometric models of intelligence that specify a general factor ('g') which is comprised of several sub factors (e.g. verbal reasoning, numerical reasoning). Indeed an earlier but no longer available version of the PATH manual stated that the cognitive assessments were developed based on a review of available inventories that are based on this psychometric model (e.g. Saville Ability Assessments, CGI).

## **2. Classification**

### **2.1. Content domains**

Personality: Personality traits, motivation, values, beliefs, and emotion skills

Cognitive ability: General ability, verbal ability, numerical ability, and spatial ability

### **2.2. Intended main area of use**

Both personality and cognitive assessments from PATH are clearly developed to be used in work and occupational settings primarily for selection and assessment. The publishers also state that PATH can be used for on-boarding needs, training and development and team development. Furthermore, although not specified by the Talegent, the PATH would also be appropriate for use in career counselling, advice, guidance and career choice.

### **2.3. Intended mode of use**

This is an online test that is not directly supervised. However there is some control over several test conditions (time etc.) and also control over the identity of the test taker (only selected individuals can take the test via password restricted access).

### **2.4. Number of scales and description of variables measured by the test**

In addition to the 32 personality traits (organised into six clusters) and three cognitive assessments as outlined previously, the PATH can be used to create and measure 25 competencies organised according to five competency clusters. These are summarised below.

### **Cluster 1: Leading**

Competency: Supervision (influential, motivating, self-confident)

Competency: Command skills (directing, motivating, driven, trusting)

Competency: Negotiation (influential, sociable, self-confident)

Competency: Strategic agility (logical reasoning, strategic, low meticulous, risk tolerant, innovative)

### **Cluster 2: Relating**

Competency: Interpersonal Sensitivity (accepting, empathetic, socially aware)

Competency: Teamwork (collaborative, low competitive, accepting, empathetic, reliable)

Competency: Customer Focus (reliable, accepting, socially aware, driven, amiable, empathetic)

Competency: Emotional Intelligence (self-aware, receptive, socially aware, empathetic, composed, adaptable, collaborative, accepting, influential, motivating)

Competency: Building Relationships (sociable, amiable, accepting, socially aware, trusting).

Competency: Communication (verbal reasoning, influential, socially aware, self-confident)

### **Cluster 3: Solving**

Competency: Critical Thinking (logical reasoning, analytical, data driven)

Competency: Numerically Minded (numerical reasoning, analytical, data driven)

Competency: Business Acumen (verbal reasoning, numerical reasoning, logical reasoning, analytical, strategic, learning focused, risk tolerant, adaptable)

Competency: Judgement (logical reasoning, data driven, decisive, intuitive, risk tolerant)

Competency: Ingenuity (strategic, innovative, learning focused, risk tolerant)

### **Cluster 4: Doing**

Competency: Organisation (driven, analytical, meticulous, reliable, strategic)

Competency: Implementation (work focused, reliable, meticulous, compliant)

Competency: Adherence (compliant, reliable, meticulous, low adaptable)

Competency: Achievement (driven, competitive, energetic, work focused)

Competency: Mental Power (logical reasoning, learning focused, theoretical, analytical)

Competency: Self Focus (driven, energetic, self-confident, sociable, influential)

### **Cluster 5: Being**

Competency: Resilience (driven, self-confident, optimistic, adaptable, composed)

Competency: Flexibility (adaptable, composed)

Competency: Self Insight (self-aware, receptive, learning focused).

## **2.5. Format of items**

The personality questionnaire uses a six point likert-type scale with no neutral option. The cognitive assessment tests primarily use multiple choice with same scale alternatives.

## 2.6. Number of test items

There are 202 items in the personality questionnaire and generally more than 50 items in each of the cognitive assessments. The specific number of items individuals take in the cognitive assessments will differ due to the use of Computerised Adaptive Testing.

## 2.7. Administration mode

The publisher only makes the PATH assessments available to administrators that they describe as “qualified, competent persons who are fully aware of the limitations of these assessments” (p. 68 technical manual). The publisher also requires that administrators of their tests have completed accreditation with them (Talegent).

