

Exploratory and Confirmatory Factor Analysis of a Workforce Equity Scale for Government Employees

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Abstract - This study evaluated the psychometric structure of a workforce equity scale administered to randomly selected to 526 permanent civil service–eligible government employees, with the goal of gaining deeper insight into perceptions of fairness, equity, and inclusion in public sector workplaces. Equity in employment remains a critical concern in government institutions in the Philippines, where fairness in hiring, evaluation, and career development can directly affect employee morale, trust, and performance. To establish construct validity, exploratory and confirmatory factor analyses (EFA & CFA) were conducted on survey data. The factor analysis generated a three-factor model for the workforce equity scale. The three factors were labeled as Fair Work Distribution and Evaluation, Equitable Hiring Practices, and Equal Access to Career Growth. From the original 25-item test of the workforce equity scale, it was reduced to 12 items with 4 items each factor. The final scale captures the most meaningful indicators of workforce equity. The generated three-factor structure showed strong model fit and high internal consistency. It was established in this study the valid measure for workforce equity in the government entities. The resulting scale can serve as a diagnostic to assess the perceptions of government employees related to workforce equity. This instrument is recommended for use to improve retention and organization effectiveness and provide actionable insights for workforce development and policy interventions.

Keywords: workforce equity, factor analysis, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), psychometric structure

I. INTRODUCTION

Workforce equity in government and in the private sector involves ensuring inclusive representation of diverse groups at all employment levels by removing structural barriers to opportunity and advancement. Research shows that fair pay, equitable hiring practices, and opportunities for career growth are critical factors that improve job satisfaction and employee retention. Furthermore, a study revealed that supportive work environments and clear pathways for advancement have been associated with reduced turnover and improved workforce stability across various sectors (Galiano-Coronil & Blanco-Moreno, 2024).

Similarly, a 2023 study found that equitable wage distribution increased retention, with fair pay adjustments influencing employees' decisions to stay (Lora, 2023). In healthcare, Caires et al. (2023) reported that clear hiring and career development programs reduced turnover by 30% during post-pandemic.

There's a limited study on determining the psychometric analysis of workforce equity scales in the public sector despite ongoing efforts to address challenges related to fair workload distribution, fair hiring, and promotions. Compared to the private sector, relatively few studies

have applied factor analytic methods, particularly using both the exploratory and confirmatory factor analysis, to the workforce equity scale within government settings (Alnuaimi, 2022).

This study examined the psychometric properties of a workforce equity scale designed for public sector employees. Utilizing exploratory and confirmatory factor analysis, the study offers a systematic, evidence-based approach to identifying distinct dimensions of equity related to structural, cultural, and individual factors. These insights provide a foundation for developing more effective and targeted policy interventions to promote fairness and inclusivity in public sector workplaces.

This study addressed following research questions:

1. What are the underlying factors that contribute to workforce equity among government employees, as revealed by exploratory factor analysis?
2. What evidence from confirmatory factor analysis supports the validity of these factors?
3. What psychometrically valid workforce equity scale is developed in this study

II. LITERATURE REVIEW

A. *Workforce Equity in the Public Sector*

Workforce equity is pivotal for promoting fair treatment, equal career opportunities, and equitable access to organizational resources regardless of employees' backgrounds. Research consistently demonstrates that organizations committed to equitable practices—such as fair pay, unbiased hiring, and transparent advancement paths—experience higher job satisfaction, reduced turnover, and increased workforce diversity (Galiano-Coronil & Blanco-Moreno, 2024; de Souza & White, 2024).

Jaiswal (2023) and de Souza & White (2024) both emphasize the value of transparent, structured recruitment practices. Such processes reduce bias, enhance inclusivity, and foster stronger employee engagement and organizational commitment. Jaiswal (2023) further reports that organizations implementing transparent hiring and equity initiatives experienced a 30% drop in turnover, a finding echoed by de Souza & White, who note that inclusive recruitment also boosts productivity.

Workplace equity entails fair distribution of workload, just compensation, benefits, and opportunities, transparent decision-making, and valid assessment and evaluation among employees (Galie et al., 2021). According to Harvey and Park (2022), equity is associated with fair career development, a high level of satisfaction among employees, and high retention and productivity. Combining all these creates a multidimensional equity scale for the government sector.

B. *Psychometric Evaluation of Instruments*

Accurate assessment of workforce equity depends on psychometrically sound instruments in which validity and reliability is serving as the foundation for generating meaningful insights across various disciplines.

