

ORIGINAL

## Metadata-Driven Competency Modeling for Civil Servant Placement: A Structural Equation Approach

### Modelado de competencias basado en metadatos para la colocación de funcionarios públicos: un enfoque de ecuaciones estructurales

Firman Syah Putra<sup>1</sup> , Muhammad Giatman<sup>1</sup> , Resmi Darni<sup>1</sup> , Yudha Aditya Fiandra<sup>1</sup> , Deval Gusrion<sup>2</sup> , Herio Rizki Dewinda<sup>3</sup> 

<sup>1</sup>Universitas Negeri Padang, Faculty of Engineering. Padang, Indonesia.

<sup>2</sup>Universitas Putra Indonesia YPTK Padang, Faculty of Computer Science. Padang, Indonesia.

<sup>3</sup>Universitas Putra Indonesia YPTK Padang, Faculty of Psychology. Padang, Indonesia.

Cite as: Syah Putra F, Giatman M, Darni R, Aditya Fiandra Y, Gusrion D, Rizki Dewinda H. Metadata-Driven Competency Modeling for Civil Servant Placement: A Structural Equation Approach. Data and Metadata. 2025; 4:1152. <https://doi.org/10.56294/dm20251152>

Submitted: 29-10-2024

Revised: 06-03-2025

Accepted: 21-08-2025

Published: 22-08-2025

Editor: Dr. Adrián Alejandro Vitón Castillo 

Corresponding Author: Muhammad Giatman 

#### ABSTRACT

**Introduction:** the objective of this study is to examine both the direct and indirect effects of data communication competence, data-driven critical thinking, and data-informed leadership on the perceived suitability of job placement decisions based on data assessments within Indonesia's civil service system, while specifically assessing the mediating role of data-driven critical thinking in these relationships.

**Method:** a quantitative, cross-sectional design was applied using Partial Least Squares Structural Equation Modeling (PLS-SEM). A total of 256 civil servants from various Indonesian public institutions participated. Five hypotheses were tested to examine both direct and mediated relationships.

**Results:** the findings revealed that both data communication competence ( $\beta = 0,123$ ;  $p = 0,044$ ) and data-driven critical thinking ( $\beta = 0,156$ ;  $p = 0,006$ ) significantly influenced perceived suitability. However, data-informed leadership did not have a significant direct effect ( $\beta = -0,061$ ;  $p = 0,159$ ). Mediation analysis showed that data-driven critical thinking significantly mediated the relationship between both communication competence and leadership with perceived suitability.

**Conclusions:** the study highlights the pivotal role of cognitive competencies, particularly critical thinking, in influencing perceptions of data-based placement decisions. While leadership alone did not directly impact perceptions, its indirect role through critical thinking was substantial. These findings offer insights for refining leadership development and assessment practices within bureaucratic systems.

**Keywords:** Data-Driven Decision Making; Communication Competence; Critical Thinking; Data-Informed Leadership.

#### RESUMEN

**Introducción:** este estudio investiga la influencia de la competencia comunicativa, el pensamiento crítico orientado por datos y el liderazgo basado en datos sobre la percepción de idoneidad en las decisiones de asignación de puestos basada en la evaluación de datos dentro del sistema de servicio civil en Indonesia.

**Método:** se aplicó un diseño cuantitativo y transversal utilizando el Modelo de Ecuaciones Estructurales de Mínimos Cuadrados Parciales (PLS-SEM). Participaron un total de 256 funcionarios públicos de diversas instituciones indonesias. Se evaluaron cinco hipótesis para examinar relaciones tanto directas como mediadas.

**Resultados:** los resultados revelaron que tanto la competencia en comunicación de datos ( $\beta = 0,123$ ;  $p = 0,044$ ) como el pensamiento crítico basado en datos ( $\beta = 0,156$ ;  $p = 0,006$ ) influyeron significativamente en

la percepción de idoneidad. Sin embargo, el liderazgo basado en datos no tuvo un efecto directo significativo ( $B = -0,061$ ;  $p = 0,159$ ). El análisis de mediación mostró que el pensamiento crítico basado en datos medió significativamente la relación entre la competencia comunicativa y el liderazgo con la percepción de idoneidad.

**Conclusiones:** el estudio destaca el papel fundamental de las competencias cognitivas, en particular el pensamiento crítico, en la conformación de percepciones sobre decisiones de asignación basadas en datos. Si bien el liderazgo por sí solo no tuvo un impacto directo en las percepciones, su papel indirecto a través del pensamiento crítico fue sustancial. Estos hallazgos ofrecen perspectivas valiosas para mejorar las prácticas de desarrollo y evaluación del liderazgo dentro de sistemas burocráticos.

**Palabras clave:** Toma de Decisiones Basada en Datos; Competencia Comunicativa; Pensamiento Crítico; Liderazgo Informado por Datos.

## INTRODUCTION

Data-based assessment in the public sector refers to the systematic use of structured data and metadata to evaluate employee performance and determine position suitability. This approach leverages digital platforms, analytic dashboards, and predictive algorithms to realize the principles of objectivity, transparency, and accountability in human resource management. Similar digital competency frameworks have been discussed in the higher education context, where digital integration in entrepreneurship education has been systematically reviewed as a driver for skill development and adaptive decision-making.<sup>(1)</sup> In Indonesia, Law No. 5 of 2014 on the State Civil Apparatus (ASN) emphasizes a merit-based system, placing civil servants according to competencies rather than seniority or informal networks.<sup>(2,3)</sup>

Globally, the use of data analytics in public sector human resource management has grown rapidly. The OECD (2023) reports that over 70 % of member countries have established centralized data analytics units for HR policy, achieving up to a 25 % increase in placement efficiency. In Southeast Asia, implementation progress varies: Singapore and Malaysia are in advanced stages of integration, while Indonesia remains in an early consolidation phase, facing challenges in digital literacy and organizational culture. According to Indonesia's Ministry of Administrative and Bureaucratic Reform (2023), only 46 % of local government agencies consistently apply competency-based digital evaluations in job placement, revealing a significant gap between policy and practice.<sup>(4,5)</sup> Studies on techno-savvy generations in higher education have shown that digital competencies influence career-related perceptions and intentions,<sup>(6)</sup> a phenomenon potentially mirrored in the public sector context where younger civil servants may respond differently to data-driven placement systems.

