






Systematic Review

Systematic Review of Studies Using Confirmatory Factor Analysis for Measuring Management Skills in Sustainable Organizational Development

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Abstract: This systematic review explores the most validated methodologies for measuring managerial skills that contribute to sustainable organizational development, with a focus on confirmatory factor analysis (CFA). Using PRISMA guidelines and the PICOS framework, a systematic search in the Web of Science (6810 articles) and Scopus (11,267 articles) identified 27 relevant studies. Our findings emphasize the significance of valid, reliable measurement scales for key managerial competencies, such as leadership, decision-making, communication, and teamwork, which enhance employability and foster sustainable management aligned with the Sustainable Development Goals (SDGs). CFA emerges as a robust technique for ensuring methodological rigor in competency assessment, confirming theoretical models with empirical data. This study identifies gaps in current measurement frameworks, advocating for expanding models to incorporate digital transformation, sustainability leadership, and crisis management skills. Additionally, it underscores the importance of developing context-specific instruments that reflect sectoral and cultural variations. This review contributes to management education and workforce development by providing a validated framework for assessing managerial skills, supporting organizations in aligning leadership training with sustainability-driven business goals. Our findings offer practical implications for designing competency-based curricula and corporate training programs to enhance organizational resilience in an evolving global landscape.

Keywords: sustainable education; skills measurement; human talent; managerial training; management education; organizational psychology



Academic Editors: Jesús N. García and Judit García-Martín

Received: 8 January 2025

Revised: 26 February 2025

Accepted: 1 March 2025

Published: 8 March 2025

Citation: Andino-González, P.; Vega-Muñoz, A.; Salazar-Sepúlveda, G.; Contreras-Barraza, N.; Lay, N.; Gil-Marín, M. Systematic Review of Studies Using Confirmatory Factor Analysis for Measuring Management Skills in Sustainable Organizational Development. *Sustainability* **2025**, *17*, 2373. <https://doi.org/10.3390/su17062373>

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1. Introduction

The significance of developing managerial skills stems from their pivotal role as a key requirement for modern organizations to drive institutional improvement and achieve successful outcomes [1–4]. These skills serve as critical differentiators of productivity across

various business sectors, directly influencing not only organizational profitability but also employability and job stability for individuals [5,6]. Furthermore, by aligning managerial competencies with sustainability principles, these skills contribute to the achievement of the Sustainable Development Goals (SDGs), particularly in fostering quality education (SDG 4), decent work and economic growth (SDG 8), and sustainable management practices (SDG 12), thus supporting a broader societal impact.

In this regard, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) highlights the importance of achieving SDG 4 (Quality Education) through its education target 4.4, which aims to significantly increase the number of youth and adults who acquire the necessary skills, particularly technical and vocational, to access employment, decent work, and entrepreneurship by 2030 [7]. However, despite their recognized importance, there is no universal consensus regarding a specific set of managerial skills, as they are often studied as isolated dimensions rather than as an integrated framework [8]. Additionally, the Organization for Economic Cooperation and Development (OECD, 2016) emphasizes that very few countries assess managerial skills directly due to the lack of agreement on definitions and the high costs and complexity of measurement [9]. This presents a significant barrier to sustainable development, as organizations struggle to identify and cultivate the competencies necessary to address economic, social, and environmental challenges.

2. Literature Review

2.1. Classification of Managerial Skills

Managerial skills are built and developed through education and training, which expand the potential of individuals, improving job performance, employability, and sustainable organizational growth [2,6,10–13]. These skills can be categorized into different groups based on their function and application. Technical skills are related to the practical knowledge needed for specific job functions, including technological and digital competencies [14]. Cognitive (intellectual) skills are essential for problem-solving, analysis, and decision-making [14]. Furthermore, managerial skills are divided into hard skills, which refer to technical knowledge, and soft skills, which involve personality traits and interpersonal abilities that are more difficult to develop [15,16].

Several theoretical models classify managerial skills into core dimensions. One of the most widely cited is the Seven Core Managerial Skills Model, which includes interpersonal, conceptual, technical, time management, diagnostic, communication, and decision-making skills [17]. Another relevant framework is the Ten Essential Managerial Skills Model, which categorizes competencies into three main groups: personal–technical skills (self-knowledge, problem-solving, and time/stress management), interpersonal–social skills (conflict resolution, motivation, communication, and leadership), and group management skills (delegation, change management, and teamwork) [18]. Similarly, the Corporate Council on Education, through the National Center for Education and Business of the Conference Board of Canada, developed the Employability Skills 2000+ framework, which classifies core managerial skills into three main categories. The fundamental skills group includes communication, information handling, numerical skills, and problem-solving. People management skills focus on positive behavior, responsibility, adaptability, learning, and workplace safety. Lastly, collaborative skills encompass teamwork and participation in projects and tasks [19,20].

These classifications reflect the absence of a standardized framework for defining managerial competencies, as they vary depending on industry demands and global trends [8]. While some models emphasize technical and interpersonal dimensions, others incorporate aspects related to leadership, decision-making, and adaptability. The challenge of

establishing a universally accepted set of managerial skills underscores the need for robust measurement instruments that can assess these competencies effectively across diverse organizational settings.

2.2. Managerial Skills and Employability in a Changing Job Market

Economic, technological, and social changes constantly reshape job structures and employability requirements [21]. The OECD has emphasized that generic and specific competencies are becoming increasingly relevant for future employment, as organizations demand professionals who can adapt to evolving labor market conditions [8,22–24]. In response to these shifts, organizations are increasingly investing in management development programs designed to enhance managerial skills through education, systematic training, and leadership development initiatives [25–27]. These programs aim to standardize managerial practices within organizations, equip managers with strategic decision-making abilities, and ensure that managers are prepared to lead sustainability-driven business environments.

Workers who participate in management development programs and achieve high levels of managerial competence benefit from increased employability, successful career transitions, and inclusion in corporate succession planning. These individuals are recognized as key assets within organizations, as they demonstrate the potential to assume higher managerial responsibilities, thereby contributing to the long-term sustainability and growth of the organization [27,28]. Additionally, management development is considered a strategic approach for promoting human talent to leadership positions, enhancing both the level of managerial expertise and the employability capital of individuals. Employability capital, in this context, refers to an individual's ability to secure and maintain sustainable employment [29].

2.3. The Need for Reliable Measurement Instruments

A crucial element of managerial development is the assessment of educational needs and skill proficiency among professionals and senior executives. Accurate measurement tools help organizations identify training gaps, assess different management styles, and ensure that leadership competencies align with sustainable development objectives [27,30]. However, according to a study by the Organization for Economic Cooperation and Development (OECD) [9], very few countries directly assess these skills, primarily due to a lack of consensus on the definitions of many relevant skills and the high costs and challenges associated with measurement. This challenge limits organizations' ability to implement effective skill development programs that enhance long-term competitiveness and workforce readiness for economic, social, and environmental challenges.

To bridge this gap, this study aims to establish a validated and reliable assessment framework for measuring managerial skills and employability attributes. A robust evaluation instrument would provide organizations with the necessary insights to improve talent development processes, ensure that human capital is better equipped for sustainability-driven labor markets, and contribute to the broader goal of aligning workforce competencies with sustainable business practices.

2.4. CFA as a Prominent Technique for Measuring Managerial Skills

Confirmatory factor analysis (CFA) has become a key methodology for measuring managerial skills due to its ability to validate theoretical models with empirical data [31–33]. Unlike exploratory factor analysis (EFA), which identifies underlying structures without prior hypotheses, CFA allows for confirming the factorial structure of previously defined managerial competencies, ensuring that the indicators used accurately represent the constructs being measured [34–36].

Its application in management studies facilitates the accurate assessment of key competencies such as leadership, decision-making, and teamwork, ensuring the validity and reliability of the scales used, and has been successfully applied in various studies measuring managerial skills, such as time management, business intelligence, and emotional skills, providing a deeper understanding of these competencies and validating theoretical models in studies by Hu and Bentler [37], Byrne [38], Kline [39], Plant et al. [40], Liu and Hallinger [41], Yuan et al. [42], and Faúndez and de la Fuente-Mella [43].

The assessment and optimization of managerial competencies through validated instruments are crucial for organizational sustainability. Previous research, such as the systematic review by Díaz-Burgos et al. [44], has demonstrated the significance of digital competencies in education and the workforce and their impact on learning and organizational resilience.

Moreover, by utilizing structural equation modeling, CFA allows for examining complex relationships between latent variables, offering a more detailed view of the impact of managerial skills on sustainable organizational development [38,39,45]. Compared to other techniques, CFA ensures greater statistical robustness and methodological rigor, making it an essential tool for research in management and business development [33,35,36].

2.5. Research Question and Study Objectives

Given these complexities, this study seeks to address the gap in measuring managerial skills by identifying the most reliable assessment methods that contribute to sustainable development and strengthen organizational resilience. Accordingly, the research question guiding this study is as follows:

What are the most rigorously validated methods for measuring managerial skills that, based on confirmatory factor analysis (CFA) and complemented by other validation tools, enable a rigorous and reliable assessment of these competencies in the context of sustainable development and organizational resilience?

