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Numerical reasoning – much more than maths

In recent years there has been a growing demand for a specific way to assess the numerical reasoning of existing and potential managers as well as the critical reasoning of those who present themselves as potential candidates. It was this demand that led the highly regarded psychometrician and the only Professor of Psychometrics in the UK, Dr John Rust, to develop a companion test to the now ubiquitous Watson-Glaser Critical Reasoning Appraisal called the Rust Advanced Numerical Reasoning Appraisal (RANRA).

Good managers make great decisions, sometimes appearing to do so with very limited information. They can do this because they have highly developed critical thinking skills. Managers that have what are known as higher order cognitive skills, who make decisions based on context added to their own experience and who can remain objective, are in high demand. Those same managers are also adept at knowing that some decisions cannot be made when there isn't enough information, and that helps them ask the right questions. These critical thinking abilities, along with their numerical reasoning powers, can be measured. However, because the general view remains that this sort of innate intelligence is born, not made, many organisations fail to develop their managers as well as they could.

The Rust Advanced Numerical Reasoning Appraisal (RANRA) is a test of power, not speed.

Background to the emergence of RANRA

To reveal the extent of an individual's thinking skills, probably one of the most widely used critical thinking tests on the market today is the Watson-Glaser Critical Thinking Appraisal (WGCTA). The idea was first developed in the early part of the 20th century by combining the theoretical aspects of critical thinking with the practical issues of producing measures that could be used in an organisational setting. Good managers and good leaders are greatly valued, especially in the knowledge economy where the ability to think flexibly and make good decisions is essential to operate in increasingly competitive markets. As a consequence, the Watson-Glaser test is universally recognised by professionals involved in management selection and development.

RANRA has been developed as a companion tool to Watson-Glaser specifically to assess the higher level numerical skills required of managers today. Used either in combination with Watson-Glaser or on its own, the test assesses an individual's capacity for deduction, interpretation and evaluation. It is not a computational maths test, but a sophisticated and highly developed assessment of internalised mathematical knowledge combined with real life problem solving. The test measures various aspects of numerical reasoning that together give a whole picture of the candidate's higher cognitive facilities. In broad terms, RANRA investigates the candidate's ability to compare quantities while understanding and judging the sufficiency of information available. At the last analysis, numerical reasoning is more than simple ability. It can be developed through education and it can be learned which means your best people could be even better.

test description

The Rust Advanced Numerical Reasoning Appraisal, (RANRA), is presented to individuals in two different but interdependent tests. The tests measure aspects of numerical reasoning, requiring the individual to consider alternative solutions relative to given problems. The individual's task is to study each problem and evaluate how appropriate or valid these alternatives are.

Test 1 – Comparison of Quantities

In test 1 each question presents comparative information, A & B, from which the individual selects the most appropriate answer. Some questions will have additional information in the form of statements.

For example, after the statement 'The field covered an area of 10,000 square metres' the individual has two further pieces of information. (A), simply states, 'The length of the field' without giving numbers, and (B), simply states, 'The width of the field', again without numbers. Four options are then given from which the individual must choose one: A is greater than B; B is greater than A; A and B Equal, or Insufficient Data.

Test 2 – Sufficiency of Information

In test 2, each question is supported by two statements, (A) and (B), which give certain information. There are 5 combinations of answers; A not B; B not A; A and B; A or B; Not A, Not B.

For example. In a question about relative speed, the individual is given information about the speed of two different types of aircraft: A, a propeller driven aircraft and B a jet aircraft. The question is, 'How much faster is a jet than a propeller driven aircraft?' Neither statement is sufficient to answer the question in isolation, but taken together, it is possible to work out which aircraft is the faster. The test, however, doesn't require the individual to calculate the difference in speed, but to say what information would be needed to do so. Therefore, the correct answer is A and B

Graduate Recruitment

Employers are finding that today's graduates are lacking anything more than a basic mathematical capability. This makes it very difficult to accurately select for management occupations that require more sophisticated numerical reasoning skills. Organisations, therefore, have to increase the use of ability tests to try to identify graduates with the capability to learn and grow into more complex roles.

Selection Prediction for Experienced Hires

RANRA can provide an estimate of potential success in certain types of occupation that require numerical reasoning capabilities. It can be used successfully as a selection tool within the recruitment process for those occupations. For example, hiring a sales manager whose performance is proven in meeting targets but an unknown quantity in so far as managing budgets, RANRA can give an indication of the candidates capacity to develop into a more senior role with those requirements as part of the job specification.

Training & Development – Measuring Existing Achievement

RANRA can provide an accurate measure of existing numerical reasoning capabilities providing a benchmark against which training and development can be designed. This can be particularly useful in situations where team development is being investigated. RANRA provides for relative differentials in ability between individuals within a group being assessed, making it a valuable team development tool.

High Potentials and Succession Planning

RANRA is exceptionally helpful as part of an assessment and development programme to groom existing leaders for succession, or as part of the selection process prior to appointing managers into more senior and/or complex roles.

