

Building a Scale of Emotional Intelligence for Human Resource Management by using the Graded-Response Model

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Abstract

This paper uses the graded-response model to construct the dimension of personal competence in the emotional intelligence scale for human resource management at Sohar University in Oman. It also aims to ensure that unidimensionality and local independence are achieved in the graded-response model for the personal competence dimension in the scale of emotional intelligence for human resource management. It also estimates the parameters of personal competence in the emotional intelligence scale of human resources management, as well as individuals' parameters (abilities) corresponding to each possible total score on the personal competence in the emotional intelligence scale of human resources management. It also aims to identify items' and persons' fit in the emotional intelligence scale (personal competence) for human resource management using the graded-response model. This research aims to reveal the presence of statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the level of emotional intelligence (personal competence) for human resources management using the graded-response model according to the variables of gender, job title, years of experience. The researchers adopted the descriptive approach, and data were collected from a stratified random sample of Sohar University employees. The sample consisted of 396 employees. The researchers used an emotional intelligence scale and focused on the personal competence dimension. The Multilog software program was used for statistical analysis. The results indicate that the assumptions of the graded-response model (i.e., one-dimensional and positional independence) are upheld in the present research. The item parameters were easy and medium difficulty, and the arithmetic mean of ability was slightly higher than average. The results show that 38 items fit the graded-response model, while 12 did not. The results also show that the model did not fit 24 individuals in the study sample. The results indicate non-significant differences in the employees' abilities in personal competence according to gender. The results also reveal statistically significant differences in the employees' abilities in personal competence according to the job in favor of academic employees.

Keywords: *Emotional Intelligence, Human Resource Management, Graded-Response Model, Sohar University.*

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Introduction

A good employee has a set of qualities, such as honesty, problem-solving skills, teamwork, conflict management skills, communication skills, the ability to control and manage emotions, and good health. Therefore, in recent times, the importance of emotional intelligence has appeared, which is no less important than other types of intelligence. Binet defined “intelligence” as an individual’s ability to understand and purposefully direct his own behavior. Thus, emotional intelligence is an important and influential factor in an individual’s academic, social, and emotional life, and it is considered the primary controller of his behavior (Tashtoush et al., 2023 b). Thorndike defined “emotional intelligence” as the ability to act wisely in human relations, and he described it as the ability to understand and manage others and to act skillfully and wisely in human relations (Amscha, 2013).

Attention to human resources development in the government and private sectors is one of the most important goals that the future vision in the Sultanate of Oman aims to achieve in general and in higher education institutions, in particular by raising the level of workers and promoting the skills necessary for the work environment (Tashtoush et al., 2020). As higher education institutions are responsible for educating and training students in various sectors, the workers in these institutions, whether they are academics or administrators, have a significant role in refining students’ experiences and preparing them to join the labor market. Among those skills that workers in higher education institutions must possess are emotional intelligence (personal competence) and its dimensions: emotional self-awareness, self-control, Orientation of Achievements, positive vision, and adaptability (Tashtoush et al., 2023 a).

Sohar University, which is a private higher education institution in the Sultanate of Oman, hopes to develop its human resources, provide a high-quality service to students enrolled in its educational programs, and ensure that its employees (academics and administrators) continue to give an effort with dedication and proficiency. Therefore, Sohar University is assiduous in building psychological scales concerned with this aspect so that it can identify its employees’ strengths and weaknesses and work to enhance their strengths and lower their weaknesses (Sohar University, Strategic Plan 23/2018).

Given the importance of constructing psychological and educational scales that are well-established in measuring the psychological characteristics of workers, specialists in the field of psychological and educational measurement and evaluation have been assiduous in making the correct scientific foundations in building them according to clear steps represented in writing items and their connection to the field in which they are measured. This means that the scales have a high degree of validity and reliability. The process of construction and statistical analysis of scales follow clear theories in measurement, including the Classical test theory (CTT) and the modern theory in measurement, which is called the item response theory (IRT) (Odah, 2014; Rasheed & Tashtoush, 2023). Item response theory appeared to complete the deficiencies in the classical theory because it has a high degree of accuracy and objectivity, in addition to its ability to perform operations such as calibrating tests, building item banks, and constructing adaptive tests (Fannakhosrow et al., 2022; Rasheed & Tashtoush, 2021).

Given the importance of the item response theory for items in general and the graded-response model in particular in building educational and psychological scales, the current study seeks to build a scale of emotional intelligence (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to the graded-response model.

Research problem

In 2001, Konstantinos developed the trait-based emotional intelligence model, which overlaps significantly with the concept of personality traits. It is based on self-reported

behavioral behaviors and cognitive abilities. Trait-based intelligence can be described as including only the mental abilities that correlate intelligence and emotion with the presence of other personal traits and tendencies such as motivation, sociability, and feelings (Ibrahim & Al-Hashemi, 2022; Tashtoush, 2008). Emotional intelligence has become one of the important features that leaders focus on in various work institutions, and it must be revealed to the extent that employees possess it. Thus, scales are urgently needed to measure employees' emotional intelligence levels.

Given that academic institutions are among the service institutions that are keen to provide education services to students and academics, administrators have to possess a high level of emotional intelligence. Recently, there has been a need to build psychological and educational scales that keep pace with development in fields of measurement, such as the theory of measurement, which includes a set of models, including the graded-response model. The graded-response model is an extension of the two-parameter model, and it can provide estimates of the locations of individuals, parameters of difficulty, discrimination of items, and the thresholds for each item.

Based on the researcher's experience and work as a faculty member at the College of Education and Arts at Sohar University, as well as her dealings with students and administrative and academic colleagues, she found that there is a lack of interest in emotional intelligence in higher education institutions despite its importance. In addition, through her acquaintance with many studies (e.g., Lazriq, 2018) the researcher found that studies have dealt with emotional intelligence from certain aspects related to students and its relationship to the level of achievement, such as Al-Harassi and Michael (2019) and Al Mawalia et al. (2019). Researchers have also focused on the classical test theory more broadly than the item response theory, and the majority of studies that have dealt with the modern theory of measurement have focused on achievement tests and general intelligence tests without focusing on other measures of intelligence. Examples include Bashir's (2020) study "Achievement tests according to the item response theory" and the study of Awad and Al-Qahwaji (2016) entitled, "Developing a test in scientific research skills for students of faculties of education in Jordanian universities and verifying its psychometric properties according to the classical and modern measurement theories."

Given the lack of studies that have dealt with the issue of building a scale of emotional intelligence according to the graded-response model, and given the need for higher education institutions in the Sultanate of Oman in general and in Sohar University in particular, the researcher decided to conduct this research, which she hopes will contribute to identifying weaknesses in emotional intelligence among workers at Sohar University. This will facilitate improvements to the process of making treatment plans and raise the level of workers' emotional intelligence in a manner that enables to employ workers in light of their capabilities and emotional intelligence, which leads to an increase in production quality in the university in various fields.