The objective of this article is to systematically identify and analyze the most rigorously validated methods for measuring managerial skills, using confirmatory factor analysis (CFA) as a fundamental component within a comprehensive methodological approach, in combination with other quantitative and qualitative validation tools. To achieve this, a systematic literature review in the Web of Science (WoS) and Scopus is conducted to examine the applicability and reliability of various approaches used in the evaluation of managerial competencies. This study highlights those methods that significantly contribute to the sustainable development of organizations by strengthening organizational capacities and institutional resilience, promoting inclusive and responsible management practices, addressing gaps in current measurement frameworks, and aligning skill development with the principles of the Sustainable Development Goals.

This research aims to contribute to the development of a rigorous methodological framework for assessing managerial skills in sustainable organizational development. By validating measurement instruments through confirmatory factor analysis (CFA), it ensures strong psychometric properties and identifies key competencies such as leadership, decision-making, communication, teamwork, emotional intelligence, and change management. Our findings have practical implications for improving training programs and organizational strategies, aligning with digital transformation and sustainability, while supporting the achievement of the Sustainable Development Goals (SDGs).

3. Materials and Methods

In this review, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [46] and the PICOS (Population, Interventions, Comparators,

Outcomes, and Study) tool were used to establish eligibility criteria for articles [44,47,48], being also used by the authors of [49–52]. We have also generated a protocol registered in Zenodo [53], under the modified PROSPERO format recommended by Tricco et al. [54].

The initial search for articles was strengthened with the use of scientometrics for a systematic review [55], which focuses on knowledge production, spatiality for knowledge production, and knowledge relationships within the global network of actors [56,57]. This approach allowed refining the initial selection of articles based on a vector search using field labels and Boolean operators, as well as incorporating the mixed sequential use with the PRISMA guideline, which has been applied in other studies [40,58,59].

Articles with the search vector TS = (management NEAR/0 skills) were identified using the Web of Science (WoS) Core Collection databases: Science Citation Index Expanded (SCIE), Social Science Citation Index (SSCI), and Emerging Sources Citation Index (ESCI). These databases contain journals indexed in the WoS Journal Citation Report (JCR), considered high-quality sources whose impact is calculated annually based on the average number of citations received.

In parallel, a complementary search was conducted in Scopus using the equivalent search vector TITLE-ABS-KEY (“management skills”), retrieving studies where the term appears in the title, abstract, or keywords. This search identified a total of 11,267 articles, compared to 6810 articles from the WoS. Search vectors have been developed by the WoS and Scopus to avoid Boolean “AND” errors in multifield searches (e.g., title, abstract, and keywords), avoiding false positives in the search, by simultaneously finding words for a concept, but distributed separately in two or more fields of the search. Given the high indexing duplication between the WoS and Scopus, a deduplication process was carried out to remove overlapping records. The final selection of articles was specified based on eligibility criteria, including the target population, interventions, comparison elements, study outcomes, and research design, as shown in Table 1. After applying these filters, a total of 27 studies were selected for detailed review. (You can access the data in the Supplementary Material available on the platform).

Table 1. Eligibility criteria using PICOS (Population, Interventions, Comparators, Outcomes, and Study).

PICOS	Description
Population	Students, teachers, employers, employees
Interventions	Survey application
Comparator	Methods of analysis (validity and reliability), with instruments that measure skills
Outcomes	Valid and reliable measurement scales to study managerial skills
Study designs	No a priori restrictions. Quantitative and mixed types of studies were included.

Criteria for Quantitative Review Analysis

According to Méndez Martínez and Rondón Sepúlveda [60], exploratory factor analysis (EFA) is a statistical technique of interdependence, whose purpose is to define new factors from the analysis of a set of variables that are highly correlated with each other or to reduce the number of these by identifying the most relevant ones; it is used in the construction of scales and questionnaires.

In an AFE, correlations can be evaluated by means of Bartlett’s test of sphericity; partial correlations can also be measured through the Kaiser–Meyer–Olkin index (KMO), as well as the individual sample adequacy index (MSA), both of which take values between

0 and 1. The measures can be interpreted as unacceptable values when they are less than 0.5; poor when they are between 0.5 and 0.59; regular when they are between 0.6 and 0.79, and meritorious when they range from 0.8 to 1.

According to [61], confirmatory factor analysis (CFA) evaluates models that propose that a set of unobserved variables predict the variability of a set of observed variables. In addition, it evaluates the extent to which a theoretically organized set of factors fits the data through an analysis in which the deficiencies inherent to the exploratory perspective are corrected and a confidence level must be established.

In Table 2, the evaluation metrics used in the CFA in this study are defined, based on [60,61].

Table 2. Confirmatory factor analysis (CFA) evaluation metrics.

N.	Evaluation Metrics	Definition
1	Chi-square test (χ^2)	Allows for the evaluation of whether the model proposed fits the theorized distribution, comparing the observed data with the expected data according to the hypothesized model; a non-significant chi-square value indicates a good fit between the model and the data. Chi-square can be used for discrete distributions such as the binomial distribution and the Poisson distribution.
2	Root mean square error of approximation (RMSEA)	Evaluates the discrepancy between the hypothesized model and the population covariance matrix. Measures the average error per degree of freedom and considers both the complexity of the model and the sample size, which makes it a robust and widely used fit index.
3	Adjusted goodness-of-fit index (AGFI)	The GFI adjusted for the degrees of freedom for the proposed model. Calculates the proportion of the variance explained by the estimated covariance of the population.
4	Goodness-of-fit index (GFI)	Indicates the proportion of the information given by the estimation with respect to the information in the sample matrix. Evaluates the fitness of the model, considering the sample size and the number of indicators.
5	Comparative fit Index (CFI)	Indicates the proportion of improvement in the fit statistics based on non-centrality.
6	Normalized fit index (NFI)	Measures the proportional reduction in fit function when moving from the null model to the proposed model.
7	Non-normed fit index (NNFI)	Also known as the Tucker–Lewis index (TLI). Compares the fit by degrees of freedom of the proposed and null model, i.e., a model with no relationship between the variables.
8	Root mean squared residuals mean squared index (SRMR)	Fit index that provides an average of the deviations of the elements of the matrices.

It was necessary to perform an analysis of the following indicators and their parameters: the chi-square/ratio of degrees of freedom (χ^2/df), root mean square error approximation (RMSEA), adjusted goodness-of-fit index (AGFI), goodness-of-fit index (GFI), comparative fit index (CFI), normed fit index (NFI), non-normed fit index (NNFI), and root mean square root of residuals (SRMR or RMSR) to determine the validation and reliability parameters, which are shown in Table 3.

Table 3. Validation parameters and reliability.

Authors	Parameters	Sample	χ^2/df	RMSEA	AGFI	GFI	CFI	NFI	NNFI	SRMR
Schermelel-Engel et al. [62]	Good fit **	≥ 200	≥ 0	≤ 0.05	≥ 0.90	≥ 0.95	≥ 0.97	≥ 0.95	≥ 0.97	
			≤ 2		≤ 1.00	≤ 1.00	≤ 1.00	≤ 1.00	≤ 1.00	
	Acceptable fit *		> 2	> 0.05	≥ 0.85	≥ 0.90	≥ 0.95	≥ 0.90	≥ 0.95	
			≤ 3	≤ 0.08	< 0.90	< 0.95	< 0.97	< 0.95	< 0.97	
Kalkan and Kelecioğlu [63]	Good fit **	≥ 200								< 0.05
Acceptable fit *										

** Good fit and * acceptable fit, according to the parameters based on Schermelleh-Engel et al. [62] and Kalkan and Kelecioğlu [63].

4. Results

The bibliometric search identified a total of 6810 documents from the Web of Science (WoS) Core Collection (i.e., SCIE, SSCI, and ESCI) and an additional 11,267 records from Scopus. After removing duplicates, a total of 12,847 unique titles and abstracts remained.

Following an initial screening process, 3405 records were excluded as they were not classified as scientific articles. The remaining 8889 records, which were in English or Spanish and met the article classification criteria, were subjected to a second round of screening. At this stage, 8817 records that did not include a confirmatory factor analysis (CFA) were excluded, reducing the analyzed corpus to 72 full-text articles retrieved and screened.

Further refinements led to the exclusion of 46 articles that did not focus on managerial skills, resulting in 26 articles, plus 1 additional study recommended during the review process, bringing the total to 27 full-text articles assessed for eligibility. After applying the selection criteria defined by the PICOS tool, all 27 studies met the inclusion criteria and were incorporated into the final synthesis of this systematic review, as shown in Figure 1.

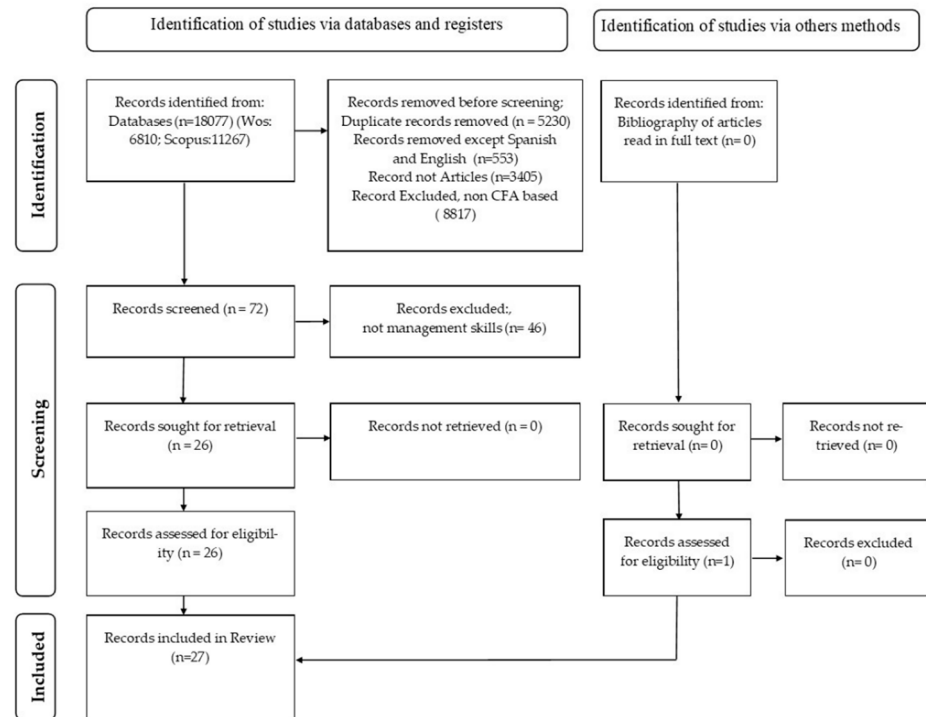


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) analysis flow.