Getfeedback uses RANRA as a key component of high potential and leadership assessment. Integrated with other assessments, RANRA is a key component to Getfeedback's performance based and holistic Talent Identification Assessment.

RANRA Norms and companion information to Watson Glaser Critical Thinking Appraisal (WGCTA)

Published normative (comparative) information, 'Norms', have inherent limitations because of the nature of moveable job markets, local conditions of employment and job demands. Ideally, local in-house norms that are representative of the conditions against which people are being reviewed would be the better comparator. However, where this is impractical, either because of sample size or time restraint, RANRA is still a very powerful tool when used with its published Norms. 13 different occupational normative tables are published to support RANRA and can be used individually or in combination. There are also certain advantages with combining RANRA and WGCTA together as both tests have been co-normed on the same standardisation sample. Such a combination is highly recommended, not least because of the higher data reliability, but because an assessment of critical thinking along with numerical reasoning provides the user with a greater breadth of information against which better decisions can be made.

Item Development

Conceptual analysis of the role of critical thinking in the use of mathematics was carried out. From this analysis two fields, comparison of quantities and sufficiency of information, were derived as key concepts for assessment. 80 test items were constructed, re-evaluated and modified by a panel of educationalists and psychologists to arrive at the pilot 80 questions. These were then administered to 76 students and staff from diverse backgrounds within London University. Data was then subject to detailed analysis at item level. This was followed by distracter analysis, difficulty value calculation, discrimination indexing and with final modifications, a 32-item standardisation version of RANRA was created.

RANRA Standardisation Sample

The RANRA is standardised using the percentile conversion method to a T-score format based on a large UK standardisation sample. RANRA was administered to 1546 respondents from over 50 different and varied occupations within diverse organisations and companies in the UK. The sample included 1019 men and 520 women with a mean age of 29.97 years with a standard deviation of 8.13 years. Educational level was widespread from those with no qualifications to those with PhD's. Ethnic ratios are representative of the UK working population.

Reliability and Validity

Reliability was calculated using alpha, split-half reliability and standard error of measurement. The scores are: Alpha 0.78; split half 0.78 and SEM 4.69. While RANRA is relatively new compared to the WGCTA, validity across all areas of test evaluation (face, content, criterion, construct) exhibit high levels of confidence and are shown to be statistically valid.

The test conforms to British Psychological Society and American Psychological Association guidelines on personality test construction and use.

test administration

We deliver the service your way

Businesses operate in different ways. Some want to be very hands on with the use of psychometric tests. Others want the process to be as low noise as possible. So it's no use getting a business to operate in a way that is unhelpful and uncomfortable. That's why we have a number of different ways of deploying psychometric tests.

We give you the technology you need, when you need it

We take a modular approach so that you can buy the bits you need, as and when you need them. You can link them together with other tools at any point in the future – for example your existing performance management and succession planning technology.

We make a proper job of the technology

Our web based tools are cheat proof, hack proof, idiot proof - and candidate proof.
Some essentials:

- RANRA is available through Getfeedback's online admin centre and is delivered on-line.
- Candidates are sent a secure link via email.
- RANRA is not a timed test.
- There are 32 items split in to two parts.
- Approximate time required to take the test is 40 minutes.

Please note that in line with the test publishers guidelines for ability tests every possible step must be taken to ensure that the question sets are protected, and that the individuals completing the assessment are the individuals named. By purchasing this test you agree to ensure that everything possible is done to ensure this.

How do you want to do it?

Eliminate the testing headache – Fully outsourced – We manage your testing on your behalf

Set up

Customised site set up – if required

Ongoing the process is simple.

- You give us a candidate list
- We set up and administer the tests
- You receive the results on an agreed date
- You get an hour with an occupational psychologist to help you make the most of the data OR each candidate gets an hour with us to run through their feedback (optional if BPS accredited)
- You get the right people in the right roles

Online testing for speed and convenience

Each candidate receives an email containing full instructions and a link to their questionnaire.

Equip your team with a quality testing system – Self managed – We train you to use our system

- You tell us whether you would like a fully branded testing site or use of our standard site.
- We train your internal team to use our system.
- You get started testing your candidates

Set up costs

Set up of customised branded site (if required)

Training to use the system

Ongoing costs

All you pay for is the cost of the questionnaire. The report is generated automatically.

How much does the RANRA cost?

Assessments

RANRA.....	£ 12
Watson-Glaser & RANRA Combined.....	£ 20

Prices are per test per candidate

Administration

Fully Outsourced service.....	£ 50
Price per test per candidate	
Fully outsourced administration charge can be discounted for high volume users	

Self managed service.....	£ 750
Training for up to 4 people to use the online administration centre	

Customised Online Test Centre

Client branded portal.....	£ 1100 per day
Standard web portal takes 2-3 days to set up	

NB: Administrators must be qualified to British Psychological Society Accreditation Level A – in the absence of BPA Accreditation, Getfeedback can provide support at £200 per hour.

To discuss any aspect of the administration process and/or pricing, please contact James Shimmen to discuss your specific requirements on 01491 845 532