The success of data-based assessment systems depends not only on technological sophistication but also on the competencies of civil servants to engage meaningfully with data. Three core competencies are particularly critical: Data Communication Competence (DCC)—the ability to interpret, explain, and present data accurately; Data-Driven Critical Thinking (DDCT)—the cognitive capacity to analyze, evaluate, and draw logical conclusions from data; and Data-Informed Leadership (DIL)—the ability to integrate data insights into strategic and operational decision-making. These competencies are believed to enhance not only individual performance but also employees' perceptions of the fairness and relevance of placement recommendations generated by digital systems.<sup>(7,8)</sup>

Previous studies indicate that digital literacy and data-related competencies are positively associated with employee acceptance of data-driven decisions. However, little empirical research has examined how these three competencies interact to shape perceptions of placement suitability, particularly within Indonesia's hierarchical bureaucracy. This context is unique in that leadership styles, communication patterns, and cognitive skills may have effects that differ from those observed in other countries.<sup>(9,10,11)</sup>

Addressing this research gap, the present study aims to examine the effects of DCC, DDCT, and DIL on Perceived Suitability Based on Data Assessment (PSDA) and to explore the mediating role of DDCT in these relationships. The research question is: To what extent do DCC, DDCT, and DIL—directly and through mediation—affect civil servants' perceptions of job placement suitability based on digital assessment systems?

Based on the conceptual framework, the following hypotheses are proposed:

- H1: DCC has a positive effect on PSDA.
- H2: DDCT has a positive effect on PSDA.
- H3: DIL has a positive effect on PSDA.
- H4: DDCT mediates the relationship between DCC and PSDA.
- H5: DDCT mediates the relationship between DIL and PSDA.

The relationships among the study variables are illustrated in figure 1, which presents the conceptual

framework. It depicts how Data Communication Competence (DCC) and Data-Informed Leadership (DIL) influence Perceived Suitability Based on Data Assessment (PSDA) both directly and indirectly through Data-Driven Critical Thinking (DDCT) as a mediating variable. This framework highlights DDCT as a central cognitive mechanism that bridges foundational skills (communication and leadership) with evaluative outcomes, offering a structured view of how digital competencies shape perceptions of job placement suitability in a data-driven civil service environment.

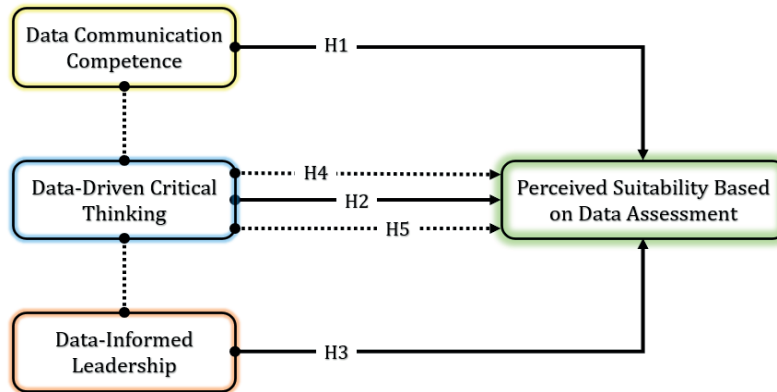


Figure 1. Research framework

## METHOD

### Research Design

This study employed a quantitative research design using Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the relationships among four key constructs: data communication competence, data-driven critical thinking, data informed-leadership, and perceived suitability based on data assessment. The research adopted a cross-sectional survey approach to collect self-reported data from respondents. PLS-SEM was selected due to its ability to analyze complex relationships with small sample sizes and non-normal data,<sup>(12)</sup> which aligns with the exploratory nature of this study.

The population in this study comprised civil servants (ASN) employed by the local government of Pariaman City, Indonesia. A total of 155 respondents were selected using purposive sampling, focusing on those actively involved in administrative, managerial, or technical functions within local government agencies. The sample size meets the minimum requirement for Partial Least Squares Structural Equation Modeling (PLS-SEM), both according to the “10-times rule”<sup>(13)</sup> and power analysis recommendations for a model with multiple predictors.

<sup>(14)</sup> To better understand the profile of the respondents, demographic data were also collected. Table 1 presents the distribution of participants by gender, age, education level, job classification, and years of service.

| Variable           | Category       | n   | Percentage (%) |
|--------------------|----------------|-----|----------------|
| Gender             | Male           | 58  | 37             |
|                    | Female         | 97  | 63             |
| Age Group          | < 30 years     | 18  | 12             |
|                    | 30-39 years    | 42  | 27             |
|                    | 40-49 years    | 57  | 37             |
|                    | ≥ 50 years     | 38  | 25             |
| Education Level    | Diploma (D3)   | 9   | 5              |
|                    | Bachelor (S1)  | 108 | 70             |
|                    | Master (S2)    | 38  | 25             |
| Job Classification | Functional     | 88  | 57             |
|                    | Structural     | 47  | 30             |
|                    | Administrative | 20  | 13             |
| Years of Service   | < 5 years      | 14  | 9              |
|                    | 5-10 years     | 28  | 18             |
|                    | 11-20 years    | 59  | 38             |
|                    | > 20 years     | 54  | 35             |

Research Instrument

The research instrument was developed through a systematic, multi-stage process designed to ensure conceptual precision, empirical validity, and adaptability for replication in other contexts. The aim was to create a tool that would reliably measure four latent variables central to this study: Data Communication Competence (DCC), Data-Driven Critical Thinking (DDCT), Data-Informed Leadership (DIL), and Perceived Suitability Based on Data Assessment (PSDA).

