EXOUSIA AI ::
REDEFINING EMPLOYEE SUCCESS ANALYTICS

Creating successful employees and teams is a challenging task for any organization. As a rule, the measurement of employee performance, knowledge and skills is carried out using performance assessments and knowledge tests. However, assessment and test data are often subjected to inadequate analysis, which leads to incorrect conclusions about the professional ability of employees, and therefore creates misleading recommendations on how to improve employee performance and knowledge.

Using innovative statistical and machine-learning methods and proprietary algorithms, EXOUSIA analyzes performance assessment and test data and provides accurate and reliable information about each employee's professional knowledge.

EXOUSIA creates quantitative Success Profiles for each job or role. These profiles help to identify gaps in employee knowledge and skills and suggest ways to address them, thus helping employees to become successful in their profession and assisting organizations in building and maintaining high performing teams.

This paper provides an overview of EXOUSIA's capabilities and presents a real-life case study.

Contents

Introduction

A Success Profile for identifying high-performing individuals – either within existing teams of an organization or among potential hires – outlines two critical requirements for individuals to be successful in their jobs and to be aligned with the organization's future needs:

- Capability (technical knowledge)
- Accountability (responsibility, problem-solving, etc.)

Success Profile development process comprises from psychometric and technical knowledge assessments. The analysis of these assessments results in a Success Profile that describes the differentiating technical knowledge and skills, drivers, and traits of successful performers regarding a specific job role. Unfortunately, psychometric and technical knowledge assessments are often inappropriately analyzed, which leads to wrongly assessed attributes of Success Profiles, incorrect inferences about strengths, gaps, and opportunities, and misleading recommendations on how to close these gaps.

Success Profile development process comprises from psychometric and technical knowledge assessments. The analysis of these assessments results in a Success Profile that describes the differentiating technical knowledge and skills, drivers, and traits of successful performers regarding a specific job role. Unfortunately, psychometric and technical knowledge assessments are often inappropriately analyzed, which leads to wrongly assessed attributes of Success Profiles, incorrect inferences about strengths, gaps, and opportunities,

and misleading recommendations on how to close these gaps.

Success Profile describes the differentiating knowledge and skills of successful performers of a specific job.

Analysis of performance assessments and knowledge tests of individuals (employees) is instrumental in developing Success profile. Unfortunately, knowledge tests and performance assessments are often incorrectly analyzed, leading to wrong inferences about employee ability regarding a particular role.

The reasons for incorrect analysis often originate from the misuse of raw scores of assessments and tests. When employees are assessed through a series of tests, it is tempting to immediately manipulate raw test data with simple mathematics. However, researchers agree that using raw scores to evaluate and compare employees' achievements is erroneous[1].

The Difficulty of Items (Questions)

Do all items (questions) in a performance assessment require the same amount of employee effort to respond to them? The answer is "No," as it is highly unlikely that all items have similar difficulty. Therefore, the use of the sum or average of test raw scores will be misleading in the evaluation of the employee fit for the job. In some cases, items are assigned points (weights) reflecting the different difficulty of the items. However, the magnitude of difficulty of the items is not an absolute value, and it depends on the ability of employees taking the test. Measuring employees' ability while disregarding actual items' difficulty creates misleading results. To

---

[1] Wright BD, Stone MH. Best Test Design. Chicago: MESA Press; 1979

address this problem, EXOUSIA uses the Polytomous Rasch Measurement Model, which correctly analyzes assessment raw scores by simultaneously estimating the difficulty of items and employees' ability.

Rating Scales

Performance assessments commonly use rating scales, such as Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The responses are usually coded as 4, 3, 2, and 1 (e.g., SA is a 4, A is a 3), and such data is called "ordinal" data (see Figure 1). It can be very appealing to conduct mathematical operations with those numbers. However, a significant problem with performing mathematical operations with numerically coded rating-scale answers is the assumption that the interval from a Strongly Agree to Agree is the same as from Agree to Disagree.

Item 1	SA		A			D	SD
Item 2	SA	A			D		SD
Item 3	SA		A	D			SD

Figure 1. Ordinal Rating Scale

In addition to differences in intervals between adjacent rating scores, the pattern of the intervals usually differs from item to item. Moreover, not all items should be assumed to be equally agreeable. For example, a 3 (Agree) response to item 1 should not be taken to indicate the same level of agreement as answering a 3 (Agree) to item 2.

EXOUSIA addresses the problem with analyzing rating scales by applying the Polytomous Rasch Measurement Model. Specifically, it uses raw test scores and expresses the employees' performance on a linear scale that accounts for the unequal difficulties across all test items to assess the true employee ability.

Foundational Items

In any performance assessment and knowledge test, we cannot assume that the knowledge required to answer one item is independent of the knowledge needed to answer other items.

Let's say one question on the exam tests knowledge of a specific technique required for the job, and two other questions test the usage of that technique to solve problems. The deficiency of knowledge in the first question leads to failure in the two different questions. Conversely, sufficient knowledge of the first question enhances the chances of success in the two related questions – thus, the first question is considered foundational. Such relationships among test items (questions) are not always straightforward and obvious; they may include dependencies on more than one item and are thus not easily detectable. Identifying foundational items allows for detecting areas of knowledge and experience essential for success in a specific role. EXOUSIA uses Relational Bayesian Networks to address this problem successfully.

EXOUSIA – Overview and Benefits

EXOUSIA methodology, methods, algorithms, and software solutions were developed to extract actionable insights from employee performance assessment and knowledge test data.

EXOUSIA provides six core functionalities that are not available in traditional methods of employee performance measurement:

- Agreement Among Raters

The evaluation of employees' performance usually involves several raters – the employees themselves, their managers, peers, etc. The relationship between raters (for example, the employee and the manager) significantly impacts employee success in the organization. Professional or personal disagreement may lead to significant problems for the team and

even for the organization as a whole. Early identification of such disagreement may help to resolve the issue before it becomes a problem. EXOUSIA uses Cohen Kappa statistics to identify employees who disagree with their manager and identify items that cause this disagreement.

