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Job Satisfaction Scale for Tech Workers: Pivotal Trial

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Abstract
The psychological health of humans is requisite for global peace, safety, inclusivity, and organizational effectiveness. The pervasive nature of the Tech industry with deepening global digitalization makes the psychological health of Tech workers crucial for global peace and development. However, the diagnostic or monitoring devices for these psychological health issues are usually adopted for use without going the full-length trials as done with other health products like drugs and medical equipment. This study advocated for the post-validation effectiveness trial of health-related psychometric scales and performed a pivotal trial on the Job Satisfaction Scale for Tech Workers (JSST) *alongside similar scales for Tech workers to establish their effectiveness as universal job satisfaction scales. A total of 585 Tech workers from different parts of the world took part in the self-report pivotal trial with a completion rate of 47.2%. Internal re-validation of* JSST *has been carried out based on the valid Tech workers' self-report responses using the multivariate statistical analysis, covariance-based structural equation modeling in particular. It has been shown empirically that* JSST *– a cross-cultural scale – is the most effective universal job satisfaction scale for Tech workers. The study affirms the need for continuous re-validation of psychometric scales.*

Keywords: Job satisfaction, Pivotal trial, Psychological health, Psychometric scale, Tech worker.

INTRODUCTION
World Health Organization (WHO, 1948) defined *health* as "a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity." The psychological health of humans is a crucial aspect of health that can slowly and stealthily dictate the overall wellbeing of humans as well as the peace, safety, and progress of the human microcosms if not adequately managed (Cernusca-Mițariu, 2014: Bickenbach, 2017; Orozco & Pizzaro, 2020; Lallo et al., 2021; Palla et al., 2021; Katiyar, 2022). The psychological health of humans is socio-economically infectious (Stolzer, 2016; Uskul, 2018; Orozco & Pizzaro, 2020) and, thus, deserves similar attention given to epidemics within a microcosm (Suzic et al., 2016; Orozco & Pizzaro, 2020) to effectively manage this aspect of human health from being decimated. Internal sabotage, for example, is an outcome of decimated psychological health

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(Hafeez et al., 2023) and remains the most elusive and destructive threat to the wellbeing of humans and their microcosm. Besides, psychological health is requisite for global peace, inclusivity, and organizational effectiveness, as enshrined in Sustainable Development Goal 16, SDG-16 (Giacomo Divide & Xi, 2024), mainly as humanity deepens digitalization. The ubiquitous, rapidly disruptive, boundaryless, and 24/7 characteristic nature of the Tech Industry, coupled with the emerging global digital economy, demands that the psychological health of Tech workers receive attention beyond a fundamental human right (Mathias et al., 2020; Orozco & Pizzaro, 2020; Anushree & Mitesh, 2021; Choon-Hong, 2023) to an infectious health issue.

Work and workplaces are notable stressors on the psychological health of humans (Jaco, 2008; Khalaf et al., 2023). Job satisfaction is a crucial determinant of humans' psychological health in the workplace (Faragher et al., 2005; Orozco & Pizzaro, 2020; Efegoma et al., 2022; Usha et al., 2023; Nikolaos et al., 2024). A *job satisfaction scale* is an abstract diagnostic device that can gauge an employee's psychological health status in the workplace (Spector 1985; Sharma, 2017; Nanjundeswaraswamy, 2019). Generally, scientific products (drugs, devices, and mechanisms) developed for diagnosing, treating, and managing health-related issues are subject to pivotal trials before they can pass for adoption and use. We are persuaded, therefore, that job satisfaction scales, being a health-related device, deserve similar quality assurance rigor for the good of humanity. However, to our knowledge, psychometric scales are deprived of pivotal trials before adoption and use. The grave implication of this deprivation (Sen-Gupta et al., 2019) is further exacerbated with psychometric scales that are *technology-related* due to the pervasive and disruptive nature of digital technologies on human behavior. This study demonstrates the efficacy of pivotal trials as an empirical or data-driven rationale for adopting psychometric scales for use on humans beyond the conventional validation protocol. With the emerging global world of digitalization, the psychological well-being of Tech workers becomes crucial for the survival, effectiveness, and competitiveness of humans as the Tech industry will be seated as the kernel of human endeavors (Ehigbochie & Ekuobase, 2024). This work, therefore, restricts itself to Tech workers.