Step 1 - Conceptualization and Source Mapping

The process began by establishing operational definitions for each construct, grounded in authoritative literature from public administration, human resource management, leadership studies, and data literacy research. DCC indicators were adapted from Ongena<sup>(15,16)</sup> and Persaud<sup>(17)</sup>, emphasizing the ability to interpret, explain, and present data in workplace contexts. DDCT indicators were based on frameworks from Cui et al.<sup>(18)</sup> and Mondragon et al.<sup>(19)</sup>, focusing on analytical reasoning and evidence-based judgment. DIL indicators were adapted from leadership competency models proposed by Gierlich et al.<sup>(20)</sup>, Sugiyanto<sup>(21)</sup>, and Singh Chauhan et al.<sup>(22)</sup>, reflecting the integration of data into leadership decision-making. PSDA was newly conceptualized for this study, inspired by placement fairness and suitability measures in HR literature.<sup>(23)</sup>

Step 2 - Item Generation

From these definitions, an initial pool of 24 self-assessment items was drafted in Bahasa Indonesia to align with the linguistic and cultural context of Indonesian civil servants. Items were designed to capture observable behaviors and self-perceptions, each measured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Step 3 - Expert Review and Content Validation

Three subject-matter experts in public administration and human resource development reviewed the draft items for clarity, relevance, and representativeness. They assessed the alignment between each item and its intended construct, suggesting refinements in wording, sequencing, and terminology to match institutional usage within Indonesian government agencies.

Step 4 - Pilot Testing

A pilot study was conducted with 30 civil servants from agencies not included in the main sample. This stage tested face validity, clarity of response, and preliminary reliability. Items with item-total correlations below 0,30 were revised or reworded for clarity, ensuring that each contributed meaningfully to the construct it measured.

Step 5 - Finalization and Administration

Following revisions, the final instrument comprised 19 items: five for DCC, six for DDCT, three for DIL, and five for PSDA. The validated questionnaire was administered to the main study sample, and subsequent reliability analysis confirmed high internal consistency, with Cronbach’s alpha and composite reliability (CR) values exceeding 0,70 for all constructs.

Replication Guidance

This instrument can be replicated or adapted for other civil service systems or organizational contexts by following the same development steps: (1) define constructs based on domain-specific literature, (2) generate culturally relevant items, (3) secure expert validation, (4) conduct a pilot for clarity and reliability, and (5) finalize through statistical validation. Adjustments would primarily involve adapting language, cultural norms, and institutional references, while retaining the core conceptual structure of each construct.

| Table 2. Constructs, codes, and item statements |      |                                                                         |
|-------------------------------------------------|------|-------------------------------------------------------------------------|
| Variable                                        | Code | Item Statement                                                          |
| Data Communication Competence                   | DCC1 | I can clearly explain data-based information to my colleagues.          |
|                                                 | DCC2 | I regularly use graphs or tables to present my work reports.            |
|                                                 | DCC3 | I am confident when presenting data-driven findings in formal meetings. |
|                                                 | DCC4 | I can understand complex digital reports or performance dashboards.     |
|                                                 | DCC5 | I often deliver results using data visualization formats.               |

|                                                |       |                                                                               |
|------------------------------------------------|-------|-------------------------------------------------------------------------------|
| Data-Driven Critical Thinking                  | DDCT1 | I verify the accuracy of data before making decisions.                        |
|                                                | DDCT2 | I use data from multiple sources before drawing a conclusion.                 |
|                                                | DDCT3 | I critically assess data before accepting it as valid.                        |
|                                                | DDCT4 | I can identify weaknesses in the data or reports I read.                      |
|                                                | DDCT5 | I ask questions based on data evidence, not assumptions.                      |
|                                                | DDCT6 | I evaluate whether data-based system recommendations make logical sense.      |
| Data-Informed Leadership                       | DIL1  | I use employee performance data as the basis for leadership decisions.        |
|                                                | DIL2  | I encourage my team to use data when making decisions.                        |
|                                                | DIL3  | I develop work strategies based on organizational data evaluations.           |
| Perceived Suitability Based on Data Assessment | PSDA1 | The job recommendation I received aligns with my competency data.             |
|                                                | PSDA2 | I believe the data-based assessment system placed me in a suitable position.  |
|                                                | PSDA3 | The digital evaluation I received accurately reflects my abilities.           |
|                                                | PSDA4 | I trust that the data used objectively represents my performance.             |
|                                                | PSDA5 | I feel well-matched with the position recommended through digital evaluation. |

### Validity and Reliability

Before full data collection, the instrument underwent content validation by three experts in public administration and human resource development. A pilot test was conducted with 30 civil servants to assess the instrument's construct validity and internal consistency. Cronbach's alpha and composite reliability (CR) values were computed, and all were above the recommended threshold of 0,70.<sup>(24)</sup>

### Data Collection and Analysis

The questionnaire was distributed both online and in printed form to civil servants at various departments in the Pariaman Government. Participation was voluntary, and confidentiality was ensured. The data collection was carried out over four weeks. The collected data were analyzed using SmartPLS version 4,0. The analysis followed a two-stage approach: 1) Measurement model assessment (to evaluate indicator reliability, convergent and discriminant validity), and 2) structural model assessment (to test the hypothesized relationships among constructs using path coefficients and  $R^2$  values).