The personality and cognitive assessments are administered online with participants being emailed a link to assessment via a password protected webpage. Test-takers (generally job candidates) are given the opportunity to ask questions prior to starting the tests (via a direct phone number to the administrator), and also whilst they are completing the tests. There is an attempt to administer the test in standardised conditions as participants are advised to avoid distraction, move through the personality test quickly, and eat and drink something beforehand. However, since the administration is not directly supervised, there are clear limits to the level of standardisation that can be obtained.

## 2.8. Format of test and time required for administering the instrument

The PATH is an online tool that enables experienced administrators to rapidly select appropriate assessments, and quickly access test-taker reports that have been automatically generated. Although not specified in the technical/user manual, the selection of appropriate tests should not take more than one hour. Administrators are not required to score or write reports themselves. They are, however, required to interpret the report in the context of other information about the candidate, to come up with an overall, multifaceted assessment of a candidate.

Due to the automated nature of scoring and report-writing, the primary time for administration includes the time taken for candidates to complete the selected tests. As noted previously, each of the four components (personality, logical reasoning, numerical reasoning, and verbal reasoning) take approximately 20 minutes each. The administrator should be contactable during this time in order to respond to any questions that may arise.

# 3. Measurement and Scoring

## 3.1. Scoring procedure for the test

Automated computer scoring is used for the PATH. For the personality test, this automated process creates raw trait scores by reverse scoring negatively worded items and then summing items from respective scales. For the three cognitive assessment tests, this is also an automated process, however scoring is more complex. Computerised Adaptive Testing is used, such that an iterative algorithm is applied in order to tailor the test to the respective abilities of test-takers. This method results comparable in accuracy to traditional methods, however it uses much fewer items.

### 3.2. Score transformation for standard scores and scales used

The results of the PATH personality are presented using Sten Scores. Results of cognitive assessments are given using percentiles which represents the value below which a given percentage of observations in a group of observations fall. For cognitive assessments, the percentile score is given for each of the tests, along with an overall percentile based on results from all three tests combined.

## 4. Computer Generated Reports

### 4.1. Names of available reports

PATH Personality Profile  
PATH Personality Report  
PATH Competency Report  
PATH Competency Detail Report  
PATH EQ Report  
PATH Leadership Report  
PATH Personal Feedback Report  
PATH Cognitive Profile

All of the reports above utilise graphics to indicate where individuals fall in comparison to relative norm groups on each respective measure (either with Sten scores or percentiles). All of these reports also have text integrated with these graphics, except for the personality profile report and the competency report.

### 4.2. Report complexity and structure

Reports contain a mix of simple descriptions and configural descriptions and are of medium complexity overall. The PATH personality profile and reports are scale based: the report is built around the individual scales and organised into the six domain clusters. The PATH component competencies and competency detail reports are tailored reports based on the selected competencies relevant to a position. The competency detailed report is basically an extended version of the component competencies that includes detailed descriptions about how the candidate performs on each of the competencies. The EQ report is structured around competencies related to EQ; these include self-awareness, emotional appraisal, self-regulation, social orientation, and communication. The report includes text integrated with graphical representations of percentiles.

### 4.3. Miscellaneous components of computer generated reports

- Sensitivity to context: Pre-defined context-related versions
  - There are slightly different versions of reports for different uses
- Clinical-actuarial: Based on empirical/actuarial relationships
  - The text in the reports is based on established empirical relationships as well as expert interpretation
- Modifiability: Not modifiable



- There does not appear to be the capacity for administrators to modify computer generated reports
- Degree of finish: Publication quality
  - Reports have a very high standard of presentation and formatting
- Transparency: Clear linkage between construct scores and text
  - The links between scales scores and descriptive text is clear and unambiguous
- Style and Tone: The reports are written in descriptive, stipulative styles
  - Comments describe how test-takers compare to others on various constructs, and talk about some empirically demonstrated implications of their scores. The text in the reports does not go beyond the data/research.
- Intended Recipients: All parties
  - The reports are written in a manner suitable for qualified test users, qualified system users, test takers and third parties.