Research Questions

- 1- To what extent do the item responses of the emotional intelligence scale (personal competence) of human resource management at Sohar University in the Sultanate of Oman form a unidimensional construct and local independence according to the graded-response model?
- 2- What are the estimates of the parameters of the items of the emotional intelligence (personal competence) scale for human resources management at Sohar University in the Sultanate of Oman using the graded response model?
- 3- What are the estimates of the individuals' parameters (abilities) corresponding to each potential total score on the scale of emotional intelligence (personal competence) for human resource management at Sohar University in the Sultanate of Oman using the graded-response model?

4- To what extent do the items and individuals match the scale of emotional intelligence (personal competence) for human resource management at Sohar University in the Sultanate of Oman using the graded-response model?

5- Are there statistically significant differences ($\alpha \leq 0.05$) in the level of emotional intelligence (personal competence) among human resource managers at Sohar University in the Sultanate of Oman using the graded response model according to the variables of gender, job, and years of experience?

Review of Related Literature

The Mayer-Salovey Caruso Emotional Intelligence test (MEIS) includes some problems, including its length and poor reliability regarding some of its dimensions, as well as its application procedures, which prompted Caruso-Salovey-Mayer to develop and improve it to present the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT). It consists of (141) items presenting various faces, tasks, and a set of situations asking the individuals to identify their emotional content and how to manage their emotions to solve problems or make decisions, such as determining the type of emotion (happiness – sadness – anger) in the presented situation and the strength of that emotion, which they can express using different images (Brackett & Salovey, 2006).

Goleman Emotional Intelligence Scale

The Emotional Competence Inventory scale was designed by Mickey Boyatz and Goleman. It is used to measure emotional intelligence in the work environment. The scale consists of (110) items that measure (20) competencies distributed over the four dimensions of emotional intelligence contained in the Goleman model (Conte, 2005; Az-Zo'bi, 2018; Zureigat et al., 2023; Az-Zo'bi et al., 2022).

Barrow-Ann Emotional Intelligence Scale

Bar-Ann designed a scale known as the (Bar-On Emotional Quotient Inventory). The scale (EQ-I) consists of (133) items distributed on five basic dimensions and (15) sub-dimensions of emotional intelligence. The items measure personal capabilities that enable some people to obtain emotional happiness more than others, according to the self-evaluation method (Conte, 2005).

Scale of emotional intelligence for human resource management by Nawal Al-Shirawi

Nawal Al-Shirawi designed a scale of emotional intelligence for human resources management according to the Goleman emotional intelligence scale. The scale consists of two dimensions: personal competence and social competence. The personal competence dimension consists of five sub-dimensions: emotional self-awareness, self-control, Orientation of Achievements, positive vision, and adaptability. The social competence dimension consists of five sub-dimensions: sympathy, organizational awareness, coaching and mentoring, teamwork, and inspiring leadership. This research will focus on building a scale of emotional intelligence (the dimension of personal competence) according to the graded-response model (Al-Shirawiyah, 2022). The sub-dimensions of the personal competence dimension are listed below.

Emotional self-awareness is the individual's ability to make decisions in the light of his ability to identify his strengths and weaknesses, as well as how he interacts with situations and people. If an individual's knowledge is related to his capabilities, it will help him to set limits and manage his interactions with others. In addition, knowing oneself well enables a person to communicate more effectively with others (Tolan et al., 2022).

Self-control is the individual's ability to deal with the emotional aspects and his knowledge of how to deal with his feelings and emotions. Self-control is the process of

assuming the individual's responsibility for his life in terms of making decisions that affect himself and his ability to self-manage himself, achieve his goals, and monitor his progress in life. This requires the individual to be flexible, adaptable, and able to adjust his plans in a way that helps him achieve his goals (Tang et al., 2022).

Orientation of Achievements means inspiring an individual to focus on his motives to participate in directed activities towards achieving goals that will lead him to develop behaviors. The achievement orientation dimension is important for determining the standards of targeted behavior and providing appropriate feedback to improve the goal and continuing self-monitoring. People who have an orientation towards achieving their goals will be more successful at work than others (Tashtoush et al., 2022 b; Chonsalasin & Khampirat, 2022).

Positive vision is a leadership competency related to emotional self-management. Positive vision is often found in successful leaders who have a strong ability to see the positive aspects of situations and people and whose attitudes are reflected in their views of others. Positive vision helps leaders to solve conflicts and focus on strategies for success during problems through effective analyses of how they could have dealt with past challenges more effectively (Chupradit et al., 2023; Haricharan, 2022).

Adaptability refers to the group of self-regulating cognitive, emotional, and behavioral abilities. People may use adaptability to deal with current and expected career development tasks, as well as their coping mechanisms in complex, work-related professional and job transitions, where adaptability helps control anxiety through self-confidence in transforming individual actions into positive behaviors when solving professional problems (Wardat et al., 2023; Chupradit et al., 2022; Ravindran et al., 2021).

Dimensions of latent space (Unidimensionality)

Unidimensionality is the existence of one trait or ability that explains the performance of an individual on the scale. This means that all items on the scale measure only one dimension, which enables researchers to interpret each individual's answer due to the ability that the items measure. The unidimensionality assumption requires the presence of one dimension that is dominant and affects people's performance on the scale. Meanwhile, the assumption of unidimensionality is verified by using factor analysis for the responses of the respondents through the Eigenvalues and the ratio of their interpretations of the first dimension so that the difference between the Eigenvalues of the first dimension and other dimensions is relatively large (i.e., the value of the explained variance is from 20% to 80%), the percentage of the variance explained by the second dimension is less than (5%), and the Eigenvalue of the percentage of the variance explained by the second dimension does not exceed or fall below (3) (Rasheed & Mansour, 2018; Wardat et al., 2024; Tashtoush et al., 2023 c; Shirawia et al., 2023; Az-Zo'bi et al., 2024).

Local Independence

Local independence is the probability that a person's correct answer to an item is independent of the outcome of his answer to any other item in the test or scale when adjusting both the estimated value of his ability and the estimated value of the item difficulty. Therefore, local independence indicates that the items of a test or scale are unrelated (Al-Shirawia & Tashtoush, 2023; Kazem, 1988; Allam, 2005; Lord, 1980).