This final selection ensures a methodologically robust corpus of studies, emphasizing validated approaches for measuring managerial skills, particularly those employing CFA-based assessments, contributing to a more rigorous evaluation framework in management research.

4.1. Qualitative Review Analysis

The twenty-seven articles that met the eligibility criteria were reviewed at the full-text level to determine precisely whether their characteristics offered homogeneous criteria that made them comparable. Table 4 shows the main identification and retrieval information obtained from the WoS databases (the details are in Appendix A).

Table 4 presents a high concentration of articles published in journals indexed in the SSCI (Social Science Citation Index) and SCIE (Science Citation Index Expanded), with additional studies indexed in the ESCI (Emerging Sources Citation Index). The selected studies include research published in reputable journals covering a diverse range of fields, ensuring methodological rigor and thematic relevance.

Regarding geographical distribution, empirical studies are widely distributed across different regions. The majority of the articles focus on Asia, with studies conducted in China, Thailand, Indonesia, Turkey, Vietnam, and Saudi Arabia. Meanwhile, five studies originate from the Americas, specifically from the United States, Chile, Mexico, Ecuador, and Honduras. Additionally, Europe is represented by research from Spain and Finland, while Australia and Morocco contribute further diversity to the corpus.

Thematically, the articles were published in journals categorized under the WoS and Scopus, primarily focusing on Psychology, Education, Social Sciences, and Business Management. This categorization highlights the interdisciplinary nature of managerial skills research, with an emphasis on leadership, organizational behavior, and competency assessment.

From a temporal perspective, the studies included in this review were published between 2004 and 2025, reflecting an increasing trend in managerial skills research over time. Notably, a significant portion of the studies were published after 2018, demonstrating a growing scholarly interest in leadership development, managerial competencies, and their implications for sustainable organizational growth.

Additionally, the source of empirical data across the selected studies is mainly survey-based, reinforcing the methodological consistency in measuring managerial skills through validated psychometric instruments. This further supports the reliability and comparability of the selected studies, ensuring that findings contribute to the broader discourse on management education, workforce adaptability, and leadership assessment.

Table 4. Articles included in the qualitative stage for review analysis.

Authors	Article Title	Journal Title	Publication Year	Country	Source Data Base Revised	DOI	Management Skills
Aldighrir, WM [64]	Impact of ai ethics on school administrators' decision-making: the role of sustainable leadership behaviors and diversity management skills	Current psychology	2024	Saudi Arabia	WoS, Scopus	10.1007/s12144-024-06862-0	Yes
Ali Y.; Kazmi S.F. [65]	Urdu translation and the validation of a 14-item measure to assess stress management skills in healthcare workers: measurement invariance across gender	Ethics in progress	2023	Pakistan	Scopus	10.14746/eip.2023.1.7	Yes
Andino-González, P; Vega-Muñoz, A; Salazar-Sepúlveda, G. [66]	Analyzing managerial skills for employability in graduate students in economics, administration and accounting sciences	Sustainability	2024	Honduras	WoS, Scopus	10.3390/su16166725	Yes
Babiak, P; Neumann, CS; Hare, RD [27]	Corporate psychopathy: talking the walk	Behavioral sciences and the law	2010	U.S.	WoS, Scopus	10.1002/bsl.925	Yes
Boonda, P; Preedeekul, A; Markmee, P. [67]	Analytical study of training program factors to develop the competency of regional operating officer (ROO) in the virtual service provider office (VSPO) in Thailand	Journal of health research	2018	Thailand	WoS, Scopus	10.1108/JHR-11-2017-006	Yes
Boonroungrut, C; Huang, F. [68]	Reforming theory of planned behavior to measure money management intention: a validation study among student debtors	Rausp management journal	2021	Thailand	WoS, Scopus	10.1108/RAUSP-02-2019-0029	Yes
Cha J.; Cichy R.F.; Kim S.H. [69]	The contribution of emotional intelligence to social skills and stress management skills among automated food service industry executives	Journal of human resources in hospitality and tourism	2009	U.S.	Scopus	10.1080/153328-40802274411	Yes
Corbett, H; Pearson, K; Karimi, L; Lim, W.K [70]	Improving the utility of multisource feedback for medical consultants in a tertiary hospital: a study of the psychometric properties of a survey tool	Australian health review	2019	Australia	WoS, Scopus	10.1071/AH17219	Yes

Table 4. Cont.

Authors	Article Title	Journal Title	Publication Year	Country	Source Data Base Revised	DOI	Management Skills
Dagar, C; Agrawal, A; Pandey, A [71]	Going beyond “I” vs. “you”- effectiveness and mechanism of yoga-based practices in management education to mitigate interpersonal conflict	International journal of management education	2025	India	WoS, Scopus	10.1016/j.ijme.2024.101089	Yes
Dao D.-H.; Pham D.-H.; Nguyen N.-D. [72]	Assessment of the factors impacting the financial management skills among university students: the moderating effect of financial education	Pakistan journal of life and social sciences	2024	Vietnam	Scopus	10.57239/PJLSS-2024-22.1.00420	Yes
Dirgatama C.H.A. [73]	Exploratory and confirmatory factor analysis of digital entrepreneur skills	Problems and perspectives in management	2024	Indonesia	Scopus	10.21511/ppm.22(2).2024.23	Yes
Eyana, Shiferaw Muleta; Masurel, Enno; Paas, Leo J. [74]	Causation and effectuation behaviour of Ethiopian entrepreneurs: Implications on performance of small tourism firms	Journal of Small Business and Enterprise Development	2018	Ethiopia	Scopus	10.1108/JSBED-02-2017-0079	Yes
Faúndez, MO; De La Fuente-Mella, H. [43]	Skills measurement strategic leadership based on knowledge analytics management through the design of an instrument for business managers of Chilean companies	Sustainability	2022	Chile	WoS, Scopus	10.3390/su14159299	Yes
García-Ros, R; Pérez-González, F; Hinojosa, E. [75]	Assessing time management skills as an important aspect of student learning: the construction and evaluation of a time management scale with Spanish high school students	School psychology international	2004	Spain	WoS, Scopus	10.1177/01430-34304043684	Yes
Habidin, NF; Yusof, SM; Fuzi, N.M [76]	Lean six sigma, strategic control systems, and organizational performance for automotive suppliers	International journal of lean six sigma	2016	Malaysia	WoS, Scopus	10.1108/IJLSS-04-2015-0013	Yes
Harmoinen, M; Niiranen, V; Munnukka, J; Suominen, T [77]	Reliability and validity of a further tested appreciative management scale	Journal of nursing measurement	2021	Finland	WoS, Scopus	10.1891/JNM-D-19-00047	Yes

Table 4. Cont.

Authors	Article Title	Journal Title	Publication Year	Country	Source Data Base Revised	DOI	Management Skills
Idkhan, AM; Syam, H; Sunardi; Hasim, A.H [20]	The employability skills of engineering students' assessment at the university	International journal of instruction	2021	Indonesia	WoS, Scopus	10.29333/iji.2021.1448a	Yes
Kocak, O [78]	Development and validation of a scale for assessing personal digital content management skills of higher education students	Malaysian journal of library and information science	2021	Turkey	WoS, Scopus	10.22452/mjlis.vol26no2.4	Yes
Liu, SN; Hallinger, P [41]	Principal instructional leadership, teacher self-efficacy, and teacher professional learning in China: testing a mediated-effects model	Educational administration quarterly	2018	China	WoS, Scopus	10.1177/0013161-x18769048	Yes
Guerrero, M. A., Manosalvas, C. A., Maino, A. A., Silva, D. R. [79]	Adaptation and validation of the management skills instrument from the perspective of subordinates [adaptación y validación del instrumento de habilidades gerenciales desde la perspectiva de los subordinados]	Revista de ciencias sociales	2023	Ecuador	Scopus	10.31876/rcs.v29i4.41260	Yes
Vázquez-Moreno, MA; Ledesma-Amaya, L; GarcíaCruz, R [80]	Validation of the ESCQ-20 questionnaire in Mexican adolescents	Revista universidad y sociedad	2022	Mexico	WoS	NR	Yes
Plant, JL; van Schaik, SM; Sliwka, DC; Boscardin, CK; O'Sullivan, PS [40]	Validation of a self-efficacy instrument and its relationship to performance of crisis resource management skills	Advances in health sciences education	2011	United States	WoS, Scopus	10.1007/s10459-011-9274-7	Yes
Qostal, A; Sellamy, K; Sabri, Z; Nouib, H; Lakhriissi, Y; Moumen, A [81]	Perceived employability of Moroccan engineering students: a PLS-SEM approach	International journal of instruction	2024	Moroccan	WoS	10.29333/iji.2024.17215a	Yes

Table 4. Cont.