## 5. Supply and Conditions

### 5.1. Documentation provided by the test distributor as part of the selection package

The PATH is a combination of two types of assessment: personality and cognitive ability. Although the two tests are separate, they are marketed as a set of related tests, because the publisher argues that an adequate psychometric assessment of applicants/employees involves the assessment of both personality and cognitive ability. Consistent with this perspective, several of the Competency scores and reports that utilise these reports draw from both personality and cognitive ability scores.

Overall, the documentation provided about the personality component of PATH is excellent. This includes a detailed technical manual which also serves as a user manual, as well as example reports described in previous sections. The technical manual is a well written, 294 page document that introduces and describes the PATH personality questionnaire, outlines the applications, describes the requirements for administering and providing feedback on PATH personality components, provides a detailed overview of the reports, describes the range of different norm-groups, discusses the psychometric properties of the personality scales and addresses adverse impact.

The documentation provided about the cognitive component of PATH is not as comprehensive as the documentation provided for the personality component. The publishers provide example copies of cognitive profile reports and cognitive reports, however at this stage they do not have an up-to-date technical manual that is equivalent to what they offer for the personality component. Upon request however, they do provide information about the test, which includes adequate empirical research on the test demonstrating good overall reliability and adequate validity (as outlined in section 7 of this report).

This documentation is available in electronic PDF form from the publisher. It is not available for download directly from the website, however the publisher can be contacted via the website to obtain these documents.

## 5.2. Test-related qualifications required by the supplier of the test.

Talegent requires that test users complete an accreditation course with Talegent. Available training courses run from ½ day industry-targeted training to two day state of the art training.

The publisher states that psychometric assessments should be administered by “qualified, competent persons who are fully aware of the limitations of these assessments”, however they do not state what occupational groups they believe meet these criteria. It is possible that the publisher has specific requirements for accreditation training (e.g. certain occupational groups or people with specific qualifications), however this information is not given in the manual.

## 6. Evaluation of Test Materials

### 6.1. Evaluation procedure

This section will directly follow the test evaluation procedure outlined in the European Federation of Psychologists Association’s (EFPA) Review Model for the Description and Evaluation of Tests. The descriptive information on the following two pages therefore, is based largely on Lindley, Bartram, & Kennedy (2004).

There were three sources of information that were considered in carrying out this evaluation:

1. The manual and/or reports that are supplied by the publisher.
2. Open information that is available in the academic or other literature.
3. Reports and other information held by the publisher that are not formally published or distributed.

### 6.2. Evaluation table

All sections are scored using the following rating system:

- \* Inadequate
- \*\* Not used
- \*\*\* Adequate or Reasonable
- \*\*\*\* Good
- \*\*\*\*\* Excellent

**Any instrument with one or more [\*] ratings relating to the attributes that are regarded as critical to the safe use of that instrument, shall not be deemed to have met the minimum standards.**

Note that this table represents an evaluation of the test materials and supporting documentation. So the section here on ‘validity’ is not an evaluation of the validity of the test/s. It is an evaluation of how validity information has been presented in the test materials and supporting documentation.

<b>Quality of the explanation of the rationale, the presentation and the quality of information provided</b>		<b>****</b>
<b>1</b>	<b>Overall rating of the quality of the explanation of the rationale</b>	<b>****</b>
1.1	Theoretical foundations of the constructs	***
1.2	Test development procedure	****

1.3	Thoroughness of the item analyses and item analysis model	****
1.4	Explanation of content validity	****
1.5	Summary of relevant research	****
<b>2</b>	<b>Adequacy of documentation available to the user (user and technical manuals, norm supplements etc.)</b>	
2.1	Rationale (well-argued and clearly presented description of what test is designed to measure and why it was constructed as it was)	****
2.2	Documentation (full details of item sources, piloting, item analyses, comparison studies and changes made during development trials)	***
2.3	Standardisation (clear and detailed information provided about sizes and sources of standardisation sample and procedure)	***
2.4	Norms (clear and detailed information provided about sizes and sources of norms groups, conditions of assessment etc.)	***
2.5	Reliability (good explanation of reliability and a comprehensive range of internal consistency and retest measures provided with explanations of their relevance, and the generalisability of the assessment instrument)	***
2.6	Validity (good explanation of validity with a wide range of studies clearly and fairly described)	***
<b>3</b>	<b>Quality of the procedural instructions provided for the user</b>	
3.1	For test administration	****
3.2	For test scoring, norming etc.	***
3.3	For interpretation and reporting	****
3.4	For providing feedback and debriefing to test takers and others	****
3.5	For providing good practice issues on fairness and bias	***
3.6	Restrictions on use (clear descriptions of who should and who should not be assessed, with well-explained justifications for restrictions, e.g. type of disability, literacy levels required etc.).	***
<b>3.7</b>	<b>References and supporting materials</b>	
<b>4</b>	<b>Quality of the materials</b>	***
4.1	General quality of the test	****
4.2	Test quality of the local adaptation	n/a
4.3	Ease with which the test taker can understand the task	****
4.4	Ease with which responses or answers can be made by the test taker	***
4.5	Quality of the items	***