Graded-Response Model (GRM)

This is one of the item response theory models for multiple responses. It aims to locate the distinguishing thresholds on the continuum of the latent trait. The graded-response model is an extension of the two-parameter logarithmic model that assumes that the parameters of difficulty and discrimination affect the respondents' responses. Its

mathematical models were developed to classify responses. The GRM is also known as the ordered categorical responses model because it deals with ordered polymorphic categories that can relate to each composite response item or selected response items in cases when the examinees are supposed to obtain different levels of scores, such as (A, B, C, D, E), or scales based on Likert categories (strongly disagree, strongly agree, neutral, agree, strongly agree), which are subject to a specific order of responses (Tashtoush et al., 2022 a). “Polytomous” means that the responses fall into more than two categories. The nonlinear logistic function of the graded-response model can be represented as follows:

$$P_{ik}(\theta) = \frac{e^{a_i(\theta_j - \beta_{ij})}}{1 + e^{a_i(\theta_j - \beta_{ij})}}, \quad k = m = (1, 2, \dots, m_i)$$

Each item (i) is described by a discrimination parameter or one slope and threshold parameter (β_{ij}). Thresholds between the categories of responses on the item (m_i), where (j) represents the numbers of the difference thresholds, and (k_j) denote the categories of response within each item of the scale.

The number of curves characteristic of an item in the graded response model is equal to the number of differential thresholds for each item. Each curve represents the probability of the individual obtaining a score of (k) or more related to the level of the trait or his ability level (see Figure (1) (Farhat, 2022).

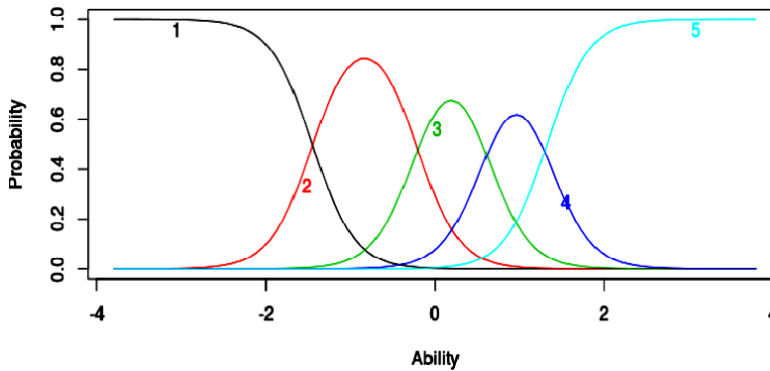


Figure (1): Item Characteristic Curve of the graded-response model

Interpreting difficulty parameter values are presented in Table (1):

Table (1): Interpreting Difficulty Parameter values in the graded-response model

Difficulty value (b)	Interpretation
Difficulty parameter is less than (-1)	Easy
Difficulty parameter between (-1) and (+1)	Medium difficulty
Difficulty parameter greater than (+1)	Difficult

Interpreting discrimination parameter Values are presented in Table (2):

Table (2): Interpreting Discrimination Parameter values in the graded-response model

Discrimination Value	Quality of the Item
Discrimination parameter is less than (1)	Discrimination is weak
Discrimination parameter is greater than (1)	Discrimination is good

Interpretations of the individual ability values are presented in Table (3):

Table 3: Ratings of the abilities' values in the graded-response model

Value	Interpretation
Ability is less than (-2)	very low
Ability is between (-2) and (-1)	low
Ability is between (-1) and (0)	Slightly below average
Ability is between (0) and (+1)	Slightly larger than average
Ability is between (+1) and (+2)	High
Ability is greater than (+2)	Too high

(Baker, 1985)

Research Methodology

The researcher adopted the descriptive approach. Thus, the researcher can design an emotional intelligence scale for human resource management at Sohar University using the graded-response model and apply it to academic and non-academic employees at Sohar University.

Research population and sample

The study population consists of all Sohar University employees, and the research sample consisted of a stratified random sample of (396) male and female employees Sohar University employees in the Sultanate of Oman for the academic year (2020–2021).

Research instrument

The instrument of the current research is an emotional intelligence scale for human resource management. The scale was prepared based on theoretical readings, scientific references, and previous studies (e.g., Ranasinghe et al., 2017; Faltas, 2017; Dhani et al., 2016) to identify the main dimensions of the scale.

Research Question 1:

To what extent are unidimensionality and local independence assumptions achieved in the graded-response model of the emotional intelligence scale (personal competence) of human resource management at Sohar University in the Sultanate of Oman?

The component of the personal competency dimension in the emotional intelligence scale is unidimensionality. This component was chosen because the ratio between the Eigenvalues of the first factor and the second factor for each component of the personal competency dimension in the emotional intelligence scale is greater than (2) according to the Lord test and the proportion of the explained variance on the first factor is not less than the ratio of the cumulative variance exponent of the extracted factors for (20%) for each component separately according to Reckase test (Farhat, 2022).

Table (4) shows the Eigenvalues and the explaining variance of some factors of the personal competency dimension in the emotional intelligence scale. Figure (2) shows the scree plot of the components of the emotional intelligence scale (personal competence). The exploratory factor analysis revealed that the emotional intelligence scale (personal competence) of human resources management, which consists of 49 items, measures one trait after six items were deleted from the (emotional self-awareness) dimension, one item was deleted from the (Self-Control) dimension, and three items were deleted from the (Adaptability) dimension due to their weak associations with personal competence. The

Eigenvalues after deleting items were much greater than the rest of the factors, with a high rate of explaining variance (33.56%).

Table (4): Statistical indicators to verify the unidimensionality assumption of the emotional intelligence scale (personal competence)

Extraction Sums of Squared Loadings			
Component	Total Eigenvalue	% of Variance	Cumulative %
1	10.40	33.56	33.56
2	1.72	5.53	39.09
3	1.61	5.19	44.28
4	1.42	4.58	48.86
5	1.20	3.87	52.73

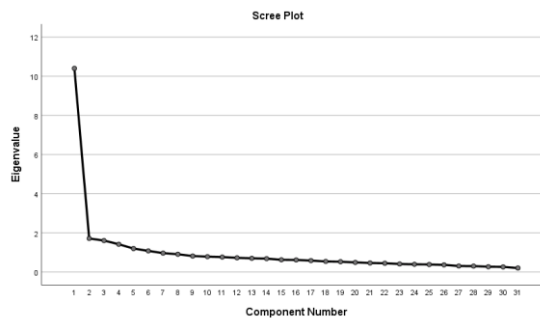


Figure 2: Scree plot of the components of the emotional intelligence scale (personal competence)

Table (5) summarizes the examination of the correlation coefficients matrix for the residual between the pairs of items. The results of the descriptive statistics of the correlation coefficients matrix for the indicator (Q3) indicate that the items of (personal competence) in the emotional intelligence scale for human resource management have positional independence because the mean of the correlation coefficients matrix was small. Moreover, the values of the correlation coefficients matrix for the indicator (Q3) ranged between (-0.251) and (0.469), with a mean of (0.074). This is close to 0, and the standard deviation is (0.089) (Az-Zo'bi, 2018; Zureigat et al., 2023; Az-Zo'bi et al., 2022). This result is supported by a study by Al-Dhafri and Sheidi (2019) that aimed to verify the psychometric properties of the emotional intelligence scale of (Alsmadoni) using the item response theory.