Again, to the best of our knowledge, only two job satisfaction scales have explicitly been validated to measure the psychological health status of Tech workers in the workplace (Ehigbochie & Ekuobase, 2024): (i) the *Job Satisfaction Scale for Tech Workers (JSST),* and (ii) the Sharma's Job Satisfaction Scale (SJSS). Although existing literature on psychometric scales usually terminates with construct validity, a pivotal trial is mandatory for all health-related products to demonstrate their safety and efficacy and earn the support and approval for use on humans by appropriate regulatory bodies (Sen-Gupta et al., 2019). This work aims to take JSST, a job satisfaction psychometric scale, through a pivotal trial compared to SJSS. This pioneering effort in psychometrics is in tandem with the global best practices for adopting and legalizing health-related products.

Specifically, this study compared JSST (Ehigbochie & Ekuobase, 2024) against SJSS (Sharma et al., 2017) in a self-assessment study by Tech workers across the globe and varying cultures to ascertain the relative effectiveness of the scales as job satisfaction measuring instruments among Tech workers in the Tech Industry. The issue of comparative effectiveness of a psychometric scale is consistent with those of the core health diagnostic devices of effectiveness and safety in pivotal trials (Britta et al., 2017; Tianyu et al., 2019) as the issue of human safety is trivial for abstract instruments like psychometric scales with no threat to human life. The issues for determination in the trial are whether (i) Mono-cultural psychometric scales are universally effective and (ii) JSST is comparatively a more effective

universal job satisfaction scale for Tech workers. Although this study is self-contained, it is undeniably rooted in the theoretical framework of Ehigbochie and Ekuobase (2024), a research work it extends to empirically establish through a global self-report data the effectiveness of JSST as a universal job satisfaction scale for Tech workers.

Hypotheses Formulation

Ehigbochie and Ekuobase (2024) developed and validated JSST in the global context and theoretically established its comparative effectiveness post-validation through a social effectiveness analysis (SEA), however, with a caveat against its effectiveness for low-paid routine Tech jobs, particularly in developing economies. Does this caveat, as evident in Ehigbochie and Ekuobase (2024), imply that (i) SJSS has a place for universal use despite being a mono-culturally validated psychometric scale unlike JSST, which is cross-cultural, and (ii) JSST is not a universal psychometric scale despite being cross-culturally validated? This question birthed Hypotheses 1 and 2. In any case, SEA being theoretical is subjective, and it will be reassuring to empirically establish the comparative effectiveness of JSST as a global job satisfaction scale for Tech workers, thus birthing hypotheses 3 and 4.

H1: SJSS is effective for measuring the job satisfaction of Tech workers in the global context
H2: JSST is effective for measuring the job satisfaction of Tech workers in the global context
H3: SJSS is the most effective scale for measuring the job satisfaction of Tech workers in the global context
H4: JSST is the most effective scale for measuring the job satisfaction of Tech workers in the global context

MATERIALS AND METHODS

The self-report online questionnaire survey method (Demetriou et al., 2015) was adopted to expose SJSS and JSST randomly to individual Tech workers across the globe. After that, the self-assessment data was codified and subjected to multivariate statistical analysis, covariance-based structural equation modeling specifically (Alberto et al., 2023) to ascertain their effectiveness as a global measure of job satisfaction of Tech workers across the globe. The following subsections explicate the study participants and instruments and the data collection and analysis techniques employed.

Study Participants.

The study respondents were Tech workers across the continents of the globe. A total of 585 Tech workers participated in the self-assessment study. However, only 276 participants' responses were used after screening to eliminate incomplete and biased responses. This number of responses implies a completion rate of 47.2%, which exceeds the average completion rate of 44.1% in contemporary online surveys (Wu et al., 2022). The high number of survey instrument's questions (N = 61) may account for the below excellent completion rate. The respondents freely consented and participated in the self-assessment survey without coercion.

Instrument.

The study questionnaire administered consists of three parts. Section A captures the respondent's cross-cultural demographic data. Sections B and C hold the SJSS and the JSST, respectively, with both questionnaire sections weighted on a Five-Likert scale from strongly disagree (-2) to strongly agree (+2). SJSS and JSST indicator questions are validated items for measuring the job satisfaction of Tech workers (Sharma et al., 2017; Ehigbochie and Ekuobase, 2024). These two scales were combined and administered as a single questionnaire to create the same basis for comparing their effectiveness.