### 6.3. Reviewers comments on the documentation

The available test materials and associated documents for PATH are excellent. In particular, the technical manual for the personality questionnaire is an excellent, 5 star document. It is well written, explains a range of sophisticated psychometric concepts in a logical way and generally provides sufficient information about the theoretical foundations of the constructs, item analysis procedures and reliability and validity tests. The reason that the evaluation of test materials in the above table typically received 3 and 4 stars (adequate, good) is primarily because a current, technical manual for the PATH cognitive tests is not yet available. If such a manual is developed to the same level as the personality component, the ratings above would improve by one star on average. Again, this does not mean there are problems with norms, validity, reliability etc. of the PATH cognitive tests; there is just a lack of available information for users about these attributes.

Although overall the personality manual is a 5 star document, there were some minor omissions from this document. For example, there was little information about what professional qualifications administrators/users are required to have (e.g. do they need to be psychologists?). There is also a lack of sample items in the manual (and also lack of sample items that were cut from the initial large pool). There could also be more discussion on issues about the restrictions of use. The section on adverse impact however was very good.

## 7. Evaluation of Norms, Reliability and Validity

This section will be covered in two sections. In the first section, the available norm, reliability and validity data from the test manual will be reviewed. In the second section, independent tests (conducted by the reviewer) of reliability and validity will be described.

### 7.1. Evaluation of norm/validity/reliability based on data available from publishers

This section evaluates the appropriateness of the norm groups, the actual validity and reliability of the test. It is based on:

1. The manual and/or reports that are supplied by the publisher
2. Open information that is available in the academic or other literature
3. Reports and other information (e.g. unpublished validation studies) held by the publisher that are not formally published or distributed.

Consistent with the last section, the following rating system is used:

- \* Inadequate
- \*\* Not used
- \*\*\* Adequate or Reasonable
- \*\*\*\* Good
- \*\*\*\*\* Excellent

Overall Evaluation of Technical Information (note that this score is based on the ratings given in the following two tables): *3.5 stars*.

#### Norms or reference group information

1	<b>Overall Adequacy</b>	<b>4.5 stars</b>
2	Appropriateness for local use, whether local or international norms: local country samples or relevant international samples drawn from well-defined samples from the relevant application domain	*****
3	Appropriateness for intended applications: excellent range of sample relevant, age-related and sex-related norms with information about other differences within groups (e.g. ethnic group mix)	*****
4	Sample size: large samples (e.g. 300 – 1000)	****
5	Procedures used in sample selection: Incidental (based primarily on job applicants who have used test)	***
6	Quality of information provided about minority/protected group differences, effects of age, gender etc.	*****

### Comment

Overall, the norm groups for the PATH personality and cognitive assessments are good. Generally large sample sizes are used ( $n = 357 - 963$ ). Norm groups include admin/entry level staff ( $N = 963$ ), graduates ( $N = 254$ ), professionals ( $N = 414$ ), managers ( $N = 357$ ), executives,  $N = 525$ , and incumbent ( $N = 944$ ). The demographics of these norm groups are generally appropriate and outlined in the manual. The manual also provides appropriate statistics from each norm group (mean, standard deviations, standard errors, confidence intervals) and all these values look reasonable. The selection of the samples however seems to be incidental – the sample is comprised of former applicants who have completed the assessments. Although this is not problematic, it means that the samples cannot really be regarded as representative of the normal population.