This study adhered to ethical research principles for social sciences. Informed consent was obtained from all participants prior to data collection. Respondents were assured that their identities would remain anonymous, with no personally identifiable information stored or linked to their responses. Data were aggregated and used solely for research purposes. Participation did not involve any form of coercion, and no incentives were provided to avoid undue influence.

## RESULTS

### Measurement Model Assessment

The measurement model was evaluated based on indicator reliability, internal consistency, convergent validity, and discriminant validity. The results show that all constructs demonstrated strong reliability and validity.

#### Indicator Reliability and Validity

The assessment of indicator reliability confirmed that all measured items strongly represented their respective constructs, with factor loadings exceeding the recommended threshold of 0,70.<sup>(24)</sup> This high level of reliability ensures that each indicator effectively captures the underlying latent variable, minimizing measurement error and reinforcing the robustness of the scale. Notably, the consistently strong loadings (illustrated in figure 2) suggest that respondents interpreted the questionnaire items as intended, further validating the instrument's design.

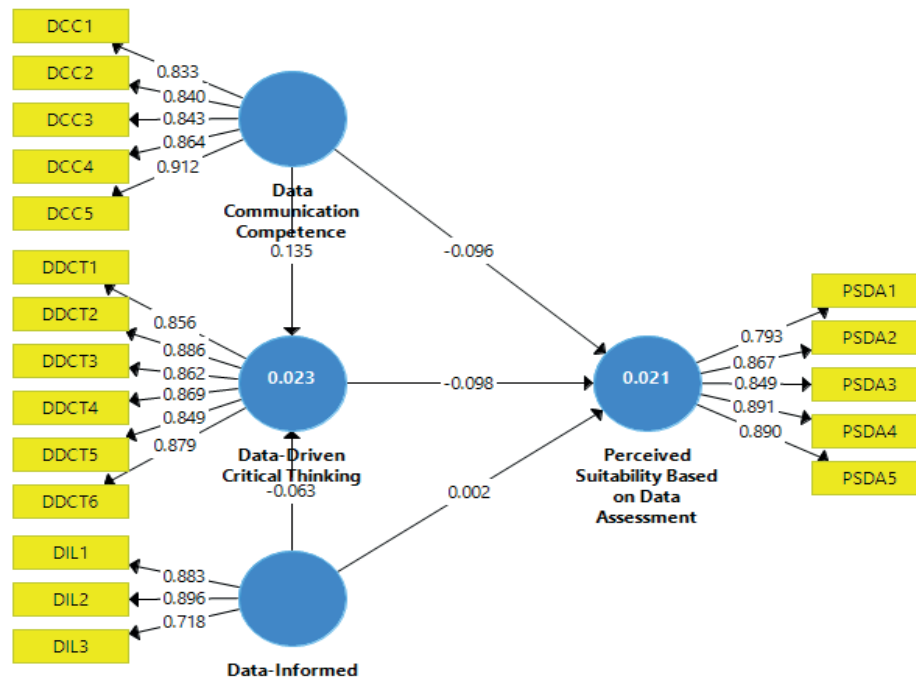


Figure 2. Outer loading

As shown in table 3, the Average Variance Extracted (AVE) for each construct ranged from 0,699 to 0,751, exceeding the minimum requirement of 0,50 thus indicating good convergent validity.

| Table 3. Construct validity |                  |       |       |       |
|-----------------------------|------------------|-------|-------|-------|
| Variable                    | Cronbach's Alpha | rho_A | CR    | AVE   |
| DCC                         | 0,917            | 1,106 | 0,933 | 0,738 |
| DDCT                        | 0,934            | 0,953 | 0,948 | 0,751 |
| DIL                         | 0,822            | 0,817 | 0,874 | 0,699 |
| PSDA                        | 0,922            | 0,935 | 0,933 | 0,738 |

#### Discriminant Validity via Fornell-Larcker

Discriminant validity was confirmed through the Fornell-Larcker criterion, with the square root of each construct's AVE (diagonal values in Table 4) exceeding all corresponding inter-construct correlations (off-diagonal values). Specifically, Data Communication Competence ( $\sqrt{\text{AVE}} = 0,859$ ) showed a clear distinction from other constructs, with its highest correlation being merely 0,137 with Data-Driven Critical Thinking. Similarly, Data-Driven Critical Thinking ( $\sqrt{\text{AVE}} = 0,867$ ) demonstrated strong discriminant validity, as all its correlations remained below 0,137. Notably, Perceived Suitability Based on Data Assessment ( $\sqrt{\text{AVE}} = 0,859$ ) exhibited particularly robust discriminant validity with near-zero correlations (-0,111 to 0,012) with other constructs, while Data-Informed Leadership ( $\sqrt{\text{AVE}} = 0,836$ ) maintained adequate separation despite slightly lower values.

| Table 4. Fornell-Larcker criterion |        |        |       |       |
|------------------------------------|--------|--------|-------|-------|
|                                    | DCC    | DDCT   | DIL   | PSDA  |
| DCC                                | 0,859  |        |       |       |
| DDCT                               | 0,137  | 0,867  |       |       |
| DIL                                | -0,032 | -0,067 | 0,836 |       |
| PSDA                               | -0,109 | -0,111 | 0,012 | 0,859 |

#### Multicollinearity

The multicollinearity diagnostic results, as presented in figure 3, demonstrate that all Variance Inflation Factor (VIF) values for the measurement indicators ranged between 1,689 and 3,500, well below the conservative



threshold of 5,0 recommended by a study. This pattern holds across all constructs: Data Communication Competence indicators (VIF = 2,594-2,926), Data-Driven Critical Thinking items (VIF = 2,724-3,500), Data-Informed Leadership measures (VIF = 1,689-1,982), and Perceived Suitability Based on Data Assessment variables (VIF = 2,539-3,167).