Data Collection

The study data was collected online using Google Forms. The Google Forms replica of the study questionnaire was launched from 29 May to 1 July 2024 to randomly assess the job satisfaction of Tech workers in their workplaces across the globe. The online mode of questionnaire administration was employed in this study because the target population, Tech workers across the globe, can most conveniently and efficiently be reached online in large numbers. The Google Forms was deactivated after exceeding the magic number of 384 in sample size (Memon et al., 2020), and no response was recorded after that in a 48-hour stretch. The number of Tech workers globally has been estimated to exceed 50 million as of 2022 (Statista, 2023). The respondents freely consented and participated in the online survey without coercion. No Email, IP address, or information that can reveal the exact identity of the respondents was solicited or covertly extracted. A total of 585 Tech workers across the globe responded to the online self-assessment survey. However, only 276 (47.2%) valid respondents' responses, as captured by the Google Forms worksheet, were used for the multivariate statistical analysis after screening to eliminate incomplete and biased Tech worker's responses.

Data Analysis

The essence of this study's data analysis is to ascertain the effectiveness of both SJSS and JSST and compare their effectiveness, if necessary. Construct validity and reliability analysis are notable data analytic techniques for evaluating and comparing the effectiveness of similar psychometric scales (Hughes, 2018; Bowling & Zelazny, 2021; Nazam & Husain, 2021; Duradoni et al., 2022; Harrison et al., 2023). The accuracy of such comparison is incident on the data from the same respondents in the same survey exercise (Hughes, 2018; Bowling & Zelazny, 2021; Duradoni et al., 2022). Besides, the Pearson correlation calculated value of 0.73 from the self-report data (using a Microsoft Excel spreadsheet) indicates that both scales are measuring seemingly the same construct, and this signals a firm basis to rely on the self-report data to determine which of the scales is a more accurate measure of job satisfaction of Tech workers in the global context (Chinchilli et al., 2005; Olutayo & Ekuobase, 2021). However, this study only made use of internal validation of these scales to ascertain their effectiveness and neglected the additional use of external validation based on the sound and practical counsel from Hughes (2018) that internal validation is necessary and sufficient to ascertain how accurate a psychometric scale measures what it is meant to measure.

The sample size for the analysis (n = 276) exceeds the minimum sample size of 200 recommended for construct validity and reliability analysis (Dash & Paul, 2021; Kline, 2023). Moreover, Memon et al. (2020) affirmed that a sample size between 160 and 300 is innocuous to a multivariate statistical analysis. Also, the respondents' demography (see Table 1) strongly indicates the global spread of the data. More so, population size is not one of the three factors that decide the sample size for multivariate statistical analysis (Dash & Paul, 2021). Thus, 276 is a sufficient representative sample for multivariate statistical analysis of the data collected. The numeric equivalent of the 276 valid respondents' self-assessment as stored and retrieved from the Google Form Worksheet was moved to the Statistical Package for Social Sciences (SPSS) version 22 for data adequacy analysis, factor analysis, and the Cronbach's alpha (α) test of both SJSS and JSST. As a result of the complementary roles of SJSS and JSST in the global context to the Tech industry signaled by Ehigbochie and Ekuobase (2024), both scales were combined into one single job satisfaction scale (christened SJSST) of 13 factors and 48 items for experimental purposes. The same statistical analyses that were ran for SJSS and JSST was also run for SJSST. SPSS is a comprehensive, viable, and popular tool for various statistical analyses (Hazarika, 2019).

However, the SJSS collapsed and could not be transitioned into the Analysis of Moment Structure (AMOS) software for Confirmatory Factor Analysis (CFA). SJSS is said to have collapsed because it could not form a valid factor structure of at least three items to a factor ∀ factors for Eigenvalue (λ) greater than one with this study's respondents' responses. The JSST formed a factor structure of at least three items to a factor for $\lambda > 1$ with this study's respondents' responses losing two items under communication and merging two factors (Cognition overload and time pressure with career advancement) into one, resulting in a six-factor model with 23 items. The hypothetical scale for Tech workers, SJSST, also formed a factor structure of at least three items to a factor for $\lambda > 1$ with this study's respondents' responses; however, with serious casualty on the SJSS component side of the scale. The original SJSS six-factor component of SJSST was reduced to a single factor, with eight items thereby losing fifteen items. In contrast, the JSST component only lost an item (under communication) but merged two factors (Cognition overload and time pressure with career advancement) into one.