The results verify the assumptions of unidimensionality and local independence and show that the data match the items and individuals well. This result is supported by a study by Khalaf (2019) that aimed to extract the psychometric properties to test the mental ability scale prepared by Edgar and Showick for the preparatory class using the three-parameter model. The results show that the assumption of unidimensionality was achieved. This result is also supported by a study by Noodle and Zare (2020) that aimed to identify the extent of the assumptions of the item response theory using the two-parameter model. The results show that the assumptions of the item response theory were achieved.

Table 5: Descriptive statistics of the correlation coefficients matrix for the indicator (Q3) to verify the assumption of the local independence of the emotional intelligence scale (personal competence)

	Minimum	Maximum	Mean	Standard deviation
Pearson correlation coefficient	-0.251	0.469	0.074	0.089

Research Question 2

What are the estimates of the item parameters of the emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman using the graded response model?

Table (6) shows that the majority of items for (emotional self-awareness) were easy, as their difficulty parameters were less than (-1). Two items, (a3) and (a29), were medium difficulty, as the values of the difficulty parameters ranged between (-1) and (1). This means that (emotional self-awareness) measures easy and medium emotional self-awareness abilities. The results also indicate that all items can distinguish between individuals, as the values of the discrimination parameters are greater than (1). This indicates the ability of the emotional self-awareness items to distinguish between employees at Sohar University with medium emotional self-awareness and employees with low emotional self-awareness. Figure (3) shows the item characteristics curve of the item (a4) of emotional self-awareness.

Table (6): Estimates of items of the emotional self-awareness dimension

Code	Item	Threshold 1	Threshold 2	Threshold 3	Threshold 4	Difficulty parameter	Description	Discrimination parameter	Description
a4	I have an awareness of my feelings.	1.19	-4.13	-1.97	-0.48	-1.35	E	2.00	G D
a6	I meditate on myself and my feelings in order to raise them.	0.82	-4.50	-1.78	0.06	-1.35	E	3.09	G D
a7	I make some sacrifices for others.	0.94	-3.48	-1.68	-0.12	-1.09	E	2.48	G D
a16	I have the ability to identify people who are causing me sadness.	1.00	-3.27	-1.72	-0.21	-1.05	E	2.39	G D
a22	I like helping others in order to change myself.	0.56	-5.44	-2.76	-0.33	-1.99	E	3.93	G D
a26	I feel satisfied with my performance.	1.10	-3.02	-1.84	-0.37	-1.03	E	1.99	G D
a28	I am aware of my own feelings and emotions.	1.12	-3.25	-1.62	-0.40	-1.04	E	1.86	G D
a29	I can evaluate myself accurately and honestly.	1.44	-2.88	-1.46	-0.35	-0.82	E	1.83	G D
a30	Everyone at work treats me with respect.	1.18	-3.44	-1.87	-0.50	-1.16	E	1.58	G D

a31	Others are proud to be working with me.	0.92	-3.88	-2.19	0.00	-1.29	E	2.50	G D
a32	I avoid conflicts with others.	1.02	-3.32	-1.60	0.33	-1.06	E	1.96	G D

M D: Medium Difficulty. E: Easy. G D: Good Discrimination

The item characteristics curve (I have an awareness of my feelings) shows that Sohar University employees who responded that they strongly agree with this statement have a high ability level. Meanwhile, Sohar University employees who responded that they disagree with the statement have a very low level of ability.

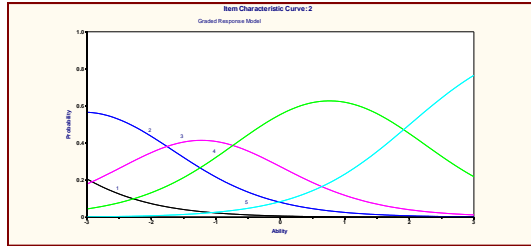


Figure 3: Item Characteristics Curve of the item (a4) (I have an awareness of my feelings)

Table (7) shows that the majority of items for (self-control) were of medium difficulty, as the values of difficulty parameters ranged between (-1) and (1). However, items (b1), (b5), and (b7) were easy, as the difficulty parameters were less than (-1), meaning that the (self-control) dimension measures easy and medium abilities in self-control. All items of self-control can be distinguished between individuals. The items can distinguish between employees at Sohar University who have a medium ability of self-control and employees who have a low ability of self-control. Figure (4) shows the item characteristics curve of item (b2) of self-control.

Table (7): Estimates of item parameters of the self-control dimension

Code	Item	Threshold 1	Threshold 2	Threshold 3	Threshold 4	Difficulty parameter	Description	Discrimination parameter	Description
b1	I remain calm when I am under stress.	0.55	-5.96	-2.85	-1.07	-2.33	E	3.82	G D
b2	I am patient even if I don't achieve good and fast results.	1.09	-3.10	-1.48	-0.09	-0.89	M D	2.86	G D
b3	I control myself after anything troublesome.	1.12	-2.98	-1.66	-0.17	-0.92	M D	2.91	G D
b4	I am aware of my strengths and weaknesses.	1.44	-3.02	-1.54	-0.47	-0.90	M D	1.89	G D
b5	I can defeat feelings of guilt about my mistakes in the past.	0.97	-3.86	-1.72	-0.04	-1.16	E	2.61	G D
b7	I stay natural and calm towards anyone till I get to know him/her well.	1.15	-2.81	-1.78	-0.55	-1.00	E	2.01	G D

b8	I am committed to the deadlines set in the work environment.	1.48	-2.31	-1.49	-0.24	-0.64	M D	1.57	G D
b9	I show strength and self-confidence in every situation I face.	1.59	-2.29	-1.31	-0.28	-0.57	M D	1.67	G D

M D: Medium Difficulty. E: Easy. G D: Good Discrimination

The item characteristics curve (I control myself after anything troublesome) shows that Sohar University employees who responded that they strongly agree with this statement have a high ability. In contrast, Sohar University employees who respond that they disagree with this statement have a low ability.

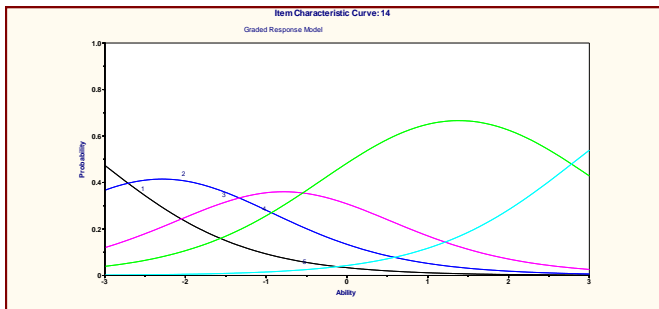


Figure 4: Item Characteristics Curve (I control myself after anything troublesome)

Table (8) shows that all items for (Orientation of Achievements) were medium difficulty, as the values of difficulty parameters ranged between (-1) and (1). The results also indicate that all items can distinguish between individuals, as the values of the discrimination parameters were greater than (1). This indicates that the items of the Orientation of Achievements dimension can distinguish employees at Sohar University who have a medium ability in Orienting achievements. Figure (5) shows the item characteristics curve of item (c4) of the achievement orientation dimension.