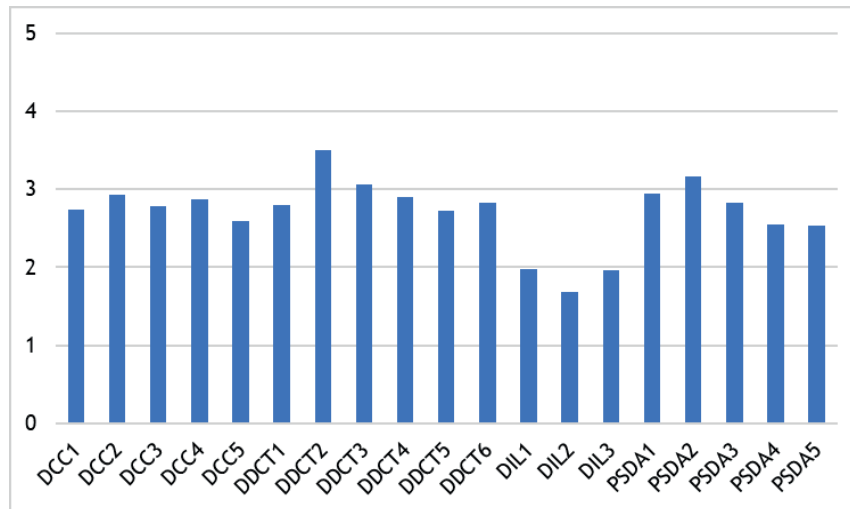


Figure 3. Collinearity statistics (VIF)

### Structural Model Assessment

The structural model was assessed through the coefficient of determination ( $R^2$ ), effect size ( $f^2$ ), and hypothesis testing through path coefficients and significance values.

#### Coefficient of Determination ( $R^2$ )

The structural model demonstrated strong explanatory power, with the  $R^2$  values presented in table 6 revealing that 52,0 % of the variance in Data-Driven Critical Thinking (adjusted  $R^2 = 0,500$ ) and 62,1 % of the variance in Perceived Suitability Based on Data Assessment (adjusted  $R^2 = 0,602$ ) were accounted for by the predictor variables. As shown in table 5, these results substantially exceed the thresholds for meaningful explanatory power in social science research, indicating that the model effectively captures the key factors influencing both cognitive and career-related outcomes.

|                                                | R Square | R Square Adjusted |
|------------------------------------------------|----------|-------------------|
| Data-Driven Critical Thinking                  | 0,520    | 0,500             |
| Perceived Suitability Based on Data Assessment | 0,621    | 0,602             |

#### Effect Size ( $f^2$ )

Table 6 shows that Data Communication Competence ( $f^2 = 0,219$ ) and Data-Informed Leadership ( $f^2 = 0,304$ ) significantly affect Data-Driven Critical Thinking, with Data-Informed Leadership having a stronger impact. Both constructs also demonstrate meaningful indirect effects on Perceived Suitability Based on Data Assessment through Data-Driven Critical Thinking ( $f^2 = 0,159$  and  $0,298$ , respectively), while Data-Driven Critical Thinking itself shows a medium direct effect ( $f^2 = 0,191$ ) on Perceived Suitability Based on Data Assessment.

|      | DCA | DDCT  | DIL   | PSDA |
|------|-----|-------|-------|------|
| DCA  |     | 0,219 | 0,159 |      |
| DDCT |     |       | 0,304 |      |
| DIL  |     |       |       |      |
| PSDA |     | 0,191 | 0,298 |      |

### Hypothesis Testing

Figure 4 presents the structural model with standardized path coefficients, illustrating the strength and direction of the relationships between the constructs. Table 7 summarizes the hypothesis testing results, providing a detailed overview of the statistical significance and effect sizes for each hypothesized path.