- ### Ability of Employees and Difficulty of Items

EXOUSIA's modified Polytomous Rasch Measurement Model (PRMM) can process incomplete data (e.g., missing values) and provide a robust estimation of items' difficulty and employees' ability. EXOUSIA enables managers to evaluate how good a fit an employee is for their role. At the same time, EXOUSIA helps improve the quality of knowledge tests by identifying and eliminating malfunctioning assessment items.

- ### Causal Relationships Among Items

EXOUSIA can identify causal relationships among knowledge test items and reveal which items are foundational. This functionality is implemented through Relational Bayesian Networks (RBN) methodology and proprietary algorithms that create an RBN structure from the employees' responses to the knowledge test. Identification of foundational items and their relationship with other items, as well as with employees' ability, contribute to developing the role's Success Profile and creating personalized improvement plans for employees.

- ### Success Profile

Using the results of PRMM and RBN, EXOUSIA's proprietary algorithm creates Success Profiles for each job or role. The most important outcome of this is the quantitative assessment of the qualitative attributes of a Success Profile. Using Success Profiles, managers and recruiters will be able to identify employees' and candidates' ability thresholds to ensure their success in the job.

- ### Employee Proficiency Cards

EXOUSIA automatically builds Employee Proficiency Cards that contain assessed by PRMM employee proficiency. These cards serve as a basis for determination of the employee's overall fit to the job or role. EXOUSIA automatically creates per each employee personalized recommendations intended for improvement of employees' ability, closing existing gaps, and increasing chances of employee to become successful in their job or role.

- ### Team Strengths and Gaps

EXOUSIA aggregates individual Employee Proficiency Cards data to evaluate the team's competency. Managers and HR representatives use this information to help the team achieve the organization's current and future goals.
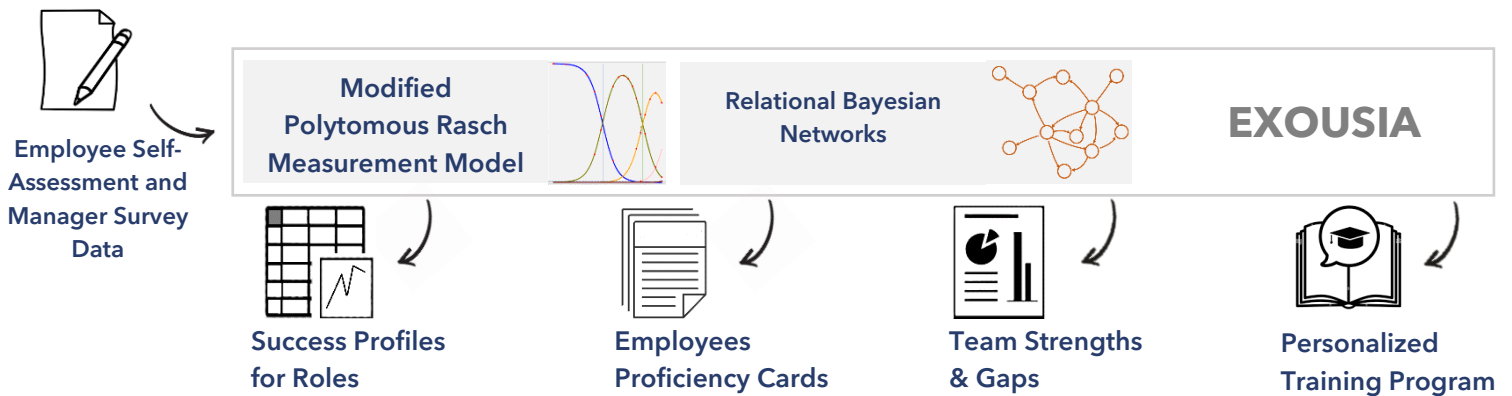

Figure 2. Architecture of EXOUSIA

CASE STUDY

This case study was conducted with data obtained during a quarterly performance review of 33 employees. Employees were asked to rate themselves on a 5-level scale regarding their knowledge and experience in 23 knowledge areas required to perform their job. Managers were also asked to rate the employees on the same subjects (knowledge areas).

The five levels were coded as numbers in the following way:

- 1 – Some Awareness (no knowledge)
- 2 – Novice (limited experience)
- 3 – Intermediate (practical application)
- 4 – Advanced (applied theory)
- 5 – Expert (recognized authority)

The HR department analyzed employee self-rated and manager-rated scores from this performance review. They simply calculated average scores per employee and received results presented as histograms in Figure 3 and Figure 4.

Figure 3. Distribution of Average Scores

Although fundamentally incorrect, this score-averaging method is still used quite often. Averaging the scores ignores the ordinal nature of the data, the different difficulty of the items, and the disagreement of employees and managers on scores for particular items. No recommendations on how to

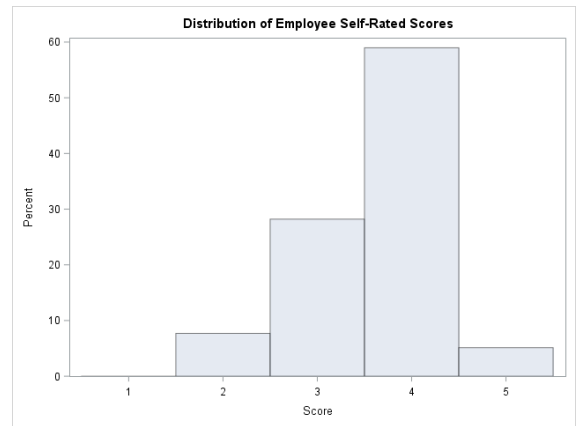improve team performance and proficiency were made.

Figure 4. Distribution of Average Scores

The company decided to use EXOUSIA to analyze the performance assessment data.

Agreement Among Raters

First, EXOUSIA identified which items caused disagreement between employees and managers.