Table (8): Estimates of item parameters of the achievement orientation dimension

Code	Item	Threshold 1	Threshold 2	Threshold 3	Threshold 4	Difficulty parameter	Description	Discrimination parameter	Description
c1	I can make decisions regarding my work.	1.57	-2.81	-1.50	-0.69	-0.86	M D	1.52	G D
c2	I have the ability to spot my mistakes and find ways to correct them.	1.66	-2.57	-1.38	-0.25	-0.64	M D	1.87	G D
c3	I try to innovate in facing life's challenges.	1.16	-3.17	-1.63	-0.06	-0.92	M D	2.39	G D
c4	I can achieve success under work pressure.	1.45	-3.11	-1.64	-0.13	-0.86	M D	1.81	G D
c5	I work sincerely to accomplish my work without supervision.	2.07	-1.84	-1.16	-0.17	-0.27	M D	1.35	G D
c6	I have the ability to finish the work I start.	1.99	-2.30	-1.30	-0.45	-0.52	M D	1.21	G D

c7	I complete my work and tasks without delay.	1.63	-2.19	-1.27	-0.20	-0.51	M D	1.44	G D
c8	I persist in mastering my work without errors.	1.89	-2.05	-1.21	-0.15	-0.38	M D	1.48	G D
c9	I always seek to participate in job performance development.	1.91	-1.95	-1.19	-0.26	-0.37	M D	1.49	G D
c10	I am able to direct myself immensely.	1.97	-1.93	-1.27	-0.30	-0.38	M D	1.48	G D

M D: Medium Difficulty. E: Easy. G D: Good Discrimination

The item characteristics curve (I can achieve success under work pressure) shows that Sohar University employees who responded that they strongly agree with this statement have high ability. In contrast, Sohar University employees who responded that they disagree with this statement have low ability.

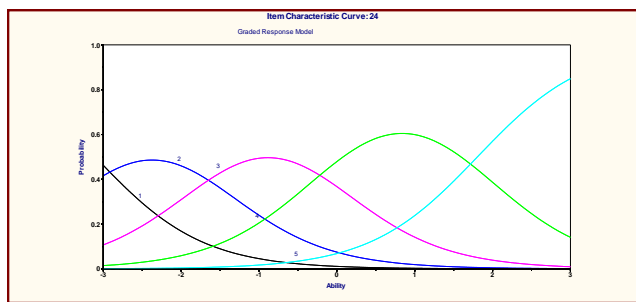


Figure (5): Item Characteristics Curve (I can achieve success under work pressure).

Table (9) shows that some items for (positive vision) were of medium difficulty, as the values of difficulty parameters ranged between (-1) and (1), and items (d1), (d3), (d4) and (d6) were easy, as the difficulty parameters were less than (-1). The (positive vision) dimension measures easy and medium abilities in positive vision. The results also indicate that all items can distinguish between individuals, as the values of the discrimination parameters are greater than (1). Figure (6) shows the item characteristics curve of item (d3) in the dimension of positive vision.

Table (9): Estimates of item parameters of the Positive Vision dimension

Code	Item	Threshold 1	Threshold 2	Threshold 3	Threshold 4	Difficulty parameter	Description	Discrimination parameter	Description
d1	I have hope and optimism in my life.	1.49	-2.94	-2.20	-1.05	-1.17	E	1.15	G D
d2	I realize my abilities and tendencies precisely.	1.94	-2.09	-1.42	-0.34	-0.48	M D	1.85	G D
d3	I have the ability to present myself in a way that creates a good impression on my colleagues.	1.24	-3.26	-1.90	-0.63	-1.14	E	1.86	G D
d4	I can easily describe my feelings to my colleagues at work.	1.07	-4.09	-1.78	-0.12	-1.23	E	2.54	G D
d5	I can accomplish work tasks with	1.77	-1.96	-1.15	-0.21	-0.39	M D	1.70	G D

	activeness and focus.								
d6	I can put my emotions aside till I get my work done.	1.07	-4.08	-1.45	-0.11	-1.14	E	2.26	G D
d7	I have the ability to define any problem that worries me.	1.65	-2.42	-1.25	-0.18	-0.55	M D	1.87	G D
d8	I get fully engaged in work when I am qualified for it.	2.21	-1.76	-1.10	-0.14	-0.20	M D	1.18	G D
d9	I keep track of the consequences of all the errors that occur in the work environment.	1.45	-2.13	-1.13	0.01	-0.45	M D	2.22	G D
d10	I speak clearly about my vision for improvement in the workplace.	1.87	-1.59	-0.84	0.03	-0.13	M D	1.66	G D
d11	I avoid mistakes that I have already committed before.	1.89	-1.92	-1.14	-0.36	-0.38	M D	1.29	G D
d12	I work to benefit from others' mistakes.	1.30	-2.23	-1.19	-0.15	-0.57	M D	1.90	G D

M D: Medium Difficulty. E: Easy. G D: Good Discrimination

The item characteristics curve (I have the ability to present myself in a way that creates a good impression on my colleagues) shows that Sohar University employees who responded that they strongly agree with this statement have a high ability in positive vision. In contrast, Sohar University employees who responded that they disagree with this statement have a low ability in positive vision.

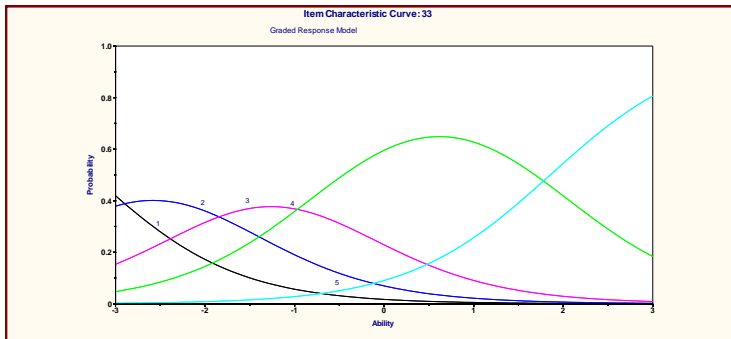


Figure (6): Item Characteristics Curve (I have the ability to present myself in a way that creates a good impression on my colleagues).

Table (10) shows that the majority of the items for (Adaptability) were all of medium difficulty, as the difficulty parameters ranged between (-1) and (1). The exception was item (e10), which was easy, as the difficulty parameter was less than (-1). This means that the dimension (Adaptability) measures a medium ability of Adaptability. The results also indicate that all items can distinguish between individuals, as the values of the discrimination parameters are greater than (1). This indicates the ability of the items of the Adaptability dimension to distinguish between employees at Sohar University who have a medium ability and those who have a low ability in Adaptability. Figure (7) shows the item characteristics curve (e11) in the adaptability dimension.