### Validity

<b>1</b>	<b>Overall Adequacy</b> (this is based on all of the assessments below)	<b>3 Stars</b>
<b>2</b>	<b>Construct Validity – Overall Adequacy</b>	<b>***</b>
2.1	Designs used <ul style="list-style-type: none"> <li>• Exploratory Factor Analysis</li> <li>• Confirmatory Factor Analysis</li> <li>• Correlations with other instruments</li> </ul>	
2.2	Sample sizes: More than one adequate or large sized study	****
2.3	Procedure of sample selection: Incidental (participants were applicants who completed the test).	***1/2
2.4	Median and range of the correlations between the test and other similar tests: Median = .28, range = -.03 - .51	***
2.5	Quality of instruments as criteria or markers	***
<b>3</b>	<b>Criterion-related validity – Overall Adequacy</b>	<b>***</b>
3.1	Description of the criteria used and characteristics of the populations <ul style="list-style-type: none"> <li>• Predictive</li> </ul>	
3.2	Sample sizes <ul style="list-style-type: none"> <li>• One sample size less than 100 and one larger sample</li> </ul>	***
3.3	Procedure of sample selection: purposive sample	***1/2
3.4	Median and range of the correlations between the test and criteria	***

### Comment

For construct validity, tests of EFA and CFA were used to demonstrate an appropriate psychometric structure. These were competently conducted and provided results consistent with the proposed structure of the questionnaire. The sample was comprised of job applicants who completed the test, and therefore cannot be considered as a random sample of the population of interest. Other methods commonly used to assess construct validity (e.g. differences between groups in expected directions, experimental designs, correlations with other methods) were not conducted.

Criterion related validity for the personality questionnaire was assessed using a predictive validity study ( $N = 58$ ). Participants completed the PATH personality questionnaire and were assessed by their managers 3 months later on a range of performance criteria (e.g. embracing diversity, helping others, tolerating stress). Results provided good support for the predictive validity of the personality

questionnaire, with the median validity coefficient ( $r = .27$ ) equivalent to what would be expected with a good personality questionnaire. The validity coefficients ranged from  $-.03$  to  $.49$ . Overall, although a small/moderate sized sample was used, the study was an adequate test of the predictive validity of the personality questionnaire.

Additionally, although not yet detailed in a technical manual, the publisher has conducted a range of validity tests on the cognitive assessments. In particular, several tests of structural validity have been performed using Item Response Theory (IRT) for the cognitive tests. These tests were competently conducted, used large sample sizes and provide some support for the construct validity of the cognitive assessments.

### Reliability

<b>1</b>	<b>Overall Adequacy</b> (this is based on all of the assessments below)	***
<b>2</b>	Data provided about reliability Reliability coefficients for each construct based on one test (i.e. one test for personality and one for each of the cognitive tests). Only tested for internal reliability, no data for test-retest reliability.	
<b>3</b>	<b>Internal Consistency</b>	
3.1	Sample Size: One large or more than one adequate size study ( $n < 1000$ )	****
3.2	Median of coefficients: $\alpha = .78$	****
<b>4</b>	<b>Test-retest reliability</b>	
4.1	Sample size	n/a
4.2	Median of coefficients	n/a

### Comment

Internal reliability was the only form of reliability assessed in the PATH. This was based on large samples for both the personality and cognitive components and in both cases revealed a good result. For the personality test, the median reliability was found to be just below  $.8$  which is considered a very good level of internal reliability. For the cognitive ability test, median reliability was at least  $.75$  for each scale.

The publishers have not yet collected data to assess test-retest reliability of either personality or cognitive assessments, and this could therefore not be assessed. However, it seems very likely that the personality test would produce scores that are reliable over time, based on the results of the predictive validity study (i.e. if the test scores at time 1 did not hold at time 2, there could not have been a correlation between test scores and time 2 performance measures).

## 8. Independent assessment of reliability and validity

In order to provide an independent assessment of reliability and validity, updated, raw data files were obtained from the publisher. The internal reliability statistics below are based on a single sample of job applicants ( $n = 1235$ ).