Table 1. Items in Agreement/Disagreement

Item	Agreement with Manager
Business Intelligence Applications	In Agreement
Data Analysis	In Agreement
Data Gap Identification	In Agreement
Data Monetization	In Agreement
Data Monetization Applications	In Agreement
Feature Engineering	In Agreement
Feature Engineering Advanced	In Agreement
Model Interpretation	In Agreement
Model Validation	In Agreement
Programming & Coding	In Agreement
Programming & Coding Advanced	In Agreement
Statistical Analysis	In Agreement
Tech Savvy	In Agreement
Theoretical Quant Foundations	In Agreement
Analytics Workflow	In Disagreement
Analytics Workflow Advanced	In Disagreement
Business Intelligence	In Disagreement
Business Intelligence Advanced	In Disagreement
Data Analysis & Interpretation	In Disagreement
Munging data	In Disagreement
Statistical Analysis Advanced	In Disagreement
Visualization	In Disagreement
Visualization Advanced	In Disagreement

These items (Table 1) are sources of discrepancy and should be excluded from further analysis. Cohen Kappa inter-rater agreement statistics identified that 9 (gray-shaded) out of 23 items caused disagreement between the employees and the managers (see Table 1). These nine items were removed from further analysis.

Based on the remaining 14 items, EXOUSIA identified which employees are in disagreement with their managers about the rating scores. As shown in Table 2, 16 out of 33 employees appear to be in disagreement. For the 16 employees in disagreement with managers, EXOUSIA performed the analysis based on self-rated and manager-rated scores. For the 17 employees who are in agreement with the manager, EXOUSIA used managers' rated scores for the analysis. In this paper, we present results only for the employees who are in agreement with the managers.

Table 2. Employees in Agreement/Disagreement

Employee	Agreement with Manager	Employee	Agreement with Manager
E10335	In Disagreement	E21013	In Disagreement
E10336	In Disagreement	E21014	In Agreement
E10337	In Disagreement	E21015	In Agreement
E10338	In Agreement	E21016	In Agreement
E10343	In Disagreement	E21017	In Disagreement
E10344	In Disagreement	E21018	In Disagreement
E10345	In Agreement	E21019	In Agreement
E10347	In Agreement	E21020	In Disagreement
E10348	In Agreement	E22867	In Agreement
E10349	In Agreement	E22868	In Disagreement
E10350	In Agreement	E23595	In Disagreement
E21007	In Agreement	E26674	In Disagreement
E21008	In Disagreement	E26675	In Disagreement
E21009	In Agreement	E35903	In Agreement
E21010	In Agreement	E75121	In Agreement
E21011	In Agreement	E75122	In Disagreement
E21012	In Disagreement		

Ability of Employees, Difficulty of Items

It is the nature of the assessment framework that test questions (items) have *different levels of difficulty*, and the respondents have *different levels of ability* regarding the test items. EXOUSIA estimates the difficulty of test questions (items) that reflects the level of proficiency of the employees in the subject tested by the item. At the same time, EXOUSIA assesses each employee's ability relative to the test. The Polytomous Rasch Measurement Model (PRMM) estimates difficulty and ability *simultaneously*. As a result, items are ranked according to their difficulty, and the employees are ordered according to their ability.

Difficulty of Items

The difficulty of assessment items, estimated by PRMM, reflects the level of complexity of the item for the respondents. Items with lower difficulty generally do not present a challenge for the employees, and items with higher difficulty appear to be arduous to the employees (see Figure 5).
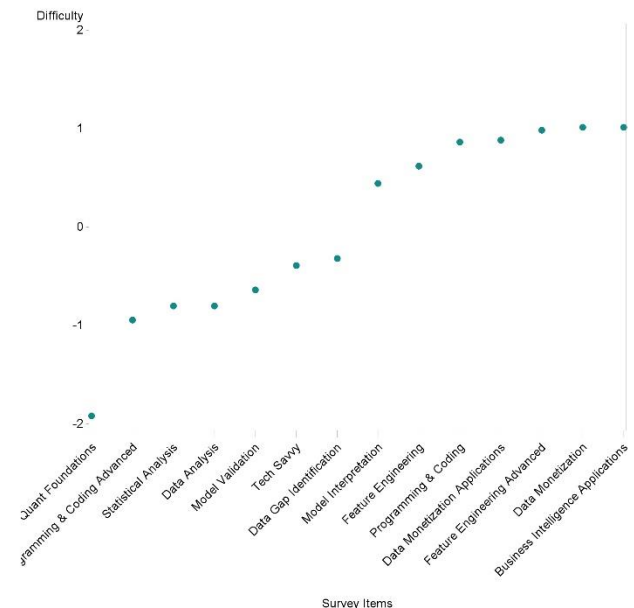

Figure 5. Items Difficulty

The PRMM not only estimates the difficulty of the items but also identifies OutFit value, an outlier-sensitive fit. An OutFit value greater than 1.3 indicates that the item's difficulty level does not consistently relate to employees' ability. For example, this shows inconsistency if generally high-rated employees were rated very differently on the

item (some were rated high while others were rated low). A similar discrepancy may appear when out of the mostly lower-rated employees for the same item some received high scores, and some received low scores.

Table 3. Items Difficulty

#	Item	Difficulty	OutFit
1	Theoretical Quant Foundations	-1.92	1.47
2	Programming & Coding Advanced	-0.95	0.70
3	Statistical Analysis	-0.80	0.67
4	Data Analysis	-0.80	0.64
5	Model Validation	-0.64	1.30
6	Tech Savvy	-0.39	1.72
7	Data Gap Identification	-0.32	0.99
8	Model Interpretation	0.44	0.91
9	Feature Engineering	0.62	0.66
10	Programming & Coding	0.86	2.08
11	Data Monetization Applications	0.88	0.29
12	Feature Engineering Advanced	0.99	0.67
13	Data Monetization	1.01	0.75
14	Business Intelligence Applications	1.01	1.04

There are three items shaded gray in Table 3 for which the OutFit value exceeds 1.3. Thus, they appear to be malfunctioning items – it is possible that the questions were not formulated clearly, may contain unfamiliar terms, or may have other reasons leading to employee misunderstandings. EXOUSIA suggested excluding these items from the evaluation of employees' proficiency.