With the significant data adequacy result output for the two surviving scales – JSST and SJSST (see Table 2), Kaiser-Meyer-Olkin (KMO) = 0.888 and 0.915 > 0.8 and Bartlett's test significance (sig) = 0.000 and 0.000 < 0.05, the surviving forms of the two scales were loaded in turn to AMOS version 26 software for Confirmatory Factor Analysis (CFA). This is to ascertain how good each of the scales is, if at all a good fit, for measuring the job satisfaction of Tech workers universally based on the self-assessments by Tech workers across the continents of the world. Structural Equation Modelling (SEM) was carried out in the AMOS software on each loaded factor. Afterward, the Model validity and Model fitness measures were also estimated using AMOS. The AMOS software is a robust graphical tool for CFA and other related analyses (Byrne, 2016; Thakkar, 2020).

RESULTS AND DISCUSSION

Results

Table 1 captures the demography of accepted Tech workers (n = 276) whose self-assessments of their job satisfaction in the workplace were accepted as valid for the study. As generated from SPSS, Table 2 holds the data adequacy analysis results for JSST, SJSS, and SJSST. The summary of the factor analysis and α test results for surviving factors of JSST (N = 6) and SJSST (N = 7) and their associated items (N = 23 and N = 32, respectively) are presented in Tables 3 and 4. As generated from the AMOS software, Figure 1 holds the path diagram of the surviving JSST factors and associated items with their path coefficients. Table 5 holds the validity and fitness analysis results of the JSST. However, two additional JSST communication items were dropped based on the model fitness concern for improved fitness and validity measures. The resultant JSST, JSST*, had the same number of factors (N = 6) but 21 items. Figure 2 holds the path diagram of the JSST* factors and associated 21 items with their path coefficients. Table 6 holds the validity and fitness analysis results of JSST*. Figure 3 holds the path diagram of the surviving SJSST factors and associated items with their path coefficients. Table 7 holds the validity results of SJSST with its compounded concerns that could not be resolved. Thus, no fitness analysis result existed for SJSST.

Table 1: Demography of Tech Workers in a Job Satisfaction Self-Assessment Survey

Physical Location		**Highest IT Qualification**		**Years of Experience**		**Company Size**	
Continent	Frequency (%)	Qualification	Frequency (%)	Number of Years	Frequency (%)	Number of Staff	Frequency (%)
Africa	44 (15.94%)	Diploma	52 (18.84%)	Less than 2	80 (28.98%)	1 – 10	30 (10.87%)
Asia	62 (22.46%)	Graduate	121 (43.84%)	2 – 5	106 (38.41%)	11 – 50	55 (19.93%)
Europe	69(25%)	None	10 (3.62%)	6 – 10	47 (17.03%)	50 – 200	49 (17.75%)
North. America	88 (31,88%)	Post - Graduate	52 (18.84%)	11- 20	29 (10.51%)	Over 200	142 (51.45%)
South America	9 (3.26%)	Professional Certification	41 (14.86%)	Over 20	14 (5.07%)		
Oceania	3 (1.09%)						
Antarctica	1 (0.36%)						
Total	276 (100%)	Total	276 (100%)	Total	276 (100%)	Total	276 (100%)
Gender		**Age**		**Work Hours Per Week**		**Ancestry**	
Sex	Frequency (%)	Age	Frequency (%)	Hours	Frequency (%)	Race	Frequency (%)
Female	95 (34.42%)	18 – 29	140 (50.72%)	40 hours and below	153 (55.43%)	American Indian	3 (1.09%)
Male	178 (64.49%)	30 – 39	86 (31.2%)	41 – 60	107 (38.77%)	Asian	35 (12.68%)
Non-Binary/ Third Gender	3 (1.09%)	40 – 49	35 (12.68%)	61 – 80	13 (4.71%)	Black/ African American	70 (25.36%)
		50 – 59	13 (4.71%)	81 – 100	2 (0.72%)	Hispanic or Latino	25 (9.06%)
		60+	2 (0.72%)	Above 100 hours	(0.36%)	White	133 (48.19%)
						Others	10 (3.62 %)
Total	276 (100%)	Total	276 (100%)	Total	276 (100%)	Total	276 (100%)