Authors	Article Title	Journal Title	Publication Year	Country	Source Data Base Revised	DOI	Management Skills
Soriano-Alcantara, JM; Guillén-Gámez, FD; Ruiz-Palmero, J. [82]	Exploring digital competencies: validation and reliability of an instrument for the educational community and for all educational stages	Technology knowledge and learning	2024	Dominican Republic	WoS, Scopus	10.1007/s10758-024-09741-6	Yes
Torabi N.; Karimi F.; Nadi M.A. [83]	Strategies for succession planning in universities: a mixed-methods analysis	Malaysian online journal of educational management	2019	Iran	Scopus	10.22452/mojem.vol7no2.3	Yes
Yildirim, M.C. [84]	Developing a scale for constructivist learning environment management skills	Eurasian journal of educational research	2014	Turkey	WoS, Scopus	10.14689/ejer.2014.54.1	Yes
Yuan, Y; Chen, Q; Sun, XM; Liu, ZZ; Xue, G; Yang, D [42]	Development and preliminary validation of the youth leadership potential scale	Frontiers in psychology	2019	China	WoS, Scopus	10.3389/fpsyg.2019.02310	Yes

4.2. Quantitative Review Analysis

The articles selected were evaluated according to the breadth of topics on the measurement of managerial skills, according to the analysis method PRISMA in its quantitative stage. As a method for the analysis of the twenty-seven articles, the confirmatory factor analysis used to evaluate the validity and reliability of the instruments applied to measure managerial skills was identified.

Additionally, in this set, articles that studied empirical cases where data were collected through surveys were statistically analyzed using several multivariate statistical techniques, including exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). These are detailed for each item, and the only ones that report complete validation and reliability for the instruments applied are those that directly use CFA.

Table 5 reports the research that refers to the measurement skills related to this research; twenty-seven articles use confirmatory factor analysis as a method to measure managerial skills, a criterion that has been maintained for the inclusion of documents in the next stage in the review.

Table 5. Articles included in the quantitative stage for the review analysis.

Authors	Published Year	Country	Total Sample	Analysis Method *	Management Skills	Dimensions	SDGs and Contributions
Aldighrir, WM [64]	2024	Saudi Arabia	447	CFA, SEM	Sustainable leadership and diversity management	Rational decision-making, intuitive decision-making, dependent decision-making, avoidant decision-making, spontaneous decision-making	SDG 4: Quality Education—Ethical AI adoption enhances decision-making in educational management. SDG 8: Decent Work and Economic Growth—Strengthens leadership skills for better workforce adaptability.
Ali et al. [65]	2023	Pakistan	400	EFA, CFA	Stress management	Cognitive strategies and problem-solving, identification and use of social resources, relaxation abilities, adequate anger expression and assertiveness, perception of bodily tension	SDG 3: Good Health and Well-being—Improving stress management skills among healthcare workers to enhance psychological resilience and well-being.
Andino et al. [66]	2024	Honduras	225	CFA	Personal management skills, fundamental skills, teamwork skills	Communication, information management, problem-solving, positive attitudes, adaptability, learning, team collaboration	SDG 4: Quality Education—Enhancing employability skills in graduate students. SDG 8: Decent Work and Economic Growth—Preparing students for the labor market.
Babiak et al. [27]	2010	U.S.	203	CFA, SEM	Charisma, presentation style, leadership	Communication, strategic thinking, creativity, responsibility, teamwork	SDG 8: Decent Work and Economic Growth—Understanding the impact of psychopathic traits on leadership, corporate success, and ethical business practices

Table 5. Cont.

Authors	Published Year	Country	Total Sample	Analysis Method *	Management Skills	Dimensions	SDGs and Contributions
Boonda et al. [67]	2018	Thailand	938	EFA, CFA	Management skills	Personnel management and internal control, management, leadership, teamwork, learning, communication	SDG 3: Good Health and Well-being—Strengthening healthcare management skills to improve the system.
Boonroungrut et al. [68]	2020	Thailand	919	CFA	Money management	Money management	SDG 8: Decent Work and Economic Growth—Developing financial skills to foster economic growth.
Cha et al. [69]	2009	U.S.	191	CFA	Emotional intelligence, stress management	Emotional regulation, social skills, leadership adaptability	SDG 8: Decent Work and Economic Growth—Strengthens leadership adaptability in hospitality and foodservice industries.
Corbett et al. [70]	2018	Australia	734	CFA, SEM	Leadership, teamwork, Conflict management, Clinical decision-making	Clinical skills, humanistic skills, management skills	SDG 3: (Good Health and Well-being): Enhancing feedback processes for healthcare professionals to improve patient outcomes
Dagar et al. [71]	2025	India	113 (Study 1), 113 (Study 2: 57 experimental, 56 control)	CFA, SEM	Conflict management, prosocial behavior, emotional regulation	Interpersonal conflict, positive emotions, wandering mind, leadership	SDG 4: (Quality Education), SDG 8 (Decent Work and Economic Growth): Enhancing interpersonal conflict management through yoga-based practices to improve teamwork, leadership, and emotional intelligence.
Dao et al. [72]	2024	Vietnam	397	EFA, CFA, SEM	Financial management skills	Financial attitude, family financial socialization, financial capability, personal financial management, financial education	SDG 4: (Quality Education), SDG 8 (Decent Work and Economic Growth): Enhancing financial education and literacy to improve students' financial management skills for economic stability.

Table 5. Cont.

Authors	Published Year	Country	Total Sample	Analysis Method *	Management Skills	Dimensions	SDGs and Contributions
Dirgatama et al. [73]	2024	Indonesia	235	EFA, CFA	Digital entrepreneur skills	Interpersonal digital skills, idea and technology management skills, adaptation and innovation skills	SDG 8: Decent Work and Economic Growth—Enhancing digital entrepreneurship capabilities for economic resilience and job creation. SDG 9: Industry, Innovation, and Infrastructure—Promoting innovation through digital entrepreneurial competencies.
Eyana et al. [74]	2018	Ethiopia	118	EFA, CFA, Hierarchical Multiple Regression	Causation and effectuation in entrepreneurship	Causation, effectuation, financial and non-financial performance	SDG 8: Decent Work and Economic Growth—Relationship between business strategies and job creation.
Faúndez et al. [43]	2022	Chile	262	CFA	Business intelligence and analysis	Professional capability development, competence in learning environment, Integra skills, strategic vision competence for business intelligence and business analysis business managers	SDG 9: Industry, Innovation, and Infrastructure—Strategic leadership for business innovation.
García et al. [75]	2004	Spain	350	EFA, CFA	Time management	Short- and long-term planning	SDG 4: Quality Education—Enhancing time management in students for better learning outcomes.
Habidin et al. [76]	2016	Malaysia	252	CFA, SEM, EFA	Lean six sigma (LSS), strategic control systems (SCSs), organizational performance (OP)	Quality leadership, process improvement, statistical control, JIT, cost focus, financial management, supplier relationship	SDG 9: (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production): Enhancing operational efficiency and strategic control in the automotive industry to drive sustainability and competitiveness.

Table 5. Cont.

Authors	Published Year	Country	Total Sample	Analysis Method *	Management Skills	Dimensions	SDGs and Contributions
Harmoinen et al. [77]	2021	Finland	734	EFA, CFA	Appreciative management, leadership, workplace well-being	Systematic management, equality, appreciating know-how, promotion of well-being at work	SDG 3: (Good Health and Well-being), SDG 8 (Decent Work and Economic Growth): Improving leadership and management in healthcare and social work environments to foster well-being and equality.
Idkhan et al. [20]	2021	Indonesia	528	CFA	Fundamental, personal, and collaborative management	Communicating, information management, use of numbers, thinking and problem-solving, positive attitudes and behaviors, responsibility, adaptability, learning, working safely, teamwork, participation in projects and assignments	SDG 8: Decent Work and Economic Growth—Technical and social skills in engineering to boost employability.
Kocak [78]	2021	Turkey	600	EFA, CFA	Digital content management	Digital content management	SDG 9: Industry, Innovation, and Infrastructure—Digital management for technological transformation in universities.
Liu et al. [41]	2018	China	3600	CFA	Leadership, time management	Leadership, confidence, motivation, communication, time management, self-efficacy, learning	SDG 4: Quality Education—Improving leadership and time management for quality education.
Guerrero et al. [79]	2023	Ecuador	482	CFA	Management skills assessment	Technical skills: software, language, negotiation; interpersonal skills: self-control, self-confidence, empathy; conceptual skills: problem-solving, new concept development	SDG 8: Decent Work and Economic Growth—Enhancing managerial skills for sustainable employment and workforce development.

Table 5. Cont.