Ability of Employees

While making conclusions about the employee's performance, it is critical to estimate their ability, considering the difficulty of test items. Such a conclusion reflects *the true proficiency* of the employee, in contrast to raw test scores (see Figure 6).

The employees' ability is estimated by PRMM conditionally on item difficulty: lower numbers mean lower employee ability relative to the test, and higher numbers indicate higher ability.
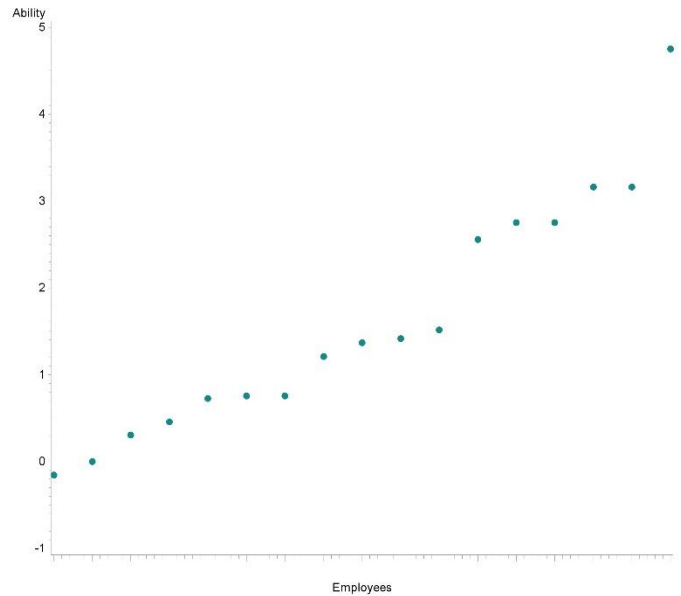

Figure 6. Employees Ability

An OutFit value higher than 1.3 indicates employees for whom some of the observed scores are too far from the expected values estimated by PRMM. It suggests that, in some items, the managers possibly over- or underestimated the employee's proficiency. In Table 4, there are three employees (shaded gray) for whom the OutFit value exceeds 1.3.

Table 4. Employees Ability

Employee	Ability	OutFit	Employee	Ability	OutFit
E10349	-0.15	1.29	E21014	1.42	0.45
E21007	0.00	0.75	E35903	1.52	1.26
E21016	0.31	1.40	E75121	2.56	0.90
E21009	0.46	0.38	E10348	2.75	1.15
E21015	0.73	0.70	E21019	2.75	0.28
E10345	0.76	1.27	E10338	3.16	0.33
E22867	0.76	2.33	E10347	3.16	1.87
E21011	1.21	0.75	E10350	4.75	0.53
E21010	1.37	1.03			

Item Characteristic Curve

Item Characteristic Curves (ICC) describe the relationship between the ability of employees and the estimated probability of the employees to get a specific score. ICCs are created by PRMM. Each item in the assessment has its own ICC, and for each item, EXOUSIA identifies the probabilities of each employee receiving a particular score.

For example, the following ICC (Figure 7) is built for the "Data Analysis" item. Each curve of the ICC represents a probability for an employee to get a specific score, depending on their ability. Thresholds (solid vertical lines) identify the ability for which the probabilities of adjacent scores are equal. For example, the pink curve represents a probability distribution to get a score of 4 for this item. According to Threshold 3 (red solid vertical line), when an employee has an ability of 0.14, they have equal chances of receiving a score of 3 (yellow curve) or 4. Thus, to get a score of 4, an employee should have an ability higher than 0.14. Red dots on the curves denote actual employees' scores.
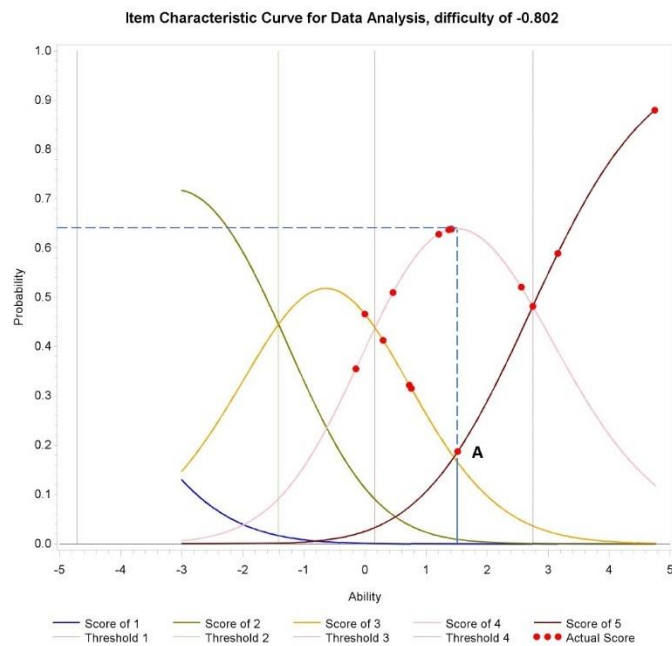

Figure 7. ICC for "Data Analysis"

Point A is located on the burgundy curve (Score of 5) and represents employee E35903 with an ability of 1.52. This employee was rated with a score of 5, while the probability of getting this score is only 0.19 for their ability level. The broken blue vertical line reaches the purple curve (Score of 4) at the point where the corresponding probability of getting a score of 4 is 0.64. Thus, the employee was rated higher than their actual proficiency in Data Analysis.