Table (10): Estimates of item parameters of the Adaptability dimension

Code	Item	Threshold 1	Threshold 2	Threshold 3	Threshold 4	Difficulty parameter	Description	Discrimination parameter	Description
e1	My sincere feelings help me succeed.	1.57	-2.44	-1.47	-0.55	-0.72	M D	1.31	G D
e2	My feelings guide me to make important decisions in my life.	1.75	-2.40	-1.06	-0.02	-0.43	M D	1.79	G D
e3	I can easily identify my emotions.	1.70	-2.09	-1.21	-0.13	-0.43	M D	1.84	G D
e4	I try to control my negative feelings and reinforce my positive ones.	1.39	-2.30	-1.50	-0.31	-0.68	M D	1.74	G D
e8	I can find many solutions to someone else's problems.	1.06	-2.76	-1.48	-0.18	-0.84	M D	2.39	G D
e9	I do what people expect me to do, even if I am different from them.	0.86	-3.11	-1.21	0.20	-0.82	M D	3.21	G D
e10	I can send nonverbal messages to my work colleagues.	0.87	-3.11	-1.91	0.16	-1.00	Easy	3.40	G D
e11	I am capable of adapting to changes.	1.55	-2.55	-1.38	-0.34	-0.68	M D	1.66	G D

M D: Medium Difficulty. E: Easy. G D: Good Discrimination

The item characteristics curve (I am capable of adapting to changes) shows that employees at Sohar University who responded that they strongly agree with this statement have a high ability in Adaptability. In contrast, employees who responded that they disagree with this statement have a low ability in Adaptability.

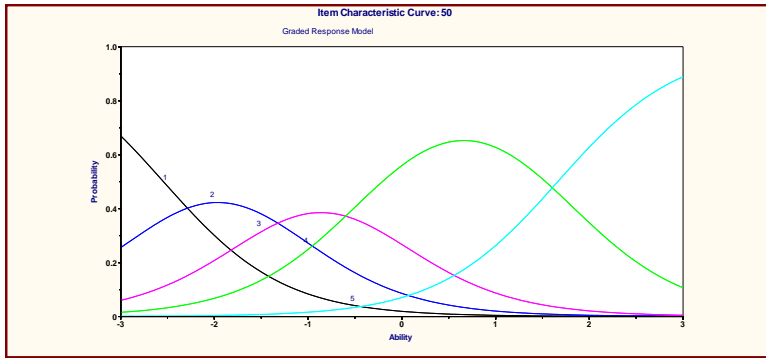


Figure 7: Item Characteristics Curve (I am capable of adapting to changes).

The results related to Research Question 2 are supported by a study by Khalaf (2019) that aimed to extract the psychometric characteristics of the mental ability test prepared by Edgar and Showick for middle school students using the three-parameter model. The results revealed that the items' difficulty ranged from (-2.5) to (2.5), and the items' discrimination ranged from (0.5 to 2.5). Meanwhile, the items guessing were less than (0.25). The results are also supported by a study by Sethar et al. (2022) that aimed to assess the scale of entrepreneurial ecosystems and perceptions about the areas of the entrepreneurial ecosystem using the IRT-GRM graded response model. The item characteristics curves showed that responses to all the items were arranged correctly and the items' difficulty and discrimination were good.

Research Question 3

How do the estimates of the individuals' parameters (abilities) correspond to each potential total score on the emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman using the graded-response model?

The descriptive statistics in Table (11) show that the abilities of employees at Sohar University on the emotional intelligence scale (personal competence) are slightly greater than average, as the mean was equal to (0.081). This means the emotional intelligence scale (personal competence) is suitable for estimating the abilities of individuals with better-than-average abilities. The normal distribution curve (see Figure (8)) is very close to normal, as the value of the skewness coefficient was (0.92).

Table (11): Descriptive statistics of abilities estimates of the emotional intelligence scale (personal competence) of human resource management

Descriptive statistics	Value
N	396
Mean	0.71
Median	0.66
Mode	0.00 ,1.17 ,1.43 ,1.47 ,1.47
standard deviation	0.62
Skewness	0.92
Minimum	-1.1
Maximum	3.87

The results in Table (12) indicate the distribution of abilities per the emotional intelligence scale (personal competence) of human resource management. The results show that the employees at Sohar University do not have very low abilities in personal

competence. Less than 1% of employees at Sohar University have low abilities in personal competence; only one individual exhibited a low ability in personal competence. The results also show that (7.58%) of the employees at Sohar University have abilities slightly below average, as (30) individuals exhibited slightly below average abilities in personal competence. The results indicate that (64.9%) of the employees at Sohar University have slightly above-average abilities. The results indicate that the items on the scale measured (257) individuals have ability slightly above the average, as the results indicate that the items on the scale measured (96) individuals have high ability in personal competence. The results show that (3.03%) of the employees at Sohar University have very high abilities, as the items of the scale revealed that (12) have a very high ability in personal competence.

Table (12): Distribution of ability estimates of the emotional intelligence scale (personal competence) of human resource management

Ability	Frequency	Percent	Interpretation
Ability < (-2)	0	0.00	Very low
Ability between (-2) and (-1)	1	0.25	Low
Ability between (-1) and (0)	30	7.58	Slightly below the average
Ability between (0) and (1)	257	64.90	Slightly above the average
Ability between (1) and (2)	96	24.24	High
Ability > (2)	12	3.03	Very High
Total	396	100	

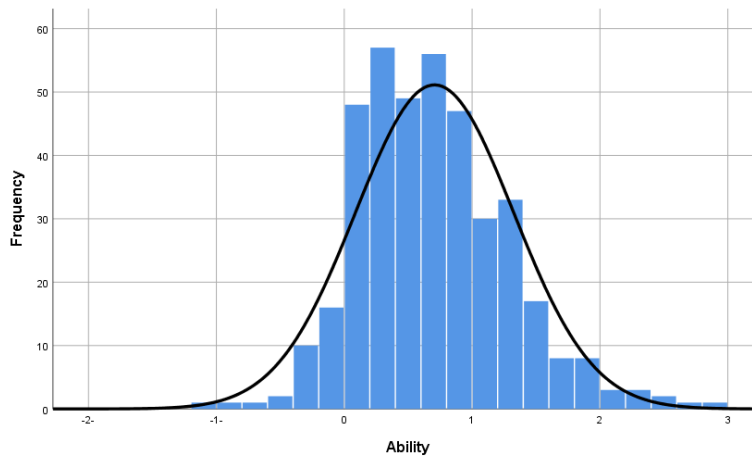


Figure (9): The normal distribution curve of abilities estimates on the emotional intelligence scale (personal competence) of human resource management

The result of Research Question 3 is supported by a study by Ibrahim and Al-Hashemi (2022) that aimed to identify the impact of emotional intelligence on the performance of employees at the Algeria Bank. The results revealed high levels of emotional intelligence among the sample.