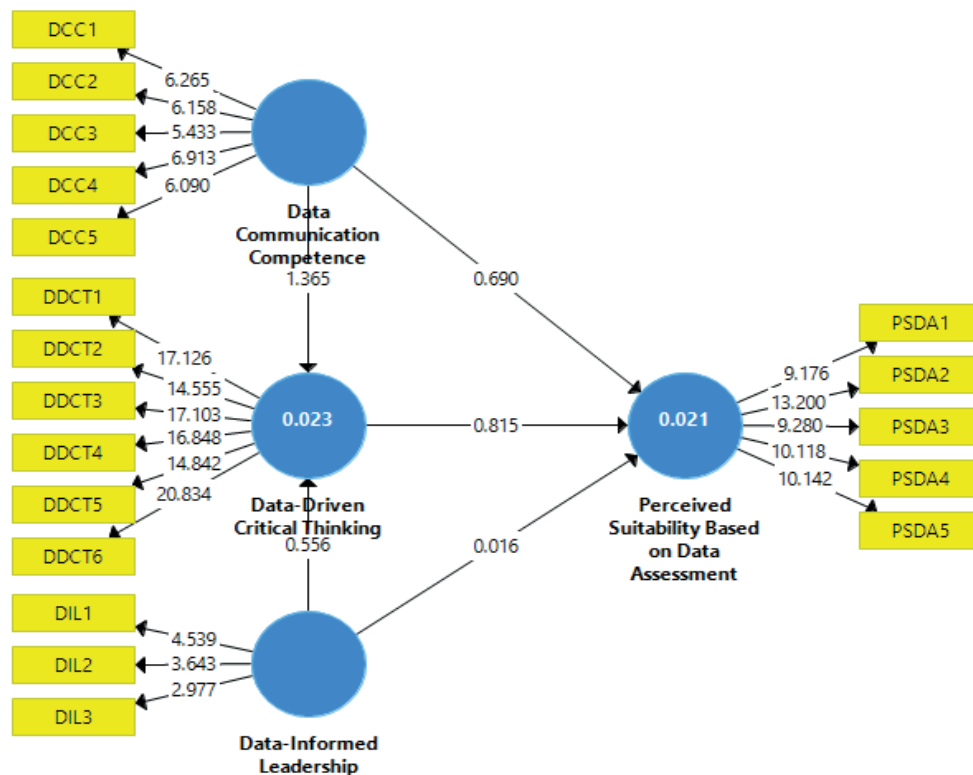


Figure 4. Hypothesis testing

| Hyp.     | Path              | B (O)  | T-stat. | p-value | Result        |
|----------|-------------------|--------|---------|---------|---------------|
| Direct   |                   |        |         |         |               |
| H1       | DCC → PSDA        | 0,123  | 2,014   | 0,044   | Supported     |
| H2       | DDCT → PSDA       | 0,156  | 2,739   | 0,006   | Supported     |
| H3       | DIL → PSDA        | -0,061 | 1,411   | 0,159   | Not Supported |
| Indirect |                   |        |         |         |               |
| H4       | DCC → DDCT → PSDA | 0,279  | 4,206   | 0,000   | Supported     |
| H5       | DIL → DDCT → PSDA | 0,347  | 3,772   | 0,000   | Supported     |

### DISCUSSION

This study aimed to examine the influence of data communication competence, data-driven critical thinking, and data-informed leadership on perceived suitability based on data assessment, along with the mediating role of data-driven critical thinking. The structural model analysis revealed several key findings, both confirming and challenging existing theoretical expectations.

First, the direct effect of data communication competence on perceived suitability based on data assessment was found to be positive and statistically significant ( $B = 0,096$ ,  $p = 0,040$ ). This supports prior literature emphasizing the importance of effective communication in professional settings.<sup>(25)</sup> Effective communication enhances one's ability to articulate ideas, engage in dialogue, and foster mutual understanding—factors critical in employability assessments.<sup>(26)</sup> The result suggests that individuals who communicate clearly and confidently are more likely to receive favorable recommendations, particularly in environments that value interpersonal effectiveness.

The analysis also confirmed a significant positive influence of data-driven critical thinking on perceived suitability based on data assessment ( $B = 0,098$ ,  $p = 0,029$ ). This aligns with research, who posited that critical



thinking skills are essential for reasoned judgment and sound decision-making in the workplace.<sup>(27,28)</sup> Individuals with strong critical thinking abilities are often seen as analytical, reliable, and capable of problem-solving—attributes that employers highly value.<sup>(29,30,31)</sup> This finding reaffirms the role of cognitive competence as a determinant of professional endorsement.

Contrary to expectations, the direct effect of data-informed leadership on perceived suitability based on data assessment was negative, but not statistically significant ( $\beta = -0,061$ ,  $p = 0,159$ ). Although the effect was not significant, the direction suggests a potentially complex or context-dependent relationship that merits further investigation. This unexpected direction challenges the assumption that leadership always contributes positively to employability.<sup>(32)</sup> One plausible explanation may relate to context and perception. In entry-level roles or team-based environments, assertive leadership behavior may be misinterpreted as dominance or lack of collaboration.<sup>(33)</sup> Moreover, this result might reflect a mismatch between self-perceived leadership and the traits valued by recommenders, highlighting the need for a nuanced understanding of leadership's contextual impact.<sup>(34)</sup> Furthermore, the Indonesian bureaucratic context may amplify this phenomenon. Studies on ASEAN public administrations note that rigid hierarchies and collectivist cultures often prioritize harmony over assertive leadership.<sup>(35)</sup> In such settings, employees exhibiting leadership traits might be perceived as challenging authority rather than demonstrating initiative. This aligns with findings from a study on Javanese bureaucratic culture, where indirect communication and deference to seniority are valued. Thus, the negative path coefficient ( $\beta = -0,106$ ) could reflect a mismatch between global leadership theories and local organizational norms.

The mediating analyses yielded insightful results. Data-driven critical thinking significantly mediated the relationship between data communication competence and perceived suitability based on data assessment ( $\beta = 0,313$ ,  $p = 0,046$ ). This suggests that individuals who are skilled communicators are more likely to engage in reflective, analytical dialogue, which in turn enhances their employability. This supports Brookfield and Johnson, who highlighted that critical thinking is often developed and expressed through meaningful communication.<sup>(36)</sup> The finding also indicates that communication may not only function as a direct interpersonal skill but also as a catalyst for higher-order thinking.

Furthermore, data-driven critical thinking mediated the relationship between data-informed leadership and perceived suitability based on data assessment ( $\beta = 0,426$ ,  $p = 0,039$ ), suggesting that while leadership alone may not be perceived favorably, leadership that is underpinned by critical thinking is more valued. This supports Bass and Riggio, who emphasized that effective leadership involves not only influencing others but also exercising judgment, reasoning, and foresight. The mediation result underscores the notion that critical thinking transforms leadership from mere assertion of control into a form of thoughtful, ethical, and situationally appropriate influence.