For the "Tech Savvy" item, presented on the Figure 8, ICC tells a different story. We already know that this item was identified as malfunctioning due to a high OutFit value. ICC below exposes some details of EXOUSIA's decision to mark this item as malfunctioning.
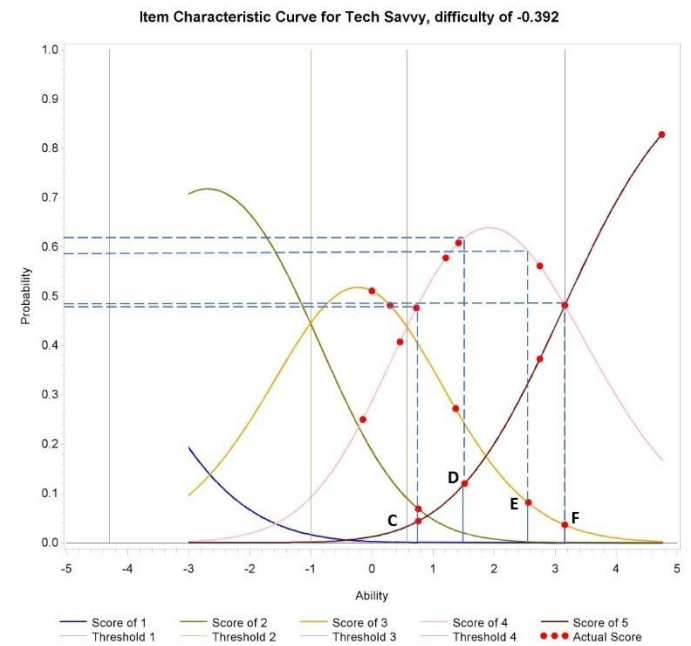
Figure 8. ICC for "Tech Savvy"

Points C, D, E, and F on the ICC illustrate employees who had a high probability of getting different scores than they received:

Point	Employee	Ability	Actual Score/ Probability	Expected Score / Probability
C	E22867	0.76	5 / P = 0.04	4 / P = 0.48
D	E35903	1.52	5 / P = 0.12	4 / P = 0.62
E	E75121	2.56	3 / P = 0.08	4 / P = 0.59
F	E10347	3.16	3 / P = 0.04	4 or 5 / P = 0.48

EXOUSIA builds ICCs for all items and estimates what level of employees' ability can ensure professional success in their role.

Causal Relationships among Items

Understanding causal relations among assessment items enables identifying what *foundational knowledge* drives success in employee performance. EXOUSIA uses Relational Bayesian Networks (RBN) to identify probabilistic *causal relationships* among the10ssessent items and employees' ability. RBN visualizes the dependency or influence of one item on another as a graph. The graphs' arrows pointing from one item to another reflect how knowledge in one item impacts competency in another.

In this case study, according to the RBN created by EXOUSIA and shown on Figure 9, the employees' ability was directly influenced by their knowledge of four items:

- Model Validation
- Data Monetization Application
- Business Intelligence application
- Data Monetization

However, for the employees' performance evaluation, it is essential to identify which items are foundational.

EXOUSIA identified foundational items critical for improving employees' proficiency in their jobs. The following four items are identified as *foundational*:

- Data Analysis
- Statistical Analysis
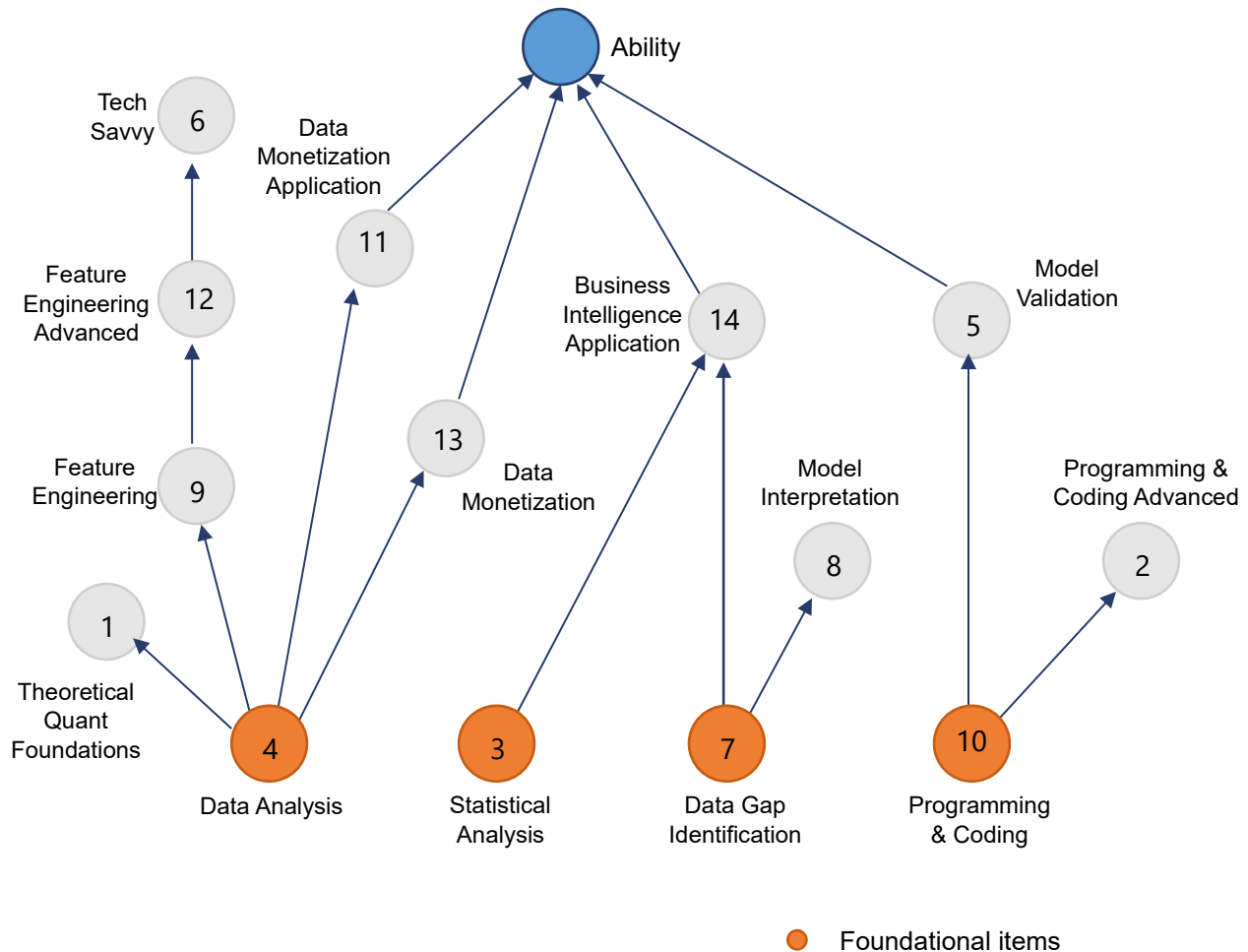- Data Gap Identification
- Programming & Coding