Research Question 4

To what extent do items and individuals match the emotional intelligence scale (personal competence) of human resource management at Sohar University in the Sultanate of Oman, corresponding to the graded-response model?

The standard residuals index was used to verify the item fit of the emotional intelligence scale (personal competence) of the Human Resources Department at Sohar University

using the graded-response model. The graded-response model is fit for 38 items, as the Chi-square is greater than 0.05. Meanwhile, the graded-response model is unfit for (12) items, as the Chi-square is greater than 0.05.

Table (13): Standard residuals index and Chi-square values of the emotional intelligence scale (personal competence) of the Human Resources Department at Sohar University according to the graded-response model

Item	Standard residuals index	χ^2	Fit*	Item	Standard residuals index	χ^2	Fit
a3	0.15	0.70	Fit*	c6	0.16	0.69	Fit*
a4	3.43	0.06	Fit*	c7	0.21	0.65	Fit*
a6	22.94	0.00	Un-Fit	c8	0.18	0.67	Fit*
a7	18.24	0.00	Un-Fit	c9	0.39	0.53	Fit*
a16	12.34	0.00	Un-Fit	c10	0.36	0.55	Fit*
a22	4.287	0.038	Un-Fit	d1	3.70	0.05	Fit*
a26	2.49	0.11	Fit*	d2	0.22	0.64	Fit*
a28	1.28	0.26	Fit*	d3	3.47	0.06	Fit*
a29	1.15	0.28	Fit*	d4	1.08	0.30	Fit*
a30	12.79	0.00	Un-Fit	d5	0.13	0.72	Fit*
a31	3.05	0.08	Fit*	d6	1.37	0.24	Fit*
a32	4.94	0.03	Un-Fit	d7	0.18	0.67	Fit*
b1	55.03	0.00	Un-Fit	d8	0.14	0.71	Fit*
b2	41.25	0.00	Un-Fit	d9	0.97	0.32	Fit*
b3	2.74	0.10	Fit*	d10	0.37	0.54	Fit*
b4	14.33	0.00	Un-Fit	d11	0.33	0.57	Fit*
b5	3.22	0.07	Fit*	d12	0.72	0.40	Fit*
b7	0.43	0.51	Fit*	e1	2.41	0.12	Fit*
b8	0.62	0.43	Fit*	e2	30.21	0.00	Un-Fit
b9	0.72	0.40	Fit*	e3	28.83	0.00	Un-Fit
c1	0.45	0.50	Fit*	e4	0.52	0.47	Fit*
c2	1.01	0.32	Fit*	e8	3.20	0.07	Fit*
c3	0.19	0.66	Fit*	e9	0.32	0.57	Fit*
c4	0.17	0.68	Fit*	e10	25.75	0.00	Un-Fit
c5	0.21	0.64	Fit*	e11	3.27	0.07	Fit*
				personal competence	1.19	0.28	Fit*

*chi-square > $\alpha = 0.05$

The residual square indicator was used to verify the person's fit of the emotional intelligence scale (personal competence) of the Human Resources Department at Sohar

University using the graded-response model. The results in Table (14) show that the responses of 93.94% of the individuals fit the graded-response model (Pearson fit). This means that the employees' practices of emotional intelligence (personal competency) of human resource management are normal.

Although emotional intelligence (personal competence) for human resources management is designed to measure various levels of personal competence, the information function curve (Fig. 13) of the emotional intelligence scale (personal competence) provides more information about employees with medium (slightly above average) and high abilities.

Table (14): Person fit of the emotional intelligence scale (personal competence) of the Human Resources Department at Sohar University using the graded-response model

Response fit	Frequency	Percent
The individuals' responses fit the graded-response model	372	93.94
The individuals' responses do not fit the graded-response model	24	6.06
Total	396	100

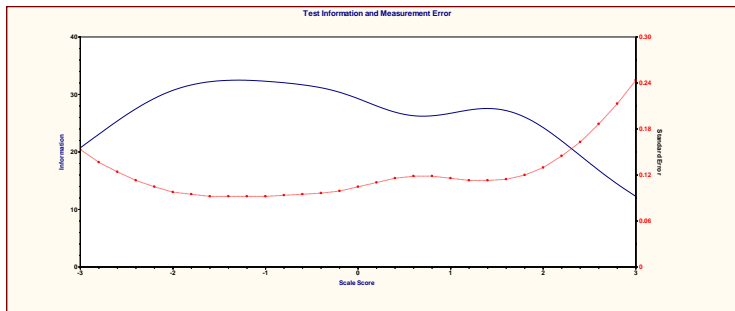


Figure (10): Information function and standard error of measurements of the emotional intelligence scale (personal competence) of human resources management at Sohar University

The results related to Research Question 4 are supported by the study of Aldhafri and Shindi (2019), who concluded that (4) students did not fit the data and that only one of (25) items did not fit the data. The results are also supported by the study of Noodle and Zaree (2020), who aimed to check the estimated parameters of the test items (difficulty and discrimination) according to the two-parameters model. The study also aimed to check the person fit of the divergent associations test, and it was concluded that (32) students and 13 of (59) items did not fit the data. The results also support the study of Farahat (2021), who aimed to construct a scale of critical reflection using the partial credit and graded-response models. The results revealed that (20) items did not fit the partial credit model, and (6) items did not fit the graded-response model. Furthermore, it was observed that the graded-response model is more suitable for the data than the partial credit model in light of the criterion of the number of identical and non-identical items (Tashtoush, 2008). Moreover, the indicator -2 Log Likelihood gave higher marginal reliability coefficients and a better information function for low and medium ability levels than the partial credit model. Meanwhile, the partial credit model gave a better information function for the low ability level.

Research Question 5

Are there statistically significant differences ($\alpha \leq 0.05$) in the emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman using the graded response model according to gender, job, and years of experience?

The Mann-Whitney U test was used for two independent samples to detect differences in the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to (gender). This was done because the assumption of normality was not verified, as Table (14) shows that the results of the Kolmogorov-Smirnova test are statistically significant ($0.001, 0.028 < 0.05$). This indicates that the distribution of the emotional intelligence scale (personal competence) is not normal in each group of males and females.

Table (14): Results of the Kolmogorov-Smirnova test conducted to verify the normality assumption according to gender

Gender	Value	d f	P-value
Male	0.083	219	0.001
Female	0.072	177	0.028

The results of the Mann-Whitney U test for two independent samples in Table (15) show that there were no statistically significant differences in the estimates of the individuals' abilities of emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman according to gender. This is indicated by the fact that the Mann-Whitney U test value and the value of (z) were not statistically significant ($P\text{-value} = 0.44 > 0.05$). This result is supported by the study of Chrome and Harsh (2020), who aimed to detect differences in emotional intelligence among the study sample according to gender. The results showed no differences in emotional intelligence among the research sample according to gender.