## 8.1. PATH personality: Reliability for each scale

### Cluster 1: Interpersonal

- Influential  $r = .71$
- Directing  $r = .85$
- Motivating  $r = .78$
- Amiable  $r = .65$
- Empathetic  $r = .84$
- Collaborative  $r = .74$
- Sociable  $r = .79$
- Socially aware  $r = .77$
- Trusting  $r = .75$
- Accepting  $r = .73$

### Cluster 2: Temperament

- Self-confident  $r = .71$
- Adaptable  $r = .81$
- Composed  $r = .86$
- Optimistic  $r = .82$

### Cluster 3: Thinking

- Data Driven  $r = .69$
- Intuitive  $r = .64$
- Analytical  $r = .69$
- Strategic  $r = .83$
- Theoretical  $r = .75$
- Innovative  $r = .79$
- Learning Focus  $r = .77$

### Cluster 4: Execution

- Compliant  $r = .71$
- Risk Tolerant  $r = .80$
- Work Focused  $r = .73$
- Meticulous  $r = .73$
- Reliable  $r = .77$

### Cluster: Drive

- Energetic  $r = .81$
- Competitive  $r = .91$
- Driven  $r = .73$
- Decisive  $r = .76$

### Cluster: Self Presentation

- Receptive  $r = .71$
- Self-Aware  $r = .71$

**Comment:**

Overall the internal reliability for each of the subscales was found to be good. All but four of the subscales were above 0.7, which is generally regarded as a good level for internal reliability. The exceptions were intuitive ( $r = .64$ ), analytical ( $r = .69$ ), data driven ( $r = .69$ ) and amiable ( $r = .65$ ). Although lower than .7, these values are still regarded as acceptable.

## 8.2. PATH personality: Tests of construct validity

Construct validity was tested by using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) with two different samples (EFA sample  $n = 1286$ , CFA sample,  $n = 1206$ ). The EFA was conducted on all items in the questionnaire (rather than single scale items as conducted by the test publishers), in order to determine both the number of factors underlying the data, and also determine whether different subscales were correlated with each other. A common factor analysis was specified, and factors with eigenvalues greater than 1 were extracted. The specified rotation method was oblique, as it was expected that factors would correlate with each other.

This specification resulted in a factor solution with 34 extracted factors. This is very close to the hypothesised 32 factor solution. Although there were some exceptions, the factor structure was clean, with items loading primarily on their respective factor more than 80% of the time. A second EFA was then conducted with the same specifications as the first, however 32 factors were extracted this time. Again, more than 80% of items loaded on their respective factor and overall, the 32 extracted factors could account for 58% of the original variance in the complete set of items. The factor correlation matrix revealed low to moderate correlations between most of the factors.

Thirty-two single factor CFA's were then conducted in AMOS graphics. EFA already supported the primarily simple structure of the PATH, so CFA was primarily used to assess whether each scale was unidimensional. Models were assessed based primarily on fit indices (RMSEA, CFI, GFI, SRMR) as well as the magnitude of standardised estimates (loadings). These analyses revealed adequate fit for all models, except those of 'intuitive', 'optimistic', and 'work focus' (borderline fit was obtained for these factors). This is consistent with the slightly poorer reliability results for these scales as described above. Fit of these models however became adequate when error terms in similar items were allowed to covary. Overall, the combination of EFA and CFA results provides evidence for the factor structure of the PATH personality test which is one indicator of construct validity.

Other data sets for testing construct validity (e.g. results of experiments, correlations with other measures, predictive validity tests) were not available from the publisher. However, this information should be available in the near future and this review will be updated when it is.

## 8.3. PATH cognitive ability: Tests of reliability

Internal reliability was calculated for each of the cognitive ability tests.

### Verbal Reasoning

N = 777

No. Items = 58

M, SD = .00, .84

Internal Reliability: .75



**Numerical Reasoning**

N = 367

No. Items = 84

M, SD = .00, .97

Internal Reliability: .89

**Logical Reasoning**

N = 959

No. Items = 53

M, SD = .00, .84

Internal Reliability: .77

**Comment:**

Internal reliability for each of the cognitive assessments is good (i.e. > .7), indicating that the items within each test generally measure the same construct. At present, samples are not available for testing other forms of reliability (e.g. test-retest reliability).