Figure 9. Relational Bayesian Network Diagram

Employee Success Profile

Using the results of PRMM and RBN, EXOUSIA created a Success Profile for the Data Scientist role (Table 5). The Success Profile determines which scores employees should receive for each item to be successful in their jobs. The Success Profile states:

- which items should be considered for success and which should be excluded (gray-shaded

items were identified as malfunctioning and were eliminated from the Success Profile).
- what is the lowest score an employee should receive for each item to be considered competent?
- which items are foundational (red-bordered) for an employee's success in their job?

Table 5. Success Profile for a Role

Success Profile for Data Scientist Role

Item	Difficulty	Score	Item Importance
Theoretical Quant Foundations	-1.92	5	
Programming & Coding Advanced	-0.95	5	
Statistical Analysis	-0.80	5	Foundational
Data Analysis	-0.80	5	Foundational
Model Validation	-0.64	5	
Tech Savvy	-0.39	4	
Data Gap Identification	-0.32	4	Foundational
Model Interpretation	0.44	4	
Feature Engineering	0.62	4	
Programming & Coding	0.86	4	Foundational
Data Monetization Applications	0.88	4	
Feature Engineering Advanced	0.99	4	
Data Monetization	1.01	4	
Business Intelligence Applications	1.01	4	

Employee Proficiency Cards

In this case study, the approach based on average scores estimated that almost 50% of employees received a score of 3, and about 45% received a score of 4. What score is needed for an employee to be successful in this job? Do all employees with a score of 4 have the same proficiency? Are those employees on a path of success or failure? EXOUSIA answers these questions as it automatically creates Employee Proficiency Cards for each employee.

The Employee Proficiency Cards identify an employee's level of competency in each item and

relate it to the importance of the item and the required level of knowledge in each item:

- Strength – the employee exceeds the score value requirement for the item in the Success Profile,
- Fit – the employee is in line with the score value requirement for the item in the Success Profile,
- Opportunity to Fit – the employee has a high probability of fitting the score value requirement of the Success Profile,
- Weakness – the employee's actual and expected score values are below the score value of the Success Profile.

The Employee Proficiency Cards allow identifying differences between actual and expected score values estimated by PRMM. This helps to identify *"hidden" gaps or "hidden" opportunities. For* example, when the employee might have been mistakenly assigned a higher score value that was not in line with their ability, or the employee was assessed a lower score value than it was estimated based on their ability.

The Employee Proficiency Cards serve as a basis for the determination of every *employee's proficiency*:

- Exceeds Proficiency (Expert) – the employee exhibits Strength in all items,
- Proficient (Advanced) – the employee shows Strength or Fit in all items,
- Foundational Proficiency (Intermediate) – the employee shows Strength or Fit in all foundational items of the Success Profile,
- Partially Proficient (Novice) – the employee shows Strength, Fit, or Opportunity to Fit in all foundational items,
- Insufficient Proficiency (Some Awareness) – the employee didn't classify into any of the four groups above.

The Employee Proficiency Cards contain the following data:

- Gray-shaded items are excluded from consideration as they were identified as malfunctioning.
- Red-bordered items were identified as foundational.
- Light-green cells identify the highest probability of score for each item.
- The column "Actual Score" contains the score value the employee received on the specific item.
- The column "Most Likely Score" contains the score value that is most probable for the employee according to PRMM (see the probabilities in the light-green shaded cell).

Examples below show the Employee Proficiency Cards for two employees.

Employee E10338, with an ability of 3.16, is *Partially Proficient* as they exhibited Fit or Opportunity to Fit in all foundational items according to the Success Profile. EXOUSIA revealed that the employee scored lower than required by the Success Profile on one of the foundational items: "Statistical Analysis."

Proficiency Card for Employee E10338, Ability 3.16, Partially Proficient

Item	Actual Score	Prob. Receiving Score 1	Prob. Receiving Score 2	Prob. Receiving Score 3	Prob. Receiving Score 4	Prob. Receiving Score 5	Most Likely Score	Success Profile	Status
Business Intelligence	4	0.00	0.01	0.20	0.64	0.16	4	4	Fit
Data Analysis	5	0.00	0.00	0.02	0.39	0.59	5	5	Fit
Data Gap Identification	4	0.00	0.00	0.04	0.50	0.46	4	4	Fit
Data Monetization	4	0.00	0.01	0.20	0.64	0.16	4	4	Fit
Data Monetization Applications	4	0.00	0.01	0.17	0.64	0.18	4	4	Fit
Feature Engineering	4	0.00	0.01	0.13	0.63	0.23	4	4	Fit
Feature Engineering Advanced	4	0.00	0.01	0.19	0.64	0.16	4	4	Fit
Model Interpretation	4	0.00	0.00	0.11	0.62	0.27	4	4	Fit
Model Validation	5	0.00	0.00	0.03	0.43	0.55	5	5	Fit
Programming & Coding Advanced	5	0.00	0.00	0.02	0.36	0.63	5	5	Fit
Programming & Coding	4	0.00	0.01	0.17	0.64	0.18	4	4	Fit
Statistical Analysis	4	0.00	0.00	0.02	0.39	0.59	5	5	Opportunity
Tech Savvy	4	0.00	0.00	0.04	0.48	0.48	4	4	Fit
Theoretical Quant Foundations	5	0.00	0.00	0.00	0.18	0.82	5	5	Fit

Another employee, E10348, with an ability of 2.75, demonstrated *Foundational Proficiency* as they showed Strength or Fit in all foundational items of the Success Profile.