(Source: authors)

Table 2: KMO and Barlett's Test Results of JSST, SJSS and SJSST

KMO and Bartlett's Test		**JSST**	**SJSS**	**SJSST**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.888	.886	.915
Bartlett's Test of Sphericity	Approx. Chi-Square	3752.039	1129.240	5169.259
	Df	253	66	496
	Sig.	.000	.000	.000

(Source: authors)

Table 3: Summary of Factor Analysis Result for the Six-Factor JSST

Factor Codes	Factors	Measurable Values (Items)	Item Codes	Factor Loading (δ)	Cronbach's Alpha Coefficient (α)	Eigen Values Total (λ)	Eigen Values Cumulative (%)	Extraction Sum of Square loading Cumulative (%)
Commu	Communication	My management tries to defend us from external criticism during crisis.	Commu 2	.670	0.881	8.635	37.544	35.986
		My management inspires me to the extent that I contribute by putting more efforts in the promotion of products, satisfying customers and other stakeholders when my organization is facing an economic crisis.	Commu 3	.620				
		My management communicates to employees its commitment to protect their welfare and well-being.	Commu 5	.711				
		Communication with employees is very important for our management during crises.	Commu 6	.856				
		Management response to my questions during crisis gives me job satisfaction.	Commu 7	.790				
IT_Know	IT Knowledge	Our firm possesses a high degree of computer-based technical expertise.	IT_Know 1	.776	0.846	2.089	46.625	43.866
		We are very knowledgeable about new computer-based innovations.	IT_Know 2	.815				
		We have the knowledge to develop and maintain computer-based communication links with our customers.	IT_Know 3	.837				
Tme_cog & Carr_Adv	Time Pressure, Cognition Overload & Career Advancement	I feel comfortable to do the things that I have to do.	Time_Pr 1	.515	0.842	1.946	55.086	50.859
		I do not feel pressed for time.	Time_Pr 2	.478				
		There is much information available on topics of interest to me. But, I don't have trouble choosing what is important and what's not.	Time_Pr 3	.311				
		My supervisors have told me I do a good job.	Carr_Adv 1	.724				
		The organizations I work for have recognized me as a good performer.	Carr_Adv 2	.817				
		I have been recognized for my contribution.	Carr_Adv 3	.824				
Carr_Asp	Changing Career Aspiration	I am at the top leadership position of my organization or business.	Carr_Asp 1	.879	0.902	1.558	61.862	56.164
		I have moved up to a leadership position in my organization.	Carr_Asp 2	.865				
		I am a leader in my career field.	Carr_Asp 3	.866				
Team_Pl	Team Player	Did a fair share of the team's work.	Team_Pl 1	.812	0.846	1.294	67.487	60.356
		Fulfilled responsibilities to the team.	Team_Pl 2	.928				
		Completed work in a timely manner.	Team_Pl 3	.661				
Crea&Inn	Creativity and Innovation	I often have new and innovative ideas.	Crea&Inn 1	.806	0.850	1.049	72.049	63.254
		I suggest new ways of performing work tasks.	Crea&Inn 2	.741				

		I have a fresh approach to problems.	Crea&Inn 3	.852				
						.801	75.532	
: .	: .	: .	: .	: .	: .	: .	: .	: .
						.160	100.000	

(Source: authors)