### 8.4. PATH cognitive ability: Tests of construct validity

Validity was tested using Exploratory Factor Analysis. Since computerised adaptive testing was used for the cognitive assessments, the item anchors were included in each factor analysis (i.e. the 15 or 20 items in each test that all participants completed). Exploratory Factor Analysis rather than Confirmatory Factor Analysis was used here due to the relatively large number of items per scale.

The Exploratory Factor Analyses were conducted using SPSS. Items were coded as being either 'correct' or 'incorrect' and were therefore appropriate for use in a factor analysis. For each of the data sets (i.e. one data set for each questionnaire) a common factor analysis was specified and factors with eigenvalues greater than 1 were extracted. Orthogonal rotation was specified. Consistent with the theorised unidimensional structure of each test, each of the three factor analyses resulted in 1 primary factor, with items loading between 30% and 50% on that factor. Although all tests had 1 primary factor, the logical reasoning test had a second factor with an eigenvalue of slightly more than 1, however this seemed to be a statistical artefact, as items did not seem to load on this factor in a meaningful way. Overall, the majority of items (more than 60%) in each test loaded at least .3 on the principal factor.

This analysis provides some evidence for the validity of the PATH cognitive assessments. As noted above however for the PATH personality test, further tests of validation (e.g. results of experiments, correlations with other measures, predictive validity tests) should also be conducted.

## 9. Final Evaluation

The PATH is a multifaceted assessment tool that includes four tests: One personality test and three cognitive assessments. The personality test contains 32 scales which can be organised into six clusters and 25 competencies (when combined with some of the cognitive assessments). Overall, the personality component of PATH is regarded as being very good. Although it lacks a strong theoretical basis, the manual provides a comprehensive statistical overview of its development, which, was very well done. The technical manual for the personality component of PATH is very good overall. It is well written and provides test administrators with most of the information they need to

competently use the personality questionnaire. The online set-up of PATH also appears like it would be very easy to use and tailor from the perspective of a test administrator. The reports outlining and interpreting the results of the personality questionnaire are also very good; they include a range of predefined reports (e.g. the Leadership Report) and are written at a level that should be easy for users to understand.

Regarding the psychometric properties of the PATH personality questionnaire, this ranged from adequate/reasonable to very good. First, the norms are very good. The norms were based on large samples, and although they were not obtained independently (i.e. the norms are based primarily on applicants who have sat PATH), their demographics suggest that they would nevertheless provide an appropriate norm base. The construct validity of PATH personality was regarded as good. Exploratory and confirmatory factor analyses revealed factor structures that were consistent with the theorised factor structure of PATH. However, further work could be conducted on providing a more thorough test of construct validity (e.g. through exploring differences between groups and conducting experiments). Criterion related validity tests could also use larger sample sizes. Reliability was rated as adequate/reasonable. The internal reliability was very good, but there was no mention in the manual of the test-retest reliability.

The materials provided with the cognitive assessments are not as impressive as those provided with the personality component of PATH. In particular, no technical manual is currently provided with the cognitive assessments. This is unfortunate, as a technical material similar to that accompanying the personality questionnaire would be of great use to administrators, and also provide them with important validity and reliability information. Fortunately however, even though such material is not available in a test manual, the publishers have conducted empirical research on the cognitive assessments. They have also used excellent methodology for assessing their items (analyses based on Item Response Theory). Independent research conducted in this review also provides some support for the reliability and validity of the cognitive assessments. Overall, the available evidence for the reliability and validity of the cognitive assessments is assessed as being 'adequate'. It is noted however, that the publishers have stated that they have plans to develop a detailed technical manual for the cognitive component of PATH. When this manual is released, the current review will be updated accordingly.

The overall set of PATH assessments is evaluated as being 'good' and certainly adequate to be used for its stated purposes (assist with selection, development, team development). At the moment, the personality assessment is the most well supported and well documented component of PATH, and on its own, is highly recommended. The cognitive assessments however are also adequate and can also be recommended. These are particularly appealing due to their use of computerised adaptive testing; however ideally, the publisher will conduct more research to test their efficacy.