Authors	Published Year	Country	Total Sample	Analysis Method *	Management Skills	Dimensions	SDGs and Contributions
Vázquez-Moreno et al. [80]	2022	Mexico	455	EFA, CFA	Emotional	Perceiving and understanding emotions; managing and regulating emotions; expressing and naming emotions	SDG 4: Quality Education—Improving emotional skills for inclusive educational environments.
Plant et al. [40]	2011	U.S.	125	EFA, CFA	Task management, resource management	ANTS: decision-making, technical knowledge, task management. GRS: teamwork, communication, problem-solving and leadership	SDG 3: Good Health and Well-being—Crisis management to improve healthcare delivery.
Qostal et al. [81]	2024	Morocco	411	CFA, SEM	Employability skills	Fundamental skills, personal management skills, teamwork skills	SDG 4: Quality Education—Enhancing employability skills among Moroccan engineering students to improve workforce readiness.
Soriano-Alcantara et al. [82]	2024	Dominican Republic	1149	EFA, CFA	Digital competencies	Skills in management and transfer of technological data, software and hardware skills, web navigation skills, skills in using word processors, data processing and management skills, multimedia presentation design skills	SDG 4: Quality Education—Enhancing digital literacy among students, teachers, and parents to improve educational outcomes and lifelong learning opportunities.

Table 5. Cont.

Authors	Published Year	Country	Total Sample	Analysis Method *	Management Skills	Dimensions	SDGs and Contributions
Torabi et al. [83]	2019	Iran	1200	EFA, CFA	Succession planning	Meritocracy, management style, organizational readiness	SDG 4: Quality Education—Enhancing leadership and institutional sustainability in universities through succession planning strategies.
Yıldırım et al. [84]	2014	Turkey	733	EFA, CFA	Constructivist learning environment management	Communication and interaction, relation establishment, skills development, time usage and assessment, learning and teaching, learning environment organization	SDG 4 (Quality Education): Developing a validated scale to assess teachers' management skills in constructivist learning environments, promoting student engagement and effective classroom practices.
Yuan et al. [42]	2019	China	696	EFA, CFA	Leadership	Leadership attitude, communication, decision-making, stress management	SDG 4: Quality Education—Promoting youth leadership for quality education.

Analysis Method *: EFA: exploratory factor analysis, CFA: confirmatory factor analysis, SEM: structural equation modeling.

Table 6 presents in detail twenty-seven articles, already included in Table 3, which use various combinations of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). For these analyses, the indicators reported by the researchers are presented: the chi-square/degrees of freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), adjusted goodness-of-fit index (AGFI), goodness-of-fit index (GFI), comparative fit index (CFI), normed fit index (NFI), non-normed fit index (NNFI), and the standardized root mean square residual (SRMR) [60,61].

Table 6. Articles with their validation and reliability reported in the quantitative stage for the review analysis.

Authors	Countries	Samples	Factors	χ^2/df	RMSEA	AGFI	GFI	CFI	NFI	NNFI	SRMR
Aldighrir, WM [64]	Saudi Arabia	447	1	2.70 *	0.06	NR	0.96	0.93	NR	NR	0.02
			4	2.11 *	0.04	NR	0.99	0.95	NR	NR	0.01
			3	1.70 **	0.05	NR	0.97	0.93	NR	NR	0.02
			5	1.36 **	0.03	NR	0.99	0.96	NR	NR	0.01
Ali et al. [65]	Pakistan	400	2	1.44 **	0.033	0.961	0.993	0.993	0.978	NR	NR
Andino et al. [66]	Honduras	225	3	1.226 **	0.032	NR	0.993	0.986	NR	0.997	NR
Babik et al. [27]	U.S.	203	4	NR	NR	NR	NR	NR	NR	NR	0.02
Boonda et al. [67]	Thailand	938	1	1.55 **	0.029 **	0.975 **	0.991 **	0.998 **	0.995 **	NR	0.008 **
Boonroungrut et al. [68]	Thailand	919	1	2.24 *	0.06 *	NR	0.94 *	0.96 *	NR	NR	NR
Cha et al. [69]	U.S.	191	3	2.35 *	0.050	NR	NR	0.905	NR	0.904	NR
			3	2.16 *	0.078	NR	NR	0.970	NR	0.940	NR
			1	1.30 **	0.040	NR	NR	0.989	NR	0.978	NR
Corbett et al. [70]	Australia	75	3	4.12	0.06	NR	NR	0.95	NR	NR	NR
Dagar et al. [71]	India	113	4	1.03 **	0.02	NR	NR	.98	NR	NR	0.07
			4	1.27 **	0.05	NR	NR	.87	NR	NR	0.09
			4	1.44 **	0.06	NR	NR	.81	NR	NR	0.09
			4	1.58 **	0.07	NR	NR	.75	NR	NR	0.10
Dao et al. [72]	Vietnam	397	5	2.9 *	0.08	NR	NR	0.9	NR	NR	NR
Dirgatama et al. [73]	Indonesia	235	4	2.927 *	0.091	0.722	0.761	0.869	0.814	NR	NR
			4	1.128 **	0.023	0.939	0.960	0.996	0.964	NR	NR
Eyana et al. [74]	Ethiopia	118	5	NR	NR	NR	NR	NR	NR	NR	NR
Faúndez et al. [43]	Chile	262	1	1.57 **	0.047 **	NR	NR	0.918	0.804	0.915	NR
García et al. [75]	Spain	350	3	2.57 *	0.08 *	NR	0.86	0.86	NR	0.81	0.06 *
Habidin et al. [76]	Malaysia	252	7	1.345 **	0.037	0.826	0.848	0.958	NR	NR	NR
			4	1.432 **	0.042	0.878	0.901	0.967	NR	NR	NR
			4	2.313 *	0.072	0.864	0.902	0.958	NR	NR	NR
Harmoinen et al. [77]	Finland	734	5	4.778	0.072	NR	NR	NR	NR	NR	NR
Idkhan et al. [20]	Indonesia	528	3	0.943 **	0.006 **	NR	0.912 *	0.974 **	0.516	0.972 **	NR
Kocak [78]	Turkey	600	1	2.03 *	0.06 *	NR	0.86	0.92	0.90 *	NR	0.099 **
Liu et al. [41]	China	3414	4	1.314 **	0.06 *	NR	NR	0.853	NR	0.847	0.05 *
Guerrero et al. [79]	Ecuador	482	3	NR	NR	NR	NR	NR	NR	NR	NR
Vázquez-Moreno et al. [80]	Mexico	455	1	0.66 **	0.021 **	NR	0.993 **	0.998 **	NR	NR	0.044 **
Plant et al. [40]	U.S.	125	2	1.85 **	0.08 *	NR	NR	0.91	NR	0.89	NR
Qostal et al. [81]	Moroccan	411	4	NR	NR	NR	NR	NR	NR	NR	NR
Soriano et al. [82]	Dominican Republic	1149	6	4.432	0.096	NR	NR	0.939	0.923	NR	NR
			6	2.155 *	0.057	NR	NR	0.988	0.978	NR	NR
Torabi et al. [83]	Iran	1200	7	14.68	NR	NR	NR	NR	NR	NR	NR
Yıldırım et al. [84]	Turkey	316	6	1.47 **	0.039	0.86	NR	0.95	NR	0.94	0.042
Yuan et al. [42]	China	696	1	2.16 *	0.041 **	NR	NR	0.963 *	NR	0.937	0.022 **

NR—Not reported in the analyzed article; ** Good fit; * Acceptable fit, according to the parameters in Table 4, based on [62,63].

Table 7 shows the results for the comparison of validity and reliability indicators, the product of the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), detailing the five articles that report the best indicators in this study. The analysis reflects the comparison of the following indicators: the chi-square/relation of degrees of freedom (χ^2/df), root mean square error of approximation (RMSEA), adjusted goodness-of-fit index (AGFI), goodness-of-fit index (GFI), comparative fit index (CFI), normed fit index (NFI), non-normed fit index (NNFI), and standardized root mean square residual (SRMR), with respect to the parameters previously established in Table 5.

Table 7. Validation and reliability in articles reporting the best indicators.

Authors	Countries	Total Sample	Factors	χ^2/df	RMSEA	AGFI	GFI	CFI	NFI	NNFI	SRMR
Boonda et al. [67]	Thailand	938	1	1.55 **	0.029 **	0.975 **	0.991 **	0.998 **	0.995 **	NR ⁺	0.008 **
Dagar et al. [71]	India	113	4	1.03 **	0.02	NR	NR	0.98	NR	NR	0.07
Idkhan et al. [20]	Indonesia	528	3	0.943 **	0.006 **	NR	0.912 *	0.974 **	0.516	0.972 **	NR
Vázquez-Moreno et al. [80]	Mexico	455	1	0.66 **	0.021 **	NR	0.993 **	0.998 **	NR	NR	0.044 **
Yuan et al. [42]	China	696	1	2.16 *	0.041 **	NR	NR	0.963 *	NR	0.937	0.022 **

NR—Not reported in analyzed article; ** Good fit; * Acceptable fit.

4.3. Managerial Skills and Their Measurement Across Different Contexts

The 27 reviewed studies provide a broad perspective on managerial skills and their assessment across various fields, including education, business, healthcare, and entrepreneurship. The research highlights the importance of validated measurement tools and their applicability in assessing competencies such as leadership, decision-making, emotional intelligence, stress management, financial literacy, and digital adaptation, as we can see in the table in Appendix A.

Studies on leadership and decision-making skills demonstrate their significance in managerial performance. Aldighrir et al. [64] found that AI ethics and diversity management skills play a key role in shaping sustainable leadership behaviors among school administrators. Similarly, Liu et al. [41] demonstrated that principal instructional leadership positively influences teacher professional learning, particularly in self-efficacy and time management skills. On the other hand, Babiak et al. [27] explored the influence of corporate psychopathy on career advancement, showing that individuals with high impression management abilities may succeed despite poor actual performance.