Table 4: Summary of Factor Analysis Result for SJSST

Factor Codes	Factors	Values Measurable (Items)	Item Codes	Factor Loading (δ)	Cronbach's Alpha Coefficient (α)	Eigen Values Total (λ)	Eigen Values Cumulative (%)	Extraction Sum of Square loading Cumulative (%)
Training, Promotion & Recognition	Training, Promotion & Recognition	The company only gives people the minimum amount of training they need to do their job	Training 1	-.357	.776	11.424	35.700	34.476
		People are strongly encouraged to develop their skills.	Training 2	.449				
		Adequate on-the-job training was provided to internal user groups to use the new system	Training 3	.523				
		There is really too little chance for promotion on my job	Promo 1	.783				
		Those who do well on the job stand a fair chance of being Promoted.	Promo 2	.831				
		I am satisfied with my chances for promotion.	Promo 3	.811				
		People get ahead as fast here as they do in other places.	Promo 4	.679				
		I am satisfied with the recognition for my work from Superiors	Reg 1	.565				
Tme & Cog	Time Pressure and Cognition Overload	I feel comfortable to do the things that I have to do.	Time_Pr 1	.548	.842	2.479	43.449	41.094
		I do not feel pressed for time.	Time_Pr 2	.625				
		There is much information available on topics of interest to me. But, I don't have trouble choosing what is important and what's not.	Time_Pr 3	.346				
Carr_Adv	Career Advance-ment	My supervisors have told me I do a good job.	Carr_Adv 1	.732				
		The organizations I work for have recognized me as a good performer.	Carr_Adv 2	.785				
		I have been recognized for my contribution.	Carr_Adv 3	.825				

Commu	**Communication**	My management's effective internal communication during crisis motivates me to serve as an ambassador by communicating positive opinion about my organization with external stakeholders.	Commu 1	.515	0.876	2.267	50.533	47.164
		My management tries to defend us from external criticism during crisis.	Commu 2	.835				
		My management inspires me to the extent that I contribute by putting more efforts in the promotion of products, satisfying customers and other stakeholders when my organization is facing an economic crisis.	Commu 3	.624				
		I have been frequently informed by my management about its operational and financial situation during crisis.	Commu 4	.616				
		My management communicates to employees its commitment to protect their welfare and well-being.	Commu 5	.704				
		Management response to my questions during crisis gives me job satisfaction.	Commu 7	.564				
Carr_Asp	**Changing Career Aspiration**	I am at the top leadership position of my organization or business.	Carr_Asp 1	.877	.902	1.602	55.540	51.047
		I have moved up to a leadership position in my organization.	Carr_Asp 2	.824				
		I am a leader in my career field.	Carr_Asp 3	.874				
Crea&Inn	**Creativity and Innovation**	I often have new and innovative ideas.	Crea&Inn 1	.803	.850	1.407	59.936	54.251
		I suggest new ways of performing work tasks.	Crea&Inn 2	.749				
		I have a fresh approach to problems.	Crea&Inn 3	.855				
IT_Know	**IT Knowledge**	Our firm possesses a high degree of computer-based technical expertise.	IT_Know 1	.758	.847	1.205	63.701	56.885
		We are very knowledgeable about new computer-based innovations.	IT_Know 2	.804				
		We have the knowledge to develop and maintain computer-based communication links with our customers.	IT_Know 3	.824				
Team_Pl	**Team Player**	Did a fair share of the team's work.	Team_Pl 1	.871	.846	1.101	67.142	58.924
		Fulfilled responsibilities to the team.	Team_Pl 2	.884				
		Completed work in a timely manner.	Team_Pl 3	.647				
						.867	69.852	
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						.148	100.000	