Construct validity is used to establish a psychometrically sound measure. It is commonly assessed through exploratory and confirmatory factor analysis (EFA and CFA)

(Sampoornam, 2018; Guanilo Echevarria et al., 2019). EFA identifies latent dimensions among items without assuming a predefined structure, whereas CFA evaluates how well those dimensions align with a theoretical model (Tavakol & Wetzel, 2020). Together, these approaches offer complementary evidence of an instrument's construct validity.

Validity refers the degree to which an instrument accurately measures the specific concept the researcher intended to measure. Reliability, consistency, and internal coherence are related but distinct aspects of measurement. Internal consistency commonly assessed using Cronbach's alpha—demonstrates whether items within a scale reliably reflect a single construct (Souza et al., 2017; Noble & Smith, 2015). Rigorous psychometric testing ensures that equity-related measures accurately represent employee perceptions, supporting their use across diverse organizational settings.

C. Theoretical Framework: Equity Theory

This study is based on J.C. Adam's equity theory (1965), as referenced in Lewis et al. (2021). The theory suggests that individuals assess the ratio between their contributions, known as inputs, and what they receive in return, referred to as outcomes. In the context of organizations, whether public or private, inputs consist of employee-related factors such as performance, educational background, work experience, and motivation. Outcomes, meanwhile, encompass the rewards employees obtain in exchange for their efforts, including salary, benefits, promotions, and opportunities for career growth. The theory further asserts that when there is an imbalance between inputs and outcomes, individuals are motivated to correct this by modifying their attitudes, efforts, or received rewards to reestablish equity.

Gallie et al. (2022) emphasize that organizations implementing equity-focused practices foster not only fairness but also a motivated and productive workforce. These practices will lead to employee job satisfaction and retention (Gallie et al., 2021). Harvey and Park (2022) support this equity-focused practices to levels of individuals. This highlights the framework of Equity as a guide for the practice of equity in the workplace in the government sectors.

III. MATERIALS AND METHODS

This validity study examined the factorial structure of a workforce equity scale using exploratory and confirmatory factor analysis. The scale underwent content validation before exploratory factor analysis (EFA) procedures were performed. EFA identifies the dimensionality of an instrument. It helps determine the number of factors, or the latent variables, the scale is supposed to measure. It refines the construct and further improves the psychometric properties of the scale under study.

Confirmatory factor analysis (CFA) was performed after EFA to test the fit of the generated factor structure of the observed data. Several model goodness-of-fit indices were used, such as the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the Tucker-Lewis index (TLI), to validate the reliability and generalizability of the factor model.

2. Population and Sampling Technique

This study surveyed 526 Philippine government employees, all civil service-eligible with permanent appointments under Philippine labor law (2024). Respondents were randomly drawn from 16 city offices across Luzon (7), Visayas (3), and Mindanao (6).

Following Comrey and Lee's (1992) guidelines, as cited in Kalkbrenner (2021), the sample size is considered "very good" for psychometric validation. The sample-to-item ratio also exceeded recommended standards, with more than 20 participants per item (526 for 25 items), surpassing the common heuristic of 5–10 cases per item for EFA and CFA. This ensures stable factor structures and reliable parameter estimates.

3. Instrumentation

The researchers developed a 25-item workforce equity scale, using a five-point Likert format to assess employees' perceptions. Item construction was informed by literature and expert review. For validation, the items first underwent content review, followed by EFA and CFA. Items with low loadings (<0.40), cross-loadings, or weak contributions to reliability were removed. This refinement produced a 12-item scale representing coherent, statistically robust factors.

4. Data Gathering Procedure

Both printed and online surveys were administered to maximize response rates. Printed questionnaires were mainly distributed to municipal employees in offices with limited internet access, while Google Forms facilitated responses in offices permitting online participation. Due to participant preference, most data were collected via printed forms.

Ethical standards were strictly adhered to. Clearance from the university's Ethics Review Board was obtained before data collection. Participation was entirely voluntary, with informed consent and the right to withdraw at any time without penalty. Confidentiality and anonymity of respondents were guaranteed.

5. Analysis of Data

Statistical analyses were performed using SPSS, Jamovi, and AMOS 24. EFA and CFA were carried out in Jamovi, with AMOS 24 used for model validation and measurement model extraction. In the EFA, principal axis factoring was applied with an oblique rotation method (oblimin). Oblimin rotation was chosen over orthogonal methods (e.g. varimax) because the underlying factors of workforce equity were theoretically expected to correlate rather than be entirely independent. This choice allows for a more realistic representation of the data structure and improves interpretability of interrelated factors.