Research focusing on financial and strategic management skills highlights the role of financial education and structured training programs in shaping managerial competencies. Dao et al. [72] demonstrated that financial attitude, family socialization, and financial education significantly impact university students' financial management capabilities. Boonda et al. [67] identified four essential training factors for regional operating officers (ROOs) in virtual service providers, emphasizing the necessity of targeted training for digital business environments. Meanwhile, Faúndez et al. [43] validated an instrument for measuring Business Intelligence and Analytics (BI&A) skills, confirming its applicability in strategic leadership development for Chilean SMEs.

The role of emotional intelligence and interpersonal skills in managerial effectiveness was highlighted in multiple studies. Cha et al. [69] found that higher emotional intelligence enhances stress management and social skills, improving professional adaptability in automated food service industry executives. Dagar et al. [71] explored yoga-based practices in management education, showing that these interventions reduce interpersonal conflict and enhance prosocial behavior. Furthermore, Corbett et al. [70] validated a psychometric tool for multisource feedback, proving its reliability in evaluating organizational decision-making and performance feedback processes.

Studies addressing employability and digital entrepreneurial skills emphasize their increasing relevance in modern work environments. Andino et al. [66] analyzed the correlation between latent variables (personal management, teamwork, and employability skills) and demographic factors, identifying significant relationships with work experience but no association with gender or employment status. Similarly, Qostal et al. [81] found that personal management, teamwork, and work safety skills had a moderate effect on employability, while fundamental skills had a smaller impact. Meanwhile, Dirgatama et al. [73] developed a measurement tool for digital entrepreneurial skills, reinforcing the necessity of digital competency in modern business environments.

The assessment of time and resource management skills in educational and healthcare contexts was another area of focus. García et al. [75] validated a time management scale for high school students, emphasizing that long-term planning enhances academic achievement. Plant et al. [40] developed a self-efficacy instrument for crisis resource management (CRM) skills among pediatric residents, demonstrating that self-assessment plays a critical role in professional competency development.

Digital skills and technology adaptation were identified as fundamental competencies for modern managers. Kocak et al. [78] validated a scale for assessing personal digital content management skills among higher education students, emphasizing its relevance in digital literacy training. Similarly, Soriano et al. [82] developed a digital competencies assessment tool applicable across all educational levels, allowing educators and students to identify technology-related skill gaps.

4.4. Application of Managerial Skills in Organizational and Educational Contexts

The reviewed studies illustrate how managerial skills contribute to organizational efficiency, leadership development, and workforce adaptability. The validation of measurement instruments across various sectors provides institutions with reliable tools to assess and improve managerial capabilities.

Studies on succession planning and institutional leadership development emphasize the importance of structured leadership training. Torabi et al. [83] advocate for structured university programs that ensure managers acquire practical and theoretical leadership skills. Yuan et al. [42] developed the youth leadership potential scale (YLPS), identifying five leadership dimensions essential for developing future leaders in different industries.

The implications for policy and curriculum development were also explored. Boonroungrut et al. [68] recommended that financial literacy programs be customized for different student demographics, ensuring targeted interventions for at-risk student populations. Habidin et al. [76] investigated the relationship between lean six sigma (LSS), strategic control systems, and organizational performance, concluding that LSS implementation enhances operational efficiency in the automotive sector.

All studies highlight the importance of adapting managerial skill assessments to different cultural and economic contexts. Vázquez-Moreno et al. [80] validated the ESCQ-20 questionnaire for measuring emotional skills among Mexican adolescents, proving its reliability in youth development research. Guerrero-Bejarano et al. [79] adapted and validated an instrument for evaluating managerial skills from employees' perspectives, emphasizing empathy and organizational commitment as key factors in effective management.

5. Discussion

The systematic review presented in this study analyzed various methodologies for measuring managerial skills, avoiding a focus on a specific classification of competencies, unlike previous studies. For instance, Aldighrir et al. [64] focused on soft or emotional skills, Qostal et al. [81] examined fundamental or socio-cognitive, personal, and collaborative

skills, Kocak et al. [78] investigated digital content management skills, Torabi et al. [83] centered on leadership competencies, and Yuan et al. [42] explored managerial skills in a broader sense. In contrast, this study provides a comprehensive perspective, allowing for the identification of common elements across the cited research, such as general management skills, leadership, decision-making, communication, and teamwork, facilitating future analyses of a broader range of employability competencies in various social, geographical, and organizational contexts.

The data analyzed in the reviewed studies were primarily collected through surveys and questionnaires, which were subsequently subjected to confirmatory factor analysis (CFA). CFA served as the foundational methodological approach, ensuring the validity and reliability of the instruments used to measure managerial skills. Its application allows for the confirmation of predefined theoretical models, the establishment of the factorial structure of the assessed competencies, and the reduction in bias in data interpretation [43]. The robustness of this statistical approach supports the development of training interventions and policy frameworks that, by enhancing the quality of management and leadership, contribute to strengthening organizational structures and achieving sustainability and equity goals, such as SDG 10 on reducing inequalities.

This study incorporated two of the most recognized scientific research databases: the Web of Science (WoS) and Scopus. The combination of both sources ensures a high degree of methodological rigor and transparency in the selection of studies, guaranteeing that the included articles meet impact and editorial quality criteria. The WoS provided access to highly cited and well-established studies in the literature, while Scopus complemented the analysis with recent and emerging research, offering a comprehensive overview of the current state of knowledge on managerial skills. Furthermore, the deduplication strategy and the application of inclusion and exclusion criteria enhanced the quality of the analysis, reducing bias and strengthening the reliability of our findings.

Although this study incorporated both the WoS and Scopus, other relevant databases, such as Google Scholar or institutional repositories, were not considered, which may have further expanded the scope of the analysis. However, selecting indexed sources in SCIE-WoS, SSCI-WoS, and ESCI-WoS ensures the quality and rigor of the reviewed studies. Future research should consider triangulating sources and integrating mixed-method analytical models to improve comparability across studies from different disciplines [82].

One of the key findings of this review is the relationship between managerial skills and their impact on organizational sustainability. Organizations that successfully integrate leadership, decision-making, and collaboration skills into their development strategies are more likely to implement policies aligned with the SDGs. In this regard, it is essential that managerial training programs not only focus on technical competencies but also incorporate principles of sustainability and corporate ethics. Dao et al. [72] emphasized that financial education plays a critical role in responsible management, reinforcing the need to include sustainability approaches in managerial training programs. Similarly, Liu et al. [41] suggested that the integration of self-management and leadership competencies in educational settings enhances the ability of future managers to navigate dynamic and increasingly regulated work environments in alignment with sustainability standards.

Our findings align with recent studies such as Dirgatama et al. [73], Soriano-Alcantara et al. [82], and Aldighrir, WM [64], which emphasize the role of various competencies in organizational sustainability and education.

Dirgatama et al. [73] highlighted the importance of digital entrepreneurial skills, including interpersonal digital skills, technology management, and adaptability, as key factors for economic resilience and innovation (SDG 8 and SDG 9).

Soriano-Alcantara et al. [82] validated an instrument for assessing digital competencies in education, identifying data management, software proficiency, and web navigation as critical skills for improving digital literacy and lifelong learning opportunities (SDG 4).

Aldighrir, WM [64], explored the relationship between sustainable leadership, diversity management, and ethical AI-driven decision-making. Their study demonstrated how attitudes toward AI ethics influence various decision-making styles, highlighting the need to enhance sustainable leadership in education (SDG 4 and SDG 8).

Notably, this study reinforces the importance of assessing and developing digital and managerial competencies in education and the workplace. Consistent with the findings of Gutiérrez-Ángel et al. [48], our results highlight that the validation of psychometric scales is essential to ensure the reliability of measurements in the field of sustainable organizational development.

Furthermore, this review has significant implications for organizations, educational institutions, and the scientific community, as it provides concrete guidelines for selecting and applying appropriate scales for measuring managerial skills. These scales, in addition to offering clear methodological guidelines and consistent evaluation parameters, can serve as a foundation for future research and the development of new instruments addressing a broader range of managerial competencies associated with employability and organizational innovation.

This holistic approach also reinforces the connection between competency measurement and the promotion of the Sustainable Development Goals (SDGs). Beyond its direct impact on quality education (SDG 4) and decent work and economic growth (SDG 8), strengthening managerial skills can also contribute to reduced inequalities (SDG 10) and industry, innovation, and infrastructure (SDG 9). Specifically, training in leadership and decision-making can enhance responsiveness and planning in productive environments (SDG 9) and foster a more equitable distribution of labor opportunities and professional growth (SDG 10). The consolidation of capabilities that promote effective and sustainable management directly supports the achievement of these global goals, driving sustainable and socially responsible organizational development.

6. Conclusions

The objective of this study was to systematically identify and analyze the most rigorously validated methods for measuring managerial skills, using confirmatory factor analysis (CFA) as a foundational component within a comprehensive methodological framework, complemented by other quantitative and qualitative validation tools. Through a systematic literature review in the Web of Science (WoS) and Scopus, this research examined the most effective measurement scales for assessing essential managerial competencies that contribute to sustainable organizational development and resilience.