Proficiency Card for Employee E10348, Ability 2.75, Foundational Proficiency

Item	Actual Score	Prob. Receiving Score 1	Prob. Receiving Score 2	Prob. Receiving Score 3	Prob. Receiving Score 4	Prob. Receiving Score 5	Most Likely Score	Success Profile	Status
Business Intelligence	3	0.00	0.03	0.28	0.60	0.10	4	4	Opportunity
Data Analysis	5	0.00	0.00	0.04	0.48	0.48	4 or 5	5	Fit
Data Gap Identification	4	0.00	0.00	0.07	0.57	0.35	4	4	Fit
Data Monetization	3	0.00	0.03	0.28	0.60	0.10	4	4	Opportunity
Data Monetization Applications	4	0.00	0.02	0.25	0.62	0.11	4	4	Fit
Feature Engineering	3	0.00	0.01	0.20	0.64	0.15	4	4	Opportunity
Feature Engineering Advanced	4	0.00	0.03	0.27	0.60	0.10	4	4	Fit
Model Interpretation	3	0.00	0.01	0.17	0.64	0.18	4	4	Opportunity
Model Validation	4	0.00	0.00	0.05	0.52	0.44	4	5	Gap
Programming & Coding Advanced	5	0.00	0.00	0.03	0.45	0.52	5	5	Fit
Programming & Coding	5	0.00	0.02	0.25	0.62	0.12	4	4	Strength
Statistical Analysis	5	0.00	0.00	0.04	0.49	0.48	4 or 5	5	Fit
Tech Savvy	5	0.00	0.00	0.06	0.56	0.37	4	4	Strength
Theoretical Quant Foundations	5	0.00	0.00	0.01	0.25	0.75	5	5	Fit

Comparison of Employees

EXOUSIA can differentiate employees that are impossible to distinguish using averaging of scores. The two presented above Proficiency Cards scored the employees differently.

To demonstrate the superiority of EXOUSIA over averaging scores, let's compare the evaluation of employees E10338 and E10348 using these two methods. The results of this comparison are in Table 6.

The calculation of the average would assign employee E10338 a score of 4.29 and employee E10348 – a score of 4.14. These scores are both high and are very close to one another. The inference would be that both employees have very similar proficiency.

Table 6. Comparison of Employees

Items	Employee E10338	Employee E10348	Success Profile
Business Intelligence	4	3	4
Data Analysis	5	5	5
Data Gap Identification	4	4	4
Data Monetization	4	3	4
Data Monetization Applications	4	4	4
Feature Engineering	4	3	4
Feature Engineering Advanced	4	4	4
Model Interpretation	4	3	4
Model Validation	5	4	5
Programming & Coding Advanced	5	5	5
Programming & Coding	4	5	4
Statistical Analysis	4	5	5
Tech Savvy	4	5	4
Theoretical Quant Foundations	5	5	5
AVERAGE SCORE	4.29	4.14	
EXOUSIA SCORE	Partially Proficient	Foundational Proficiency	

However, EXOUSIA revealed that these employees are significantly different. Table 6 demonstrates that employee E10348 is in Fit or Strength with all the foundational items (cells shaded blue) and thus exhibits Foundational Proficiency in their role. Employee E10338 is in fit with only three out of four foundational items (cells shaded orange), and therefore is only Partially Proficient. EXOUSIA identified gaps in the foundational knowledge of employee E10338 (yellow cell), which allowed the creation of a personalized training plan for that employee.

The approach based on averaging scores failed to identify this critical difference and missed that employee E10338 has a significant gap in the foundational knowledge area.

Team Strengths and Gaps

According to the averaging method, none of the employees received scores lower than 3 (Intermediate). Such results convey a reassuring message that almost all employees have intermediate or higher proficiency (see Figure 10).
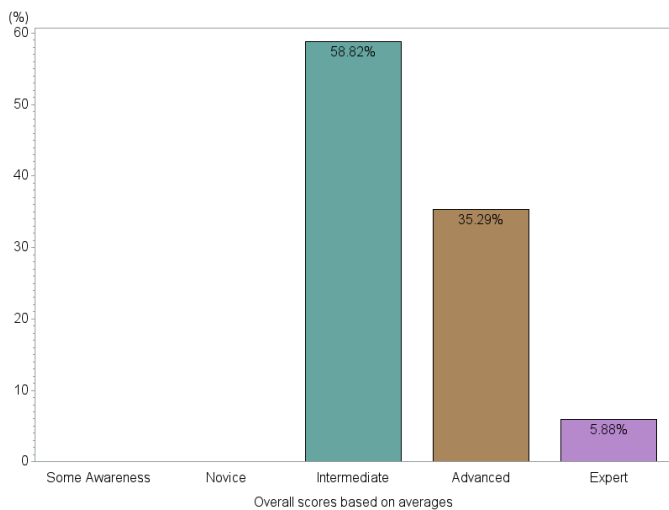