IV. RESULTS AND DISCUSSION

Exploratory and confirmatory factor analyses were used to validate the workforce equity scale for government employees. This process ensured the development of a fair, generalizable measurement tool. Exploratory analysis identified key factors, and confirmatory analysis supported their validity.

A. Underlying Factors that Contribute to Workforce Equity Among Government Employees

The underlying factor structure of the workforce equity scale was determined using exploratory factor analysis (EFA). The analysis revealed a three-factor model, which accounted for 77.7% of the total variance. The Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy is 0.927, implying an adequate sampling adequacy. The Bartlett's Test of Sphericity was significant ($p < 0.001$), confirming factorability of the data (Beavers et al., 2013; Kalkbrenner, 2021).

Table 1. Factor loadings

	Factor		
	1	2	3
Equity1	-0.035	0.852	0.070
Equity2	0.060	0.960	-0.097
Equity3	-0.072	0.799	0.103
Equity4	0.142	0.511	0.163
Equity8	0.054	-5.61e-4	0.835
Equity9	-0.070	-0.005	0.987
Equity10	0.187	0.075	0.652
Equity13	0.191	0.182	0.541
Equity17	0.933	0.008	-0.015
Equity18	0.930	-0.061	0.053
Equity19	0.935	0.025	-0.014
Equity20	0.865	0.052	0.016

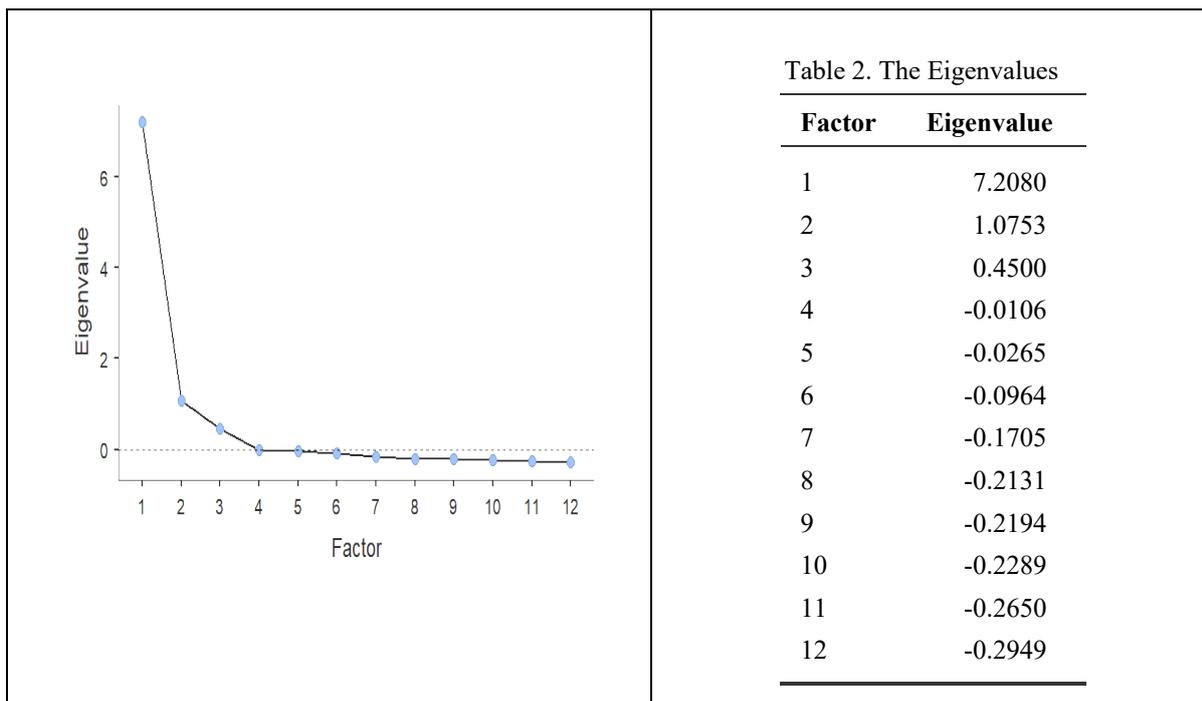
The result of EFA in Table 1 supported a three-factor solution, retaining factors with eigenvalues over one per the Kaiser criterion. Combining the three factors explained 77.7% of the total variance. Factor 1 contributed 30.0%, Factor 2 is 23.7%, and Factor 3 explained 23.3% of the total variance. Furthermore, the results also revealed a low inter-factor correlation. Negative loadings show an inverse relationship with a factor, while near-zero loadings indicate little or no association, helping identify which items belong to each factor.