Table (15): Results of the Mann-Whitney U test for two independent samples conducted to detect differences in the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to gender

Gender	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	P-value
Male	219	194.5	42,596.5	18,506.5	-0.773	0.44
Female	177	203.44	36,009.5			

The Mann-Whitney U test was used for two independent samples to detect differences in the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to (job). This was done because the assumption of normality was not verified, as Table (16) shows that the results of the Kolmogorov-Smirnova test are statistically significant ($0.00 < 0.05$). This indicates that the distribution of the emotional intelligence scale (personal competence) is not normal in the group of non-academics.

Table (16): Results of the Kolmogorov-Smirnova test conducted to verify normality assumption according to job

Job	Value	d f	P-value
Non-academic	0.087	254	0.00
Academic	0.059	142	0.200

The results of the Mann-Whitney U test for two independent samples in Table (17) show statistically significant differences in the estimates of individuals' abilities of emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman according to the job. The results are in favor of academic employees, as the Mann-Whitney U test and (z) values were statistically significant ($P\text{-value} = 0.00 < 0.05$). This means that per the emotional intelligence scale

(personal competence) of human resources management, academic employees at Sohar University have more abilities than non-academics. This can be attributed to the skills and educational level of academic employees, which give them higher levels of emotional intelligence. Through their contact and interactions with students with different personalities in different environments, academics require skills related to emotional intelligence (personal competence) to interact with students correctly. Meanwhile, non-academic employees may deal with students in limited administrative aspects only and, therefore; do not require as high a level of emotional intelligence as academic employees.

Table (17): Results of the Mann-Whitney U test for two independent samples conducted to detect differences in the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to employees' jobs

Job	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	P-value
Non-academic	254	178.08	45,231.5	12,846.5	-4.75	*0.00
Academic	142	235.03	33,374.5			

*Correlation is significant at the 0.05 level

The Kruskal-Wallis test was used in order to detect differences in the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to years of experience (less than six years, six years to 10 years, more than 10 years). This test was run because the assumption of normality was not verified, as Table (18) shows that the results of the Kolmogorov-Smirnova test are statistically significant ($0.001, 0.046 < 0.05$). This indicates that the distribution of the emotional intelligence scale (personal competence) is not normal in the group of employees with less than six years and 6–10 years of experience.

Table (18): Results of the Kolmogorov-Smirnova test conducted to verify the normality assumption according to years of experience

years of experience	Value	d f	P-value
(1–5) years	0.124	92	0.001
(10–6) years	0.08	126	0.046
11 years and above	0.06	178	0.200

The Kruskal-Wallis test results in Table (19) reveal statistically significant differences in estimates of individuals' abilities per the emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman according to years of experience (1–5) years, (6–10) years, (11 years and above). This is indicated by the statistically significant chi-square value ($P\text{-value} = 0.003 < 0.05$).

Table (19): Results of the Kruskal-Wallis test conducted to detect differences in the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to years of experience

Years of experience	N	Mean Rank	chi-square	df	P-value
(1–5) years	92	178.71			
(10–6) years	126	182.74	11.35	2	*0.003
11 years and above	178	219.88			

The results of the Mann-Whitney U test for two independent samples in Table (20) reveal that the differences between employees with (6–10) years and (11 years and above) of experience are statistically significant in favor of the (11 years and above) group. Specifically, the average value of ranks for employees with (11 years and above) of experience (164.32) is higher than that of employees with (6–10) years of experience (135.8).

Table (20): Results of the Mann-Whitney U test for two independent samples conducted to detect differences in the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to years of experience ((6–10) years and (11 years and above)).

Years of experience	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	P-value
(6–10) years	126	135.8	17,110.5	9,109.5	-2.79	*0.005
11 years and above	178	164.32	29,249.5			

The results of the Mann-Whitney U test in Table (21) for two independent samples reveal statistically significant differences between employees with (1–5) years and (11 years and above) of experience in favor of the latter group. Specifically, the average value of ranks for employees with (11 years and above) of experience (145.06) is higher than that of employees with (1–5) years of experience (117). This result is not supported by the study of Chrome and Horsh (2020), who aimed to detect differences in the level of emotional intelligence among their study sample according to professional seniority. Their results showed no differences in the level of emotional intelligence among the research sample according to professional seniority.

Table (21): Results of the Mann-Whitney U test for two independent samples conducted to detect differences in the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman according to years of experience ((1–5) years and (11 years and above)).

Years of experience	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	P-value
(1–5) years	92	117	10,764	6,486	-2.80	*0.005
11 years and above	178	145.06	25,821			

Recommendations

- Because the abilities of Sohar University employees according to the emotional intelligence scale (personal competence) were slightly higher than the average, the study recommends increasing the level of emotional intelligence among employees.
- Providing Sohar University employees training workshops in emotional self-awareness, self-control, achievement orientation, positive vision, and Adaptability. .
- Urging employees at Sohar University to use the skills of the emotional intelligence skills (personal competence) through daily activities in work environment..

Conclusion

The current study used a graded-response model to design the emotional intelligence scale (personal competence) for human resource management at Sohar University in the Sultanate of Oman. The assumptions of unidimensionality and local independence were

confirmed in the emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman. The research also aimed to estimate the item parameters of the emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman using the graded-response model. It also aimed to estimate individuals' parameters (abilities) corresponding to each potential total score on the emotional intelligence scale for human resources management at Sohar University in the Sultanate of Oman using the graded response model. The research also aimed to identify the extent of item-fit and person fit of the emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman using the graded response model. The research also aimed to detect any significant differences at ($\alpha \leq 0.05$) in the emotional intelligence scale (personal competence) of human resources management at Sohar University in the Sultanate of Oman using the graded-response model according to employees' gender, job, and years of experience. The descriptive approach was adopted, and data were collected by applying the scale to a stratified random sample of 396 Sohar University employees.

The researcher used the Multilog program for statistical analysis of the graded-response model, which is an extension of the two-parameter model, in which the items differ in difficulty and discrimination parameters. The present results support the assumptions of the graded-response model (i.e., one-dimensional and positional independence). The results also indicate that the item parameters were of easy and medium difficulty, and the arithmetic mean ability was slightly higher than the average. The results show that 38 items fit the graded-response model, while 12 items did not. The results also show that the model did not fit 24 individuals in the research sample. The results indicate non-significant differences in employees' abilities in personal competence according to gender. The results also reveal statistically significant differences in employees' abilities in personal competence according to their jobs in favor of academic employees. The results also show statistically significant differences in employees' abilities in personal competence according to their years of experience in favor of experienced workers (11 years and above).

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