Figure 10. Team Strength and Gaps Based on Average Scores

Using Success Profile, EXOUSIA discovered a very different situation. It identified foundational items – the knowledge areas that are most important for success in the role. It also identified the lowest score

value per each item that an employee needs to achieve to be successful in the job.
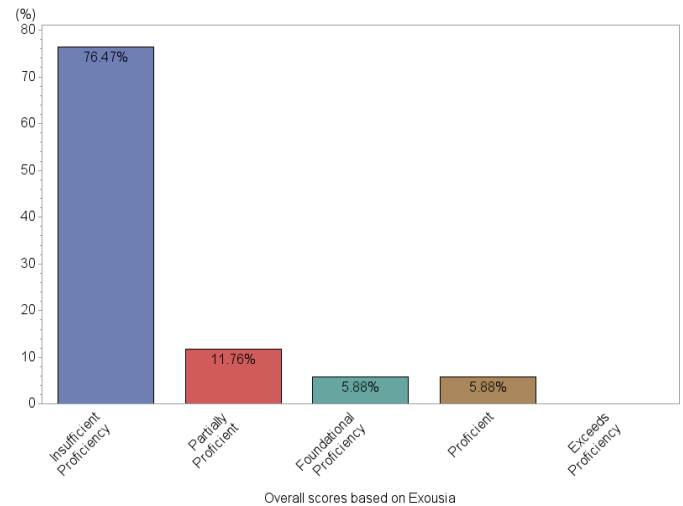

Figure 11. Team Strength and Gaps Based on EXOUSIA

Proficiency scores calculated by EXOUSIA vary significantly from the scores based on the averaging approach (see Figure 11):

· 5.88% of employees are Proficient,
· 5.88% of employees demonstrated Foundational Proficiency,
· 11.76% of employees are Partially Proficient,
· 76.47% of employees have Insufficient Proficiency

EXOUSIA revealed that 13 out of 17 employees (76.47%) demonstrated gaps in at least one foundational item and thus have insufficient proficiency in the required knowledge areas. These employees are set up to fail in their roles. EXOUSIA identified knowledge gaps, created recommendations for training programs, and thus allowed employees to improve their skills. The averaging method *was unable to identify* employees with insufficient proficiency.

In the area of individual scoring, the essential advantage of EXOUSIA is its ability to discover hidden gaps in foundational knowledge areas. This helps create personalized training programs for employees to ensure their professional success.

Strengths and Gaps in the Team

EXOUSIA identified areas of the team's strengths and weaknesses, thus providing managers with actionable feedback.
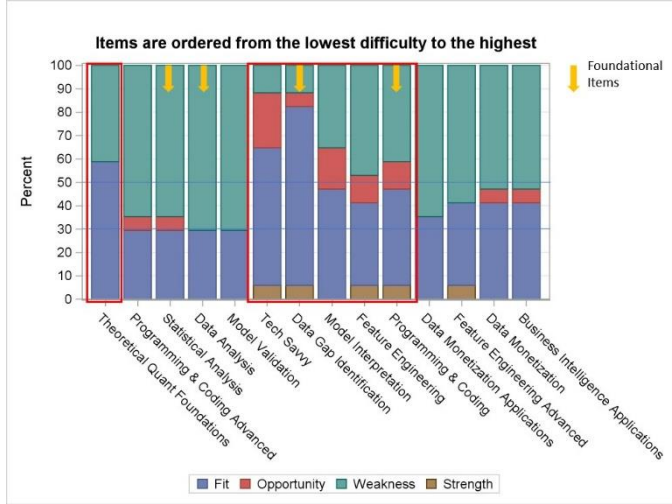

Figure 12. Strengths and Gaps in the Team

The Figure 12 visualizes the following insights:

- Foundational items identify the most critical areas of knowledge, and in two of them, "Statistical Analysis" and "Data Analysis," less than 30% of employees exhibited strength or Fit.
- Six items framed in red outline knowledge areas in which at least 50% of employees exhibit Strength, Fit, or Opportunity to Fit.
- There are eight areas of knowledge where the team needs to improve their skills.

Personalized Programs for Employees

EXOUSIA automatically created recommendations for personalized programs to improve employees' ability, to close existing gaps, and to increase the chances for employees to become successful in their roles. As shown in Table 7, for each foundational item identified by EXOUSIA, the employees for whom reinforcement is required (red) or optional (green) were identified.

Table 7. Personalized Training Program for the Data Scientists Team

Employee	Data Gap Identification	Programming & Coding	Statistical Analysis	Data Analysis
E10349	Required	Required	Required	Required
E21009	Required	Required	Required	Required
E10345		Required	Required	Required
E21007		Required	Required	Required
E21010		Required	Required	Required
E21011		Required	Required	Required
E21014			Required	Required
E21015			Required	Required
E21016			Required	Required
E21019			Required	Required
E22867			Required	Required
E75121		Optional		Required
E35903		Required		
E10338			Optional	
E10347		Optional		

Conclusion

The commonly used averaging of scores fails to evaluate employees' proficiency realistically. In this case study, we showed that this approach missed critical employee skills gaps and produced misleading results. EXOUSIA offers a solution that provides an accurate assessment of employees' proficiency along with actionable insights on how to improve employees' skills to ensure their success in the job.

EXOUSIA allows organizations to:

1. Identify which employees disagree with their managers regarding the rating scores so that reasons for the disagreement can be reviewed and the employees can receive a fair performance evaluation.
2. Rank employees by their *ability conditionally on the difficulty* of the assessment items.
3. Identify the *quality of the assessment structure* (in terms of items) and which topics are *foundational* for the employees' success in the job.
4. Measure *overall employee proficiency* in the knowledge areas assessed by the test.
5. Create the *Employee Success Profile* for each job/role and determine the realistic scores and values an employee should receive for each item to succeed in their career.
6. Create *Employee Proficiency Cards*, which report the level of proficiency for each employee per item and the *overall competence* of each employee.
7. Create a training plan for each employee.

According to the commonly used average measurement of proficiency, employees get scores that allow them to pass the assessment and move on. However, the reality could be very different, and the employees could have hidden gaps in knowledge and skill areas essential for their professional success.

EXOUSIA provides correct and accurate measurement of employees' success and creates actionable recommendations on how to close gaps in each employee's knowledge and skills. This helps organizations develop better and more successful teams, identify and treat performance issues before they become problems, and, over time, dramatically reduce employee attrition.