Each factor had four items. Factor 1, "Fair Work Distribution and Evaluation" (items 17–20), addressed equitable mentoring access, workload, performance evaluation, and work distribution—key to employee fairness perceptions and outcomes (Khajavi, 2023). Factor 2, "Equitable Hiring Practices" (items 1–4), reflected merit-based, non-discriminatory recruitment. Factor 3, "Equal Access to Career Growth" (items 8, 9, 10, 13), measured fairness in promotions, assignments, training, and advancement.

The scree plot in Figure 1 shows a steep drop in eigenvalues after Factor 1, which has the highest value above 7, explaining large proportion of the variance. Factors 2 and 3 have eigenvalues just above 1, meeting the Kaiser criterion, while subsequent values flatten below 1, indicating only the first three factors meaningfully explain variance in the workforce equity scale.

Table 2 shows eigenvalues, with only factors 1 and 2 exceeding 1 per the Kaiser criterion. Subsequent factors, including some negative values, indicate no meaningful factors, so only the first two were retained for analysis.

Figure 1. The Scree plot



B. Confirmatory Factor Analysis Evidence that Supports Validity of Factors Extracted from Exploratory Factor Analysis

The exploratory factor analysis suggested a three-factor solution, and this result was supported by confirmatory factor analysis (CFA). The theoretical foundation of the construct was tested through confirmatory factor analysis. The final three-factor model is presented in the generated measurement model in Figure 2.

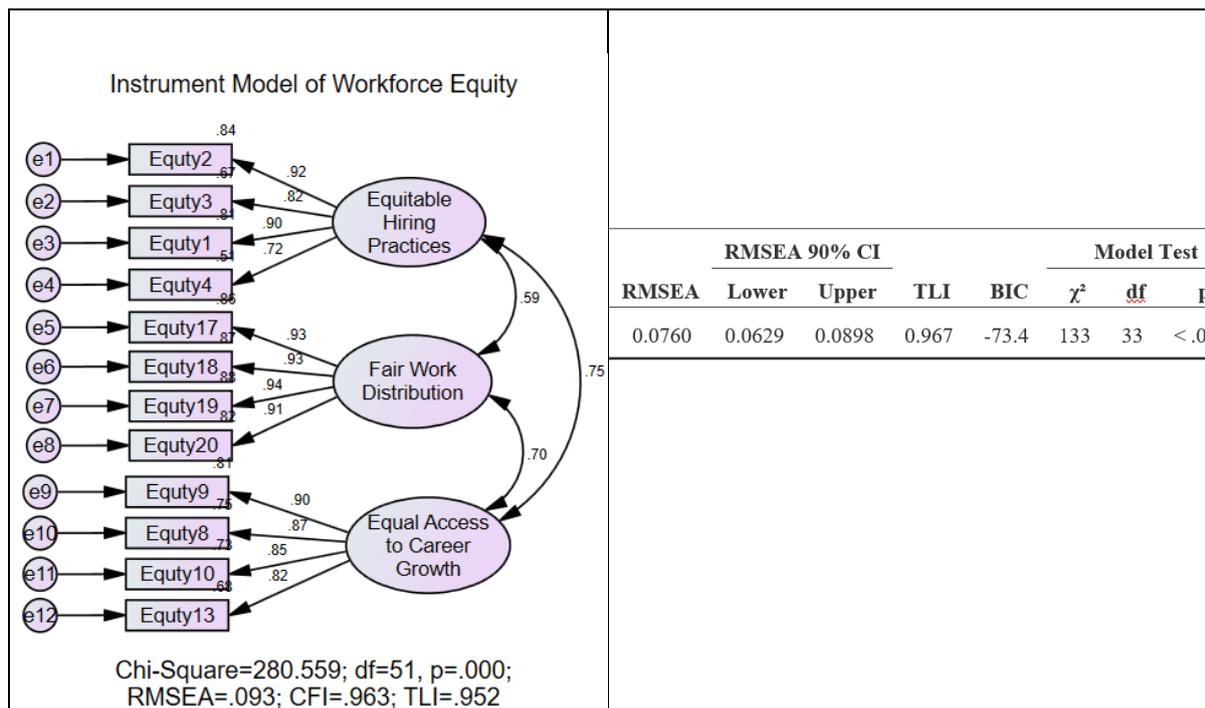
The instrument model of workforce equity shown in figure 2 represents a confirmatory factor analysis (CFA) validating a three-factor structure of the construct. The model illustrates the relationships between observed items (Equity1 through Equity20) and three latent factors: Equitable Hiring Practices, Fair Work Distribution, and Equal Access to Career Growth.

