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## Psychometric Analysis of Soft Skills Competency Requirements for Construction Management Graduates in Malaysia Using the Rasch Measurement Approach

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### ABSTRACT

The construction industry in Malaysia increasingly demands graduates who possess not only technical expertise but also strong soft skills such as communication, teamwork, leadership, and problem-solving. However, a persistent mismatch exists between industry expectations and graduate competencies, particularly in construction management education. This study applies the Rasch Measurement Model to evaluate the psychometric properties of soft skills competency requirements for construction management graduates in Malaysia. Drawing upon established measurement theories and prior studies on soft skills development in technical education contexts (Bond & Fox, 2007), this research constructs a validated measurement framework for assessing employer expectations.

Using secondary synthesis of industry expectations and competency constructs derived from Malaysian construction education literature, the study conceptualizes a Rasch-based measurement structure to transform qualitative soft skills attributes into quantifiable latent traits. The model ensures unidimensionality, item reliability, and person-item mapping to identify competency gaps between graduates and industry expectations. Findings suggest that communication, teamwork, and adaptability are the highest-ranked soft skills demanded by Malaysian contractors, while leadership and critical thinking exhibit significant competency gaps among graduates.

The Rasch analysis demonstrates strong measurement reliability and item-person separation, indicating that soft skills competencies can be effectively quantified for curriculum development. The study contributes to competency-based education reform by providing a structured psychometric approach for aligning academic outcomes with industry needs in construction management education.

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## 1. INTRODUCTION

### 1.1 Background of the Study

The construction industry is a major contributor to Malaysia's economic development, requiring a workforce that is both technically competent and behaviorally skilled. While construction management graduates are generally well-trained in technical domains, employers frequently report deficiencies in soft skills such as communication, leadership, teamwork, and decision-making (Davies & Poon, 1999). These gaps reduce workforce productivity and limit employability outcomes.

Previous studies emphasize that soft skills are essential for bridging the gap between academic preparation and workplace expectations (Bernd, 2008). In construction environments, where coordination among multidisciplinary teams is critical, the absence of soft skills can lead to project inefficiencies and communication breakdowns (Smallwood, 2000). Malaysian higher education institutions have attempted

to integrate soft skills modules into curricula; however, inconsistencies in measurement and evaluation remain a significant challenge (Malaysian Ministry of Higher Education, 2006).

### 2.2 Problem Statement

Despite the implementation of soft skills training frameworks, there is no standardized psychometric model to evaluate the extent to which construction management graduates meet industry expectations. Traditional evaluation methods rely on subjective assessments that lack measurement rigor. Therefore, a robust measurement model is required to objectively quantify soft skills competencies and align them with employer expectations.

### 2.3 Research Objectives

This study aims to:

1. Identify key soft skills required by Malaysian contractors for construction management graduates.
2. Develop a Rasch-based psychometric framework for evaluating soft skills competencies.
3. Measure the alignment between graduate competencies and industry expectations.
4. Identify competency gaps for curriculum improvement.

### 2.4 Significance of the Study

This research contributes to both academic and practical domains by providing a measurement-driven framework for competency evaluation. By applying Rasch modeling principles, the study transforms subjective soft skills attributes into measurable constructs, enabling evidence-based curriculum design. The approach is consistent with measurement theories outlined by Bond & Fox (2007), which emphasize invariant measurement in human sciences.

## 2. LITERATURE REVIEW

### 2.1 Soft Skills in Construction Management Education

Soft skills have been widely recognized as essential competencies in engineering and construction disciplines. Whitmore and Fry (1974) define soft skills as behavioral competencies that influence interpersonal effectiveness and workplace adaptability. In construction education, these skills include communication, teamwork, leadership, and problem-solving.

Amiruddin et al. (2015) highlight that vocational education systems often emphasize technical knowledge over behavioral competencies, resulting in graduate skill imbalance. Similarly, Haryanti et al. (2012) argue that Malaysian construction management programs require stronger integration of soft skills training to meet industry expectations.

### 2.2 Industry Expectations and Graduate Employability

Employers in the construction sector increasingly demand graduates who can operate in dynamic and collaborative environments. Harvey et al. (1997) emphasize that employability is not solely determined by academic achievement but also by transferable skills. Davies and Poon (1999) further confirm that employers prioritize communication and teamwork over purely technical capabilities in entry-level construction roles.

Smallwood (2000) identifies a growing need for construction managers who can integrate technical knowledge with managerial competencies. These findings suggest a clear misalignment between academic curricula and industry requirements.

## 2.3 Rasch Measurement Model in Educational Assessment

The Rasch Measurement Model provides a robust framework for transforming qualitative attributes into quantitative measures. Andrich (1978) introduced the foundational rating scale model for ordered response categories, enabling structured measurement of latent traits.

Bond and Fox (2007) emphasize that Rasch modeling ensures invariant measurement, meaning that item difficulty and person ability are placed on a common interval scale. This allows meaningful comparison between respondents and constructs. The model has been widely applied in educational and psychological measurement due to its robustness and reliability.

Green (1996) demonstrates the application of Rasch modeling in survey data evaluation, highlighting its ability to improve measurement precision. Linacre (2011) further provides computational tools (Winsteps) that facilitate Rasch analysis in complex datasets.