This study ensures the reliability of managerial skill assessment by validating instruments with strong psychometric properties through confirmatory factor analysis (CFA). It identifies key competencies such as leadership, decision-making, communication, teamwork, emotional intelligence, and change management, addressing gaps in existing models. These competencies are essential not only for employability but also for strengthening organizational resilience and fostering sustainable and responsible management practices. Our findings offer practical implications for improving training programs and organizational strategies aligned with digital transformation and sustainability. Moreover, this research underscores the alignment of validated managerial skills with the Sustainable Development Goals (SDGs), particularly in advancing quality education (SDG 4), decent work and economic growth (SDG 8), industry, innovation, and infrastructure (SDG 9), and

reduced inequalities (SDG 10), reinforcing the importance of competency-based training for sustainable business practices and equitable professional development.

Despite these advancements, this study identifies several areas requiring further exploration. Expanding the validation of measurement tools across diverse cultural and economic contexts is crucial to ensuring their applicability in organizations with varying characteristics and needs. Additionally, the increasing digitalization of the workplace necessitates greater integration of technological skills into managerial competency assessments, highlighting the need to examine how artificial intelligence, automation, and digital literacy influence leadership and workforce adaptability. In sectors such as manufacturing and logistics, where automation and robotics have transformed operations, digital skills and adaptive leadership have become essential for talent management and process optimization. Moreover, this study emphasizes the growing need to incorporate AI ethics into managerial training programs, given the increasing reliance on technology-driven decision-making in leadership contexts.

Another critical aspect identified is the relationship between emotional intelligence, stress management, and effective leadership. Our findings suggest that external evaluations of emotional intelligence in managerial settings should be further developed, along with longitudinal studies on self-efficacy in crisis management. Addressing these gaps would contribute to a deeper understanding of how managerial competencies evolve and influence organizational decision-making across different industries and leadership levels. For instance, in the healthcare industry, managers must balance work pressure with critical decision-making, making stress management and emotional intelligence fundamental to ensuring effective leadership in hospitals and medical centers.

From an applied perspective, the validated measurement scales identified in this study provide practical tools for a wide range of organizations, including public and private sector entities, as well as educational and training institutions. Their implementation can enhance leadership and sustainability training programs, ensuring that future managers develop skills aligned with current labor market challenges and global sustainability priorities. Moreover, it is recommended that academic institutions integrate these validated models into their curricula and executive training programs, fostering a more comprehensive and evidence-based approach to sustainable management education. This could be achieved by embedding managerial skills assessments into business and executive education programs through experiential learning methods, such as case studies, simulations, and leadership challenges. Like the financial industry, incorporating data-driven decision-making simulations can enhance future leaders' abilities in risk analysis and sustainable investment strategies. Additionally, the implementation of certification programs focused on sustainable leadership would allow professionals to demonstrate their competencies in alignment with global sustainability standards, further strengthening the connection between managerial education and real-world impact.

Ultimately, this study not only provides a solid framework for evaluating managerial skills in the context of sustainable organizational development but also lays the groundwork for future research and practical applications. By addressing both the validity of existing instruments and the areas requiring further investigation, this research contributes to building long-term capabilities that enhance the competitiveness and sustainability of organizations, fostering more equitable and inclusive development. Future studies should also investigate the long-term impact of managerial competency development on organizational performance, employee well-being, and the achievement of sustainability goals. Establishing longitudinal research frameworks would provide valuable insights into how skill development initiatives translate into measurable improvements in business sustainability and corporate social responsibility. Sectors, such as sustainable tourism,

analyzing the impact of managerial leadership on customer experience and the implementation of environmentally responsible practices would enhance the global competitiveness of the industry. Furthermore, leveraging digital tools and AI-driven analytics for real-time competency assessment could enhance the precision and applicability of these evaluations, allowing organizations to track and optimize leadership development over time.

By integrating validated managerial competency assessments into professional training, education, and corporate governance, this research contributes to shaping future leadership frameworks that are more adaptable, ethically responsible, and aligned with the dynamic demands of sustainable business practices. The rapid evolution of artificial intelligence and cybersecurity in the technology industry demands that managers possess not only technical expertise but also strategic acumen to anticipate changes and effectively lead teams in fast-paced, dynamic environments.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su17062373/s1>, Table S1: PAdata.xlsx.

Author Contributions: Conceptualization, P.A.-G. and A.V.-M.; methodology, P.A.-G. and G.S.-S.; validation, A.V.-M.; formal analysis, P.A.-G.; writing—original draft preparation, N.C.-B. and P.A.-G.; writing—review and editing, N.C.-B., P.A.-G., M.G.-M. and A.V.-M. and G.S.-S.; supervision, N.L. and A.V.-M.; project administration, N.L. and P.A.-G.; funding acquisition, M.G.-M., N.C.-B., N.L., A.V.-M. and G.S.-S. All authors have read and agreed to the published version of the manuscript.

Funding: The Article Processing Charge (APC) was partially funded by Universidad Católica de la Santísima Concepción (Code: APC2025). Additionally, the publication fee (APC) was partially financed through the Publication Incentive Fund, 2025, by the Universidad Arturo Prat (Code: APC2025), Pontificia Universidad Católica de Valparaíso (Code: APC2025), Universidad Andrés Bello (Research work of Nelson Lay was supported by grant Fondecyt de Iniciación N°11250569 from Agencia Nacional de Investigación y Desarrollo (ANID), Chile) and Universidad de Las Américas (Code: APC2025), Universidad Central de Chile (Code: APC2025), Universidad Autónoma de Chile (Code: APC2025).

Institutional Review Board Statement: Not applicable; this study does not involve humans or animals.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Details of the articles included in the qualitative stage for review analysis.

Authors	Article Title	Hypotheses	Results	Study Application	Research Limitations/Implications
Aldighrir, WM [64]	Impact of AI ethics on school administrators' decision-making: the role of sustainable leadership behaviors and diversity management skills	<ol style="list-style-type: none"> 1. The AT-EAI model with DMS, mediated by SLB and diversity skills, fits well. 2. Positive AI ethics attitudes predict better decision-making in managers. 3. Stronger diversity skills enhance sustainable leadership behaviors. 4. Better decision-making styles are linked to higher diversity skills. 5. SLB mediates the AI ethics-decision-making relationship. 6. Diversity skills mediate the AI ethics-decision-making link. 	This study offers valuable insights into the role of AI ethics in educational management, highlighting how attitudes toward AI ethics shape decision-making styles of educational leaders.	We suggest targeted training to promote ethical AI practices and enhance diversity management skills, improving school managers' attitudes toward AI in education.	Future research should use longitudinal designs, diverse sampling methods, and mixed approaches to improve causal insights and data credibility.
Ali et al. [65]	Urdu Translation and the Validation of a 14-Item Measure to Assess Stress Management Skills in Healthcare Workers: Measurement Invariance Across Gender	N.R.	Significant differences in stress management skills were found between healthcare workers with and without these skills, with women exhibiting stronger abilities than men.	The validated Urdu version of the instrument will aid in understanding behavior in healthcare environments.	This study used the CISS-21 and HPLP-II subscales to correlate with ISBF, suggesting the use of additional scales to assess divergent validity.
Andino et al. [66]	Analyzing Managerial Skills for Employability in Graduate Students in Economics, Administration and Accounting Sciences	This study tests whether latent variables (e.g., personal management, fundamentals, teamwork, and employability skills) are independent of demographic variables such as gender, work experience, and employment status, with alternative hypotheses suggesting associations.	This study finds key correlations between skills and work experience, but no link with personal management skills and demographics.	This study's framework can be applied to assess talent, identify training needs, and address gender and experience disparities in various sectors.	This study is limited to graduate students from the National Autonomous University of Honduras (UNAH) and has a narrow scope, focusing only on this country.

Table A1. Cont.

Authors	Article Title	Hypotheses	Results	Study Application	Research Limitations/Implications
Babiak et al. [27]	Corporate Psychopathy: Talking the Walk	N.R.	In conclusion, high psychopathic traits may not hinder career advancement, as impression management can overshadow poor performance.	Improved screening and tools to assess psychopathic traits could help prevent individuals skilled in impression management from advancing to management positions.	A limitation of this study is the non-random selection of executives, as companies typically restrict external research to protect their employees.
Boonda et al. [67]	Analytical study of training program factors to develop the competency of regional operating officer (ROO) in the virtual service provider office (VSPO) in Thailand	N.R.	The survey identified four key training factors for ROO competency in Thailand's VSPO: health sector reform, management, ROO competency, and field study.	Future research could examine how ROO training elements in Thailand's VSPO can be tailored to personnel's diverse roles and skills.	Knowledge, skills, and practices in virtual organizations vary by structure and responsibilities, validated through EFA, CFA, and PA.
Boonroungrut et al. [68]	Reforming theory of planned behavior to measure money management intention: a validation study among student debtors	N.R.	This study suggests identifying students with poor money management skills to help policymakers design targeted financial literacy programs.	Effective money management reduces debt risk, and educators or loan providers can use this approach as a tool to identify potential financial mismanagement.	Generalizing these findings to specific student groups, like open university students who work while studying, or those from non-urban areas, would require further research.
Cha et al. [69]	The contribution of emotional intelligence to social skills and stress management skills among automated food service industry executives	N.R.	High emotional intelligence improves stress management and social skills, enhancing professional effectiveness.	Emotional intelligence helps individuals adapt their behavior, make informed decisions, and empathize with others in various situations.	Future research should include external evaluations and expand data collection to explore EI's impact on additional work outcomes.