Each latent factor is measured by four observed variables (indicators), all of which have high standardized factor loadings, ranging from 0.72 to 0.94, indicating strong and statistically significant relationships between each factor and its respective items

The inter-factor correlations are also substantial, with values of 0.59 between *Equitable Hiring Practices and Fair Work Distribution*, 0.75 between *Fair Work Distribution and Equal Access to Career Growth*, and 0.70 between *Equitable Hiring Practices and Equal Access to Career Growth*. These moderate to strong correlations indicate that while the three factors are distinct, they are also meaningfully related, reflecting interconnected dimensions of workforce equity.

Willmer et al. (2019) emphasize the use of the models' goodness of fit indices, such as root mean square error of approximation (RMSEA), Akaike's information criterion (AIC), Bayesian information criterion (BIC), comparative fit index (CFI), Tucker-Lewis index (TLI), and the standardized root mean square residual (SRMSR), to evaluate the overall goodness of fit of the CFA model. It indicates whether the theorized factor structure is consistent with the data.

Figure 2. Measurement model of the three-factor



Model fit indices support the adequacy of the model. The Comparative Fit Index (CFI) is 0.963 and the Tucker-Lewis Index (TLI) is 0.952, both exceeding the commonly accepted threshold of 0.90, indicating a good model fit. Although the Root Mean Square Error of Approximation (RMSEA) is 0.093, slightly above the ideal cutoff of 0.08, it still falls within an acceptable range for complex models, considering the strong fit indicated by the CFI and TLI.

The chi-square statistic is significant ($\chi^2 = 280.559$, $df = 51$, $p < .001$), which is expected given the sample size sensitivity of this test. Overall, the model provides robust evidence for the validity of the three-factor structure representing workforce equity, demonstrating that the instrument reliably captures the intended latent dimensions.

C. Convergent and Discriminant Validity

Convergent and discriminant validity are two important aspects of construct validity. It ensures that the instrument accurately assesses the concept it is intended to measure. Table 3 presents construct validity analysis results using AMOS 23.

Table 3. Validity Analysis

Factor	Composite Reliability (CR)	Average Variance Extracted (AVE)	Maximum Shared Variance (MSV)	Maximum Reliability (MaxR(H))	F1	F2	F3
Factor 1	0.905	0.707	0.566	0.925	0.841		
Factor 2	0.960	0.857	0.493	0.961	.593***	0.926	
Factor 3	0.920	0.742	0.566	0.924	.753***	.702***	0.861

Confirmatory factor analysis supported the construct validity of the three-factor workforce equity model. Convergent validity was demonstrated through high Composite Reliability (0.905, 0.960, 0.920) and Average Variance Extracted values (0.707, 0.857, 0.742), all exceeding recommended thresholds. The maximum Reliability (0.924–0.961) further

indicated precise and consistent measurement of the latent constructs. Discriminant validity was confirmed using the Fornell-Larcker criterion, with each factor's AVE exceeding its Maximum Shared Variance and the square root of AVE surpassing inter-factor correlations, establishing factor distinctiveness. Cronbach's alpha for the overall model was 0.946, with strong reliability across individual factors (0.918, 0.901, 0.960).

D. The Psychometrically Valid Workforce Equity Scale

In this study, a psychometrically sound Workforce Equity Scale was developed, structured around three distinct factors, with four items assigned to each factor—for a total of twelve items. Exploratory Factor Analysis (EFA) revealed this three-factor structure, and Confirmatory Factor Analysis (CFA) confirmed its fit and construct validity. Each subscale demonstrated strong internal consistency reliability.

V. CONCLUSION

This study validated a 12-item Workforce Equity Scale among Philippine government employees, revealing a three-factor structure: Fair Work Distribution and Evaluation, Equitable Hiring Practices, and Equal Access to Career Growth. The scale offers a reliable tool for identifying equity gaps and guiding HR and policy interventions in the public sector. Future research should test its stability over time and adapt it for diverse industries and cultural contexts.

AUTHORS' CONTRIBUTIONS

The study was a collaborative effort among the three authors. Dr. Jolly Balila and Dr. Edwin Balila were actively involved in the conceptualization of the research, development of the methodology, data analysis, and manuscript writing. Dr. Marvin C. Hernandez contributed significantly by facilitating data collection and conducting the literature review.

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