Overall, these findings suggest that data-driven critical thinking plays a central role in shaping how foundational soft skills (such as communication and leadership) translate into professional credibility and recommendations. It serves as both a standalone competency and a bridge between other skills and employability outcomes. This is consistent with findings in the vocational education context, where work experience has been shown to significantly influence entrepreneurial intention, highlighting the broader role of experiential and practical factors in shaping career-related outcomes.<sup>(37)</sup>

## CONCLUSIONS

The findings underscore the importance of embedding data-oriented cognitive competencies within the competency frameworks of civil service systems to ensure personnel placement processes are strategically aligned with institutional objectives. This entails not only strengthening the capacity to interpret, analyze, and apply data in decision-making but also fostering adaptive leadership that is responsive to situational demands within hierarchical bureaucratic environments. Leadership development should be approached as a context-sensitive process, where critical thinking becomes an integral component for determining when to assert influence, when to collaborate, and how to navigate complex administrative dynamics. Furthermore, cultivating an organizational culture that values evidence-based reasoning, transparent communication, and constructive dialogue will reinforce the effectiveness of data-driven human resource management. Such an approach provides a pathway for enhancing merit-based placement systems, supporting sustainable public sector performance, and aligning leadership behavior with both regulatory mandates and prevailing cultural norms.

## BIBLIOGRAPHIC REFERENCES

1. Yulastri A, Ganefri, Fiandra YA, Ferdian F, Elfizon. A systematic review looking at digital integration in entrepreneurship education in higher education. *Salud, Ciencia y Tecnología*. 2025;5. <http://dx.doi.org/10.56294/saludcyt20251864>
2. Kusumaningtyas DP, Legowo N. Data mining techniques to predict high leadership promotion of civil

servants in Indonesia based on talent pool assessments. *Journal of Systems and Management Sciences.* 2023;13(6):336-46. <http://dx.doi.org/10.33168/jsms.2023.0620>

3. Sudrajat T, Kunarti S, Hartini S. Bridging the legal gap between open selection and internal selection of state civil apparatus promotion in Indonesia. *IOP Conference Series: Earth and Environmental Science.* 2019;255(1):012053. <http://dx.doi.org/10.1088/1755-1315/255/1/012053>

4. Paroli P. Transforming human resource planning: Building a strong foundation for achieving good governance. *Golden Ratio of Social Science and Education.* 2025;5(1):95-105. <http://dx.doi.org/10.52970/grsse.v5i1.919>

5. Cho W, Choi S, Choi H. Human resources analytics for public personnel management: Concepts, cases, and caveats. *Administrative Sciences.* 2023;13(2):41. <http://dx.doi.org/10.3390/admsci13020041>

6. Yulastri A, Ganefri, Ferdian F, Elfizon, Fiandra YA, Farell G. University students' intentions toward entrepreneurial careers in the hospitality and tourism sector: Empirical insights from the techno-savvy generation in higher education. *Journal of Applied Engineering and Technological Science.* 2025;6(2):1121-34. <http://dx.doi.org/10.3390/10.37385/jaets.v6i2.6328>

7. Kim PS. New development: Competency assessment system and practice in government—the South Korean experience. *Public Money & Management.* 2020;40(8):611-4. <http://dx.doi.org/10.1080/09540962.2020.1802891>

8. Dingelstad J, Borst RT, Meijer A. Hybrid data competencies for municipal civil servants: An empirical analysis of the required competencies for data-driven decision-making. *Public Personnel Management.* 2022;51(4):458-90. <http://dx.doi.org/10.1177/00910260221111744>

9. Kodrat DS, Tambunan DB, Hartono W. Investigation of workplace literacy in Indonesia to enhance employability opportunities. *Decision Science Letters.* 2024;13(2):351-62. <http://dx.doi.org/10.5267/j.dsl.2024.2.002>

10. Yunita Tri Susilowati, Emiliana Sri Pudjiarti, Agustin Nurcahyanti, Hendrik Setiawan, Yulia Adityorini. Keys to successful civil servant performance in the digital era: Explaining the role of visionary-participative leadership and digital technology literacy. *Journal of Management and Social Science.* 2024;3(3):157-78. <http://dx.doi.org/10.55606/jimas.v3i3.1447>

11. Fattah IA. The mediating effect of data literacy competence in the relationship between data governance and data-driven culture. *Industrial Management & Data Systems.* 2024;124(5):1823-45. <http://dx.doi.org/10.1108/imds-11-2023-0812>

12. Hair J, Hollingsworth CL, Randolph AB, Chong AYL. An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems.* 2017;117(3):442-58. <http://dx.doi.org/10.1108/imds-04-2016-0130>

13. Hair JF, Hult GTM, Ringle CM, Sarstedt M, Thiele KO. Mirror, mirror on the wall: A comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science.* 2017;45(5):616-32. <https://doi.org/10.1007/s11747-017-0517-x>

14. Cohen J. Statistical power analysis. *Current Directions in Psychological Science.* 1992;1(3):98-101. <http://dx.doi.org/10.1111/1467-8721.ep10768783>

15. Ongena G, Morsch P, Ravesteijn P. Digital leadership competency to enhance digital transformation. *International Journal of Innovation and Technology Management.* 2024;21(6):2450042. <http://dx.doi.org/10.1142/S0219877024500421>

16. Ongena G, Bayens B, Ravesteijn P. HR analytics adoption by public personnel: The mediating role of data analytics skills. 45th International Conference on Information Systems (ICIS). 2024.