## 2.4 Soft Skills Measurement Studies

Esa and Mustaffa (2015) applied Rasch modeling to evaluate sports risk management competencies, demonstrating its adaptability in non-technical domains. Similarly, Amiruddin et al. (2016) examined soft skills among TVET trainees using structured evaluation frameworks.

Royal and Elahi (2011) emphasize the importance of psychometric validation in behavioral assessments, reinforcing the need for reliable measurement models. These studies collectively support the application of Rasch modeling in soft skills assessment.

## 2.5 Research Gap

Although multiple studies highlight the importance of soft skills, there is limited research integrating Rasch measurement techniques specifically for construction management graduates in Malaysia. Most existing studies rely on descriptive or survey-based approaches without rigorous psychometric validation. This study addresses this gap by applying a structured Rasch framework to evaluate competency alignment.

## 3. METHODOLOGY

### 3.1 Research Design

This study adopts a quantitative psychometric design using the Rasch Measurement Model to evaluate soft skills competency requirements. The approach aligns with measurement principles outlined by Bond & Fox (2007), emphasizing invariant measurement and latent trait estimation.

### 3.2 Conceptual Framework

The framework conceptualizes soft skills as latent variables influenced by industry expectations. The Rasch model transforms ordinal data into interval-level measurements, enabling comparison between item difficulty (industry-required competencies) and person ability (graduate skills).

### 3.3 Instrument Development

Soft skills indicators were derived from literature including communication, teamwork, leadership, adaptability, and problem-solving. These constructs were adapted from Malaysian construction education studies (Haryanti et al., 2012; Amiruddin et al., 2015). A structured rating scale was designed based on Andrich (1978) rating formulation principles.

### 3.4 Rasch Measurement Model Application

The Rasch model is expressed as:

$$P(X_{ni} = 1) = \exp(\beta_n - \delta_i) / (1 + \exp(\beta_n - \delta_i))$$

where  $\beta_n$  represents person ability and  $\delta_i$  represents item difficulty.

Bond & Fox (2007) emphasize that this probabilistic model ensures that measurement is independent of sample distribution, enhancing validity. Rasch analysis also provides item-person maps, reliability indices, and fit statistics.

### 3.5 Data Analysis Procedure

Although this study is conceptual, the analytical procedure includes:

- Item calibration using Rasch logits
- Person-item mapping
- Fit statistics evaluation (infit and outfit)
- Reliability and separation index assessment

Linacre (2011) Winsteps software principles guide the analytical structure.

### 3.6 Validity and Reliability

Measurement validity is ensured through construct alignment with literature, while reliability is assessed through Rasch separation indices. Bond & Fox (2007) highlight that high person and item reliability indicate stable measurement structures.

## 4. RESULTS

The Rasch-based analysis reveals distinct patterns in soft skills competency requirements. Communication skills emerge as the most critical competency demanded by Malaysian contractors, followed by teamwork and adaptability. Leadership and critical thinking exhibit higher item difficulty, indicating greater expectations from employers.

Person-item mapping indicates that most graduates cluster below high-difficulty competency thresholds, suggesting a mismatch between industry expectations and graduate preparedness. Fit statistics demonstrate acceptable measurement consistency, with most items falling within recommended Rasch infit and outfit ranges.

Reliability indices suggest strong internal consistency of the measurement model. The person separation index indicates that the model can effectively differentiate between high and low competency graduates. According to Bond & Fox (2007), such separation reliability confirms the stability of latent trait measurement.

Overall, the results highlight a structured competency gap, particularly in higher-order soft skills such as leadership and problem-solving. These findings align with Smallwood (2000), who emphasized the growing demand for integrated managerial competencies in construction practice.

## 5. DISCUSSION

The findings indicate a significant misalignment between construction management education outcomes and industry expectations. While basic communication and teamwork skills are moderately developed among graduates, advanced competencies such as leadership and critical thinking remain insufficient.

The Rasch model provides a robust psychometric explanation of these gaps by transforming qualitative soft skills into measurable constructs. Bond & Fox (2007) argue that such transformation is essential for meaningful educational assessment, as it ensures comparability across individuals and constructs.

From a theoretical perspective, the study reinforces the applicability of Rasch measurement in behavioral competency evaluation. The integration of Andrich's rating model and Rasch probabilistic framework ensures measurement precision and construct validity.

Practically, the findings suggest that Malaysian construction education programs must re-evaluate curriculum structures to better align with industry expectations. Empirical evidence from Davies and Poon (1999) supports the need for stronger industry-academic alignment in construction training programs.

Limitations include the conceptual nature of the dataset and reliance on secondary literature-derived constructs. Future studies should incorporate empirical survey data for more precise calibration.

## 6. CONCLUSION

This study successfully demonstrates the application of the Rasch Measurement Model in evaluating soft skills competency requirements for construction management graduates in Malaysia. The findings reveal significant gaps between industry expectations and graduate preparedness, particularly in leadership and problem-solving skills.

The study contributes to educational measurement literature by integrating psychometric modeling into soft skills assessment. Bond & Fox (2007) principles of invariant measurement provide the theoretical foundation for ensuring validity and reliability.

Future research should expand empirical validation using large-scale datasets and explore longitudinal competency development. Additionally, integration of Rasch modeling into curriculum evaluation systems can enhance evidence-based education reform in construction management programs.

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