Table A1. Cont.

Authors	Article Title	Hypotheses	Results	Study Application	Research Limitations/Implications
Corbett et al. [70]	Improving the utility of multisource feedback for medical consultants in a tertiary hospital: a study of the psychometric properties of a survey tool	N.R.	This study confirms the validity and reliability of a generic survey tool, highlighting the potential importance of a single global question in future multisource feedback processes.	The five-question management skills subscale addresses key organizational issues and is expected to encourage further research in this area.	A larger dataset is needed to assess the model's robustness and better understand the role of a single global question in future multisource reviews.
Dagar et al. [71]	Going beyond "I" vs. "you"-effectiveness and mechanism of yoga-based practices in management education to mitigate interpersonal conflict	This study suggests that yoga-based practices improve emotions, improve prosocial behaviors, and reduce interpersonal conflict, with mediating effects.	This study supports yoga-based practices for improving interpersonal behaviors and highlights their role in management education.	This research highlights yoga's role in enhancing conflict management and social behaviors in management education.	Future research should explore YBP's impact on interpersonal processes, use longer interventions, and explore data collection beyond self-reports.
Dao et al. [72]	Assessment of the Factors Impacting the Financial Management Skills among University Students: The Moderating Effect of Financial Education	This study explores how financial attitude, family socialization, and capability influence financial management, with financial education acting as a moderator.	These results indicate that financial attitude, family socialization, and knowledge significantly impact students' financial management and improvement.	These findings can help create tailored financial education programs to improve students' financial stability and economic growth.	Future research should expand the sample and include more variables to better understand financial management across regions.
Dirgatama et al. [73]	Exploratory and confirmatory factor analysis of digital entrepreneur skills	H1: The new tool reliably measures digital entrepreneurial skills essential for success in the field.	This study stresses the need for digital entrepreneurial skills to succeed in the digital economy and promote growth.	This study emphasizes that digital entrepreneurship skills are key to success in the digital era.	These findings aim to assist policymakers, educators, students, and researchers in developing essential digital entrepreneurship skills.

Table A1. Cont.

Authors	Article Title	Hypotheses	Results	Study Application	Research Limitations/Implications
Eyana et al. [74]	Causation and effectuation behaviour of Ethiopian entrepreneurs: Implications on performance of small tourism firms	In uncertain and dynamic environments, entrepreneurs using causation see greater employment growth, while those using effectuation experience higher financial performance.	Causation drives employment growth, while effectuation aids financial performance, with no clear superiority in Ethiopia.	These findings support training programs to enhance entrepreneurship in Ethiopia's tourism sector.	This study expands entrepreneurship literature but is limited in generalizability due to its focus on Ethiopia's tourism sector.
Faúndez et al. [43]	Skills Measurement Strategic Leadership Based on Knowledge Analytics Management through the Design of an Instrument for Business Managers of Chilean Companies	N.R.	The instrument reliably measures BI&A skills for business managers in Chilean SMEs, with a validated factor structure.	This will help HR managers diagnose, maintain, and develop BI&A leadership skills.	This study focuses on social, economic, and historical factors and suggests further validation of the instrument with larger samples.
García et al. [75]	Assessing time management skills as an important aspect of student learning: The construction and evaluation of a time management scale with Spanish high school students	N.R.	Long-term planning aids high school success, while short-term planning benefits college students.	Effective time management is crucial for students as it directly impacts their learning outcomes.	Research is needed to improve time management strategies using reliable assessment tools.
Habidin et al. [76]	Lean six sigma, strategic control systems, and organizational performance for automotive suppliers	LSS implementation positively influences OP and SCSs in Malaysian automotive suppliers, with SCSs mediating its impact on OP.	This study found that SCSs enhance OP when combined with LSS but do not mediate the LSS–OP relationship.	The LSS, SCSs, and OP measurements can be adapted for use in other industries or countries and as a tool for business excellence.	Future research could explore additional LSS factors, such as maintenance and project management skills.

Table A1. Cont.

Authors	Article Title	Hypotheses	Results	Study Application	Research Limitations/Implications
Harmoinen et al. [77]	Reliability and Validity of a Further Tested Appreciative Management Scale	N.R.	The appreciative management scale (AMS 2.0) is a valid and reliable tool for measuring appreciative management among first-line managers in healthcare and other work environments, supporting workplace development.	The AMS was developed to assess first-line managers' actions, with potential for use at other management levels.	Collaboration between nursing managers, educators, and researchers is key to advancing evidence-based appreciative management.
Idkhan et al. [20]	The employability skills of engineering students' assessment at the university	N.R.	This study highlights the need to improve communication and other employability skills due to a lack of foreign language activities.	This study's results were used to guide educational institutions in enhancing work skill indicators, preparing graduates for the workforce.	Further research with a broader scope, involving more institutions, is recommended to identify key employability skills that require prioritization in development.
Kocak [78]	Development and validation of a scale for assessing personal digital content management skills of higher education students	N.R.	A valid and reliable tool has been developed to measure the personal content management skills (PDCMSs) of higher education students.	PDCMSs could significantly contribute to digital skills literature, particularly in measuring digital content management skills.	This scale assesses digital content management in Turkish university students, with further testing needed for other audiences, and a limitation due to excluding digital technology skills.
Liu et al. [41]	Principal Instructional Leadership, Teacher Self-Efficacy, and Teacher Professional Learning in China: Testing a Mediated-Effects Model	This study examines principal leadership's impact on teacher learning, time management, and self-efficacy in Chinese middle schools.	This study shows that principal leadership partially mediates teacher learning, with time management and self-efficacy having minor effects.	The research highlights the positive link between principal leadership and teacher learning, emphasizing self-efficacy's role in shaping teaching practices.	The authors call for systematic reviews of leadership and the teacher learning literature, offering recommendations for school leadership practices.

Table A1. Cont.

Authors	Article Title	Hypotheses	Results	Study Application	Research Limitations/Implications
Guerrero et al. [79]	Adaptation and Validation of the Management Skills instrument from the perspective of subordinates	N.R.	The items were consolidated into an empathy construct, meeting validity and reliability criteria.	The instrument should be used to assess how managerial skills impact employee well-being and organizational commitment.	The new instrument meets reliability, convergent, and divergent validity criteria, demonstrating good data fit.
Vázquez-Moreno et al. [80]	Validation of the ESCQ-20 questionnaire in Mexican Adolescents	N.R.	The instrument was validated for research on adolescent development, using a three-factor model based on Buckley and Saarni's emotional skills framework.	This approach helps distinguish emotional skills, aiding in better interpretation and understanding of developmental influences.	N.R.
Plant et al. [40]	Validation of a self-efficacy instrument and its relationship to performance of crisis resource management skills	N.R.	We developed a valid instrument to measure pediatric residents' self-efficacy in CRM skills, influenced by their experience.	This study used robust psychometric methods to measure self-efficacy and performance, finding a correlation that suggests self-assessment abilities may vary by task and context.	Our findings call for further research on self-assessment, highlighting its role in guiding self-directed learning with proper feedback.
Qostal et al. [81]	Perceived Employability of Moroccan Engineering Students: a PLS-SEM Approach	Theories suggest that fundamental, personal management, and teamwork skills, along with their elements, are positively linked to the employability of Moroccan graduates.	This study found that personal management, teamwork, and work safety skills had a moderate impact on employability, while fundamental skills had a smaller effect.	Further research should explore skills gaps and the role of Moroccan universities in improving employability through technology.	Further research should focus on identifying gaps between current and future skills needed in the labor market.

Table A1. Cont.

Authors	Article Title	Hypotheses	Results	Study Application	Research Limitations/Implications
Soriano-Alcantara et al. [82]	Exploring Digital Competencies: Validation and Reliability of an Instrument for the Educational Community and for all Educational Stages	N.R.	The basic DC scale is validated for all educational agents—teachers, students, or parents—and applicable across all education levels, from early childhood to higher education.	This scale allows each group to assess their digital competence in key technological skills and address any gaps to enhance their capabilities.	These results should be applied cautiously, with future research focusing on a more representative sample for broader validity.
Torabi et al. [83]	Strategies for succession planning in universities: A mixed-methods analysis	N.R.	The approach emphasizes raising awareness through courses and ensuring managers possess both managerial and practical knowledge for effective succession planning.	Succession planning in university management requires enhancing managers' knowledge through targeted training.	N.P.
Yıldırım et al. [84]	Developing a Scale for Constructivist Learning Environment Management Skills	N.R.	The validity and reliability results indicated that the “Scale for Constructivist Learning Environment Management Skills (SCEMSs)” is a suitable assessment tool.	This scale is considered appropriate for assessing the constructivist learning environment management skills of elementary and high school teachers in Turkey.	A student version of the SCEMSs could be created to gather more detailed insights into teachers' constructivist learning environment management skills.
Yuan et al. [42]	Development and Preliminary Validation of the youth leadership potential scale	N.R.	This study confirms the youth leadership potential scale (YLPS) is reliable, with five independent dimensions: leadership information, attitude, and skills in communication, decision-making, and stress management.	The YLPS offers a comprehensive framework for assessing youth leadership potential, enabling targeted training programs based on specific leadership areas that need improvement.	This study's limitations highlight the need for further research on YLPS reliability and validity, including test/retest reliability, addressing self-rating biases, and expanding participant diversity.

N.R.—Not reported in the analyzed article.

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