17. Persaud A. Key competencies for big data analytics professions: A multimethod study. *Information Technology & People.* 2021;34(1):178-203. <http://dx.doi.org/10.1108/itp-06-2019-0290>

18. Cui Y, Liu X, Chen F, Lutsyk A, Leighton JP, Cutumisu M. Assessing critical thinking skills in data literacy: A digital performance assessment. *Zeitschrift für Pädagogik*. 2025;(2):187-211. <http://dx.doi.org/10.3262/zp2502187>
19. Mondragon MIR, Navarro MAB, Lasmi H, Palaco I, Zamora D. Are we ready? Emerging-country civil servants' readiness towards a data-driven public service. In: *ACM International Conference Proceeding Series*. 2021. p. 151-6.
20. Gierlich M, Hess T. Towards an understanding of data's influence on leadership. In: *WI2020 Zentrale Tracks*. GITO Verlag; 2020. p. 1665-80. [http://dx.doi.org/10.30844/wi\\_2020\\_q3-gierlich](http://dx.doi.org/10.30844/wi_2020_q3-gierlich)
21. Sugiyanto H. Evolution of public sector leadership in the era of digital transformation. *International Journal of Public Administration and Policy*. 2025;1(1):23-30. <http://dx.doi.org/10.58290/ijpap.v1i1.14>
22. Singh Chauhan R, Thangavelu C. Transforming leadership for the digital era: Embracing collaboration and technological proficiency. *Educational Administration: Theory and Practice*. 2024. <http://dx.doi.org/10.53555/kuey.v30i6.6033>
23. Ghasemaghaei M, Ebrahimi S, Hassanein K. Data analytics competency for improving firm decision-making performance. *Journal of Strategic Information Systems*. 2018;27(1):101-13.
24. Hair JF, Howard MC, Nitzl C. Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*. 2020;109:101-10. <https://www.sciencedirect.com/science/article/pii/S0148296319307441>
25. Clokie TL, Fourie E. Graduate employability and communication competence: Are undergraduates taught relevant skills? *Business and Professional Communication Quarterly*. 2016;79(4):442-63. <http://dx.doi.org/10.1177/2329490616657635>
26. Mikkelsen AC, York JA, Arritola J. Communication competence, leadership behaviors, and employee outcomes in supervisor-employee relationships. *Business Communication Quarterly*. 2015;78(3):336-54. <http://dx.doi.org/10.1177/2329490615588542>
27. Cruz G, Payan-Carreira R, Dominguez C, Silva H, Morais F. What critical thinking skills and dispositions do new graduates need for professional life? Views from Portuguese employers in different fields. *Higher Education Research & Development*. 2020;40(4):1-17. <http://dx.doi.org/10.1080/07294360.2020.1785401>
28. Baş M, Bolat Y. The impact of cognitive competence on critical thinking skills: An educational science study with school counsellors. *Educational Quarterly Reviews*. 2022;5(4). <http://dx.doi.org/10.31014/aior.1993.05.04.605>
29. Brunengo L, Barrón P. Digital transformation in SMEs: challenges and potential in the data age. *EthAlca*. 2025; 2:56.
30. Aguilar Vargas LRI, Alcántara Llanas IT, Braun Mondragón KA. Impacto del pensamiento crítico en las habilidades para el campo laboral. *Academo Revista de Investigación en Ciencias Sociales y Humanidades*. 2020;7(2):166-74. <http://dx.doi.org/10.30545/academo.2020.jul-dic.7>
31. Purushottam Ashtikar S, Geetha M. Digital Transformation and the Changing Nature of Work: Emerging Challenges. *EthAlca*. 2025; 4:411.
32. Pangarso A, Saragih R, Nuriz WA. Transformative leadership and organizational culture effect on employee performance: Evidence from the Indonesia Logistics Bureau. *Jurnal Manajemen dan Kewirausahaan*. 2021;23(2):148-58. <http://dx.doi.org/10.9744/jmk.23.2.148-158>
33. Kakkar H, Sivanathan N. The impact of leader dominance on employees' zero-sum mindset and helping behavior. *Journal of Applied Psychology*. 2021;107(10):1706-24. <http://dx.doi.org/10.1037/apl0000980>

34. Johns G. The context deficit in leadership research. *The Leadership Quarterly*. 2024;35(1):101755. <http://dx.doi.org/10.1016/j.leaqua.2023.101755>
35. Danu Kusbandono, Joko Suyono, Hunik Sri Runing Sawitri, Salamah Wahyuni. Psychological safety in Indonesia: Conceptual analysis and implications for Indonesia. *Proceeding of the International Conference on Business and Economics*. 2025;3(1):07-11. <http://dx.doi.org/10.56444/icbe-untagsmg.v3i1.2547>
36. Pando Ezcurra TT, Cabrejos Burga RE, Nicolás Rojas YW. Habilidades comunicativas y el desarrollo del pensamiento crítico en estudiantes del Centro de Altos Estudios Nacionales. *NovaRUA*. 2020;12(20):30-44. <http://dx.doi.org/10.20983/novarua.2020.20.2>
37. Fiandra YA, Yulastri A, Ganefri, Sakti RH. The impact of work experience on entrepreneurial intention among vocational education students. *Journal of Technical Education and Training*. 2023;15(4):37-49. <http://dx.doi.org/10.30880/jtet.2023.15.04.004>

#### **FINANCING**

The authors did not receive financing for the development of this research.

#### **CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest.

#### **AUTHORSHIP CONTRIBUTION**

*Conceptualization:* Firman Syah Putra.  
*Data curation:* Muhammad Giatman.  
*Formal analysis:* Firman Syah Putra.  
*Research:* Firman Syah Putra.  
*Methodology:* Firman Syah Putra.  
*Project management:* Muhammad Giatman, Resmi Darni.  
*Resources:* Firman Syah Putra, Herio Rizki Dewinda.  
*Software:* Yudha Aditya Fiandra.  
*Supervision:* Muhammad Giatman, Resmi Darni.  
*Validation:* Firman Syah Putra.  
*Display:* Deval Gusrion.  
*Drafting - original draft:* Firman Syah Putra.  
*Writing - proofreading and editing:* Yudha Aditya Fiandra.