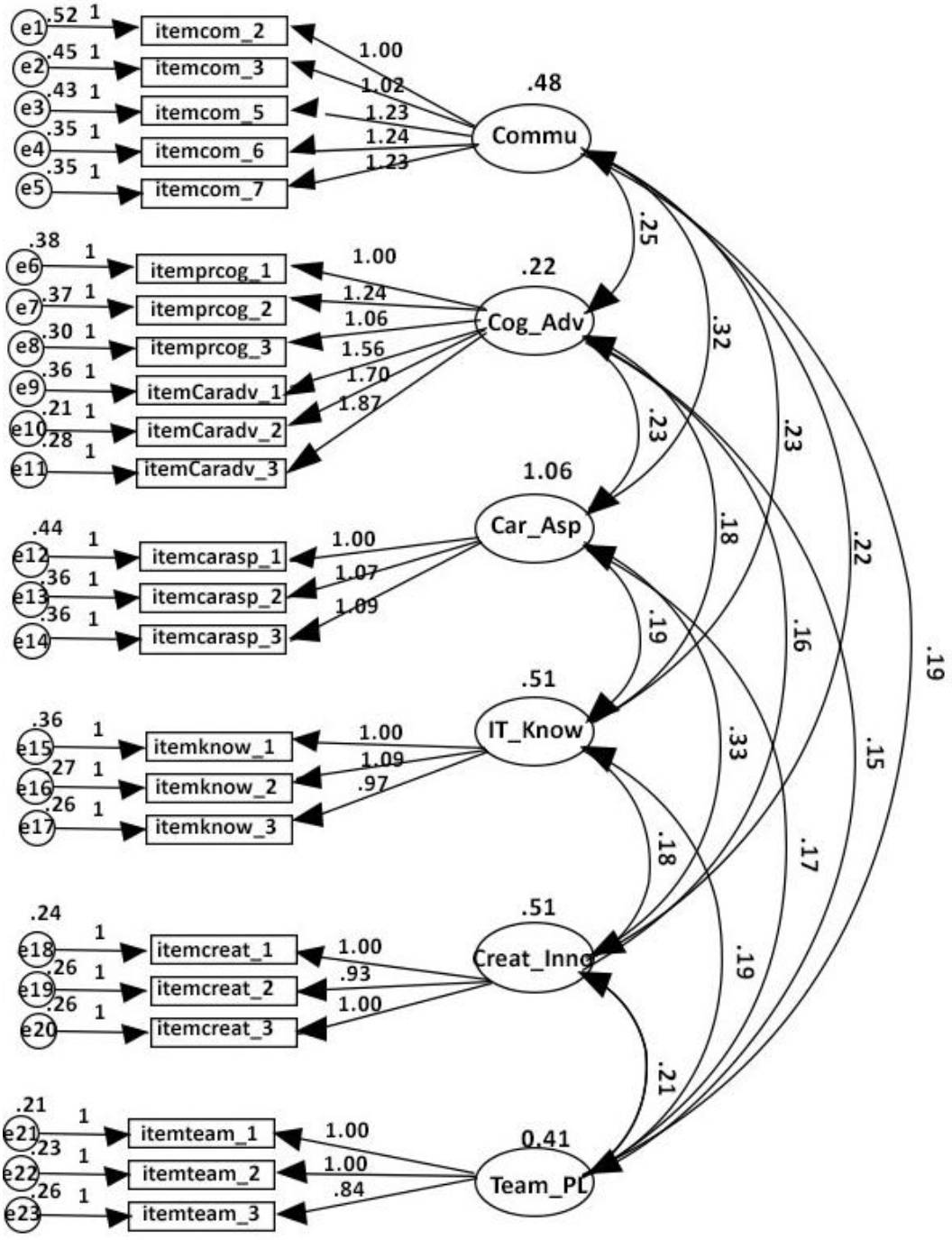

Figure 1: Path Diagram for the Six-factor JSST (source: authors)

Table 5: Validity Measures and Model Fitness of the Six-factor JSST (source: authors)

Validity Measures⁺										
Constructs	**CR**	**AVE**	**MSV**	**MaxR(H)**	**Commu**	**Tme_cog &Carr_ Adv**	**Carr_ Adv**	**IT_Know**	**Creat& Inn**	**Team_Pl**
Communication	0.882	0.600	0.593	0.889	**0.775**					
Time Pressure & Cognition Overload & Career Advancement	0.853	0.504	0.593	0.900	0.770***	**0.710**				
Career Aspiration	0.902	0.754	0.219	0.904	0.449***	0.468***	**0.869**			
IT Knowledge	0.848	0.651	0.292	0.851	0.455***	0.540***	0.255***	**0.807**		
Creativity & Innovation	0.850	0.654	0.232	0.851	0.447***	0.481***	0.456***	0.363***	**0.809**	
Team Player	0.852	0.659	0.245	0.871	0.429***	0.495***	0.253***	0.404***	0.470***	**0.812**

Model Fitness			
Measure	**Estimate**	**Threshold**	**Interpretation**
CMIN	419.731	…	…
DF	251.000	…	…
CMIN/DF	1.952	Between 1 and 3	Excellent
CFI	0.943	>0.95	Acceptable
SRMR	0.051	<0.08	Excellent
RMSEA	0.059	<0.06	Excellent
PCLOSE	0.042	>0.05	Acceptable

⁺Validity Concerns

Descriminant Validity: the square root of the AVE (Average Variance Extracted) for the 2nd factor is less than its correllation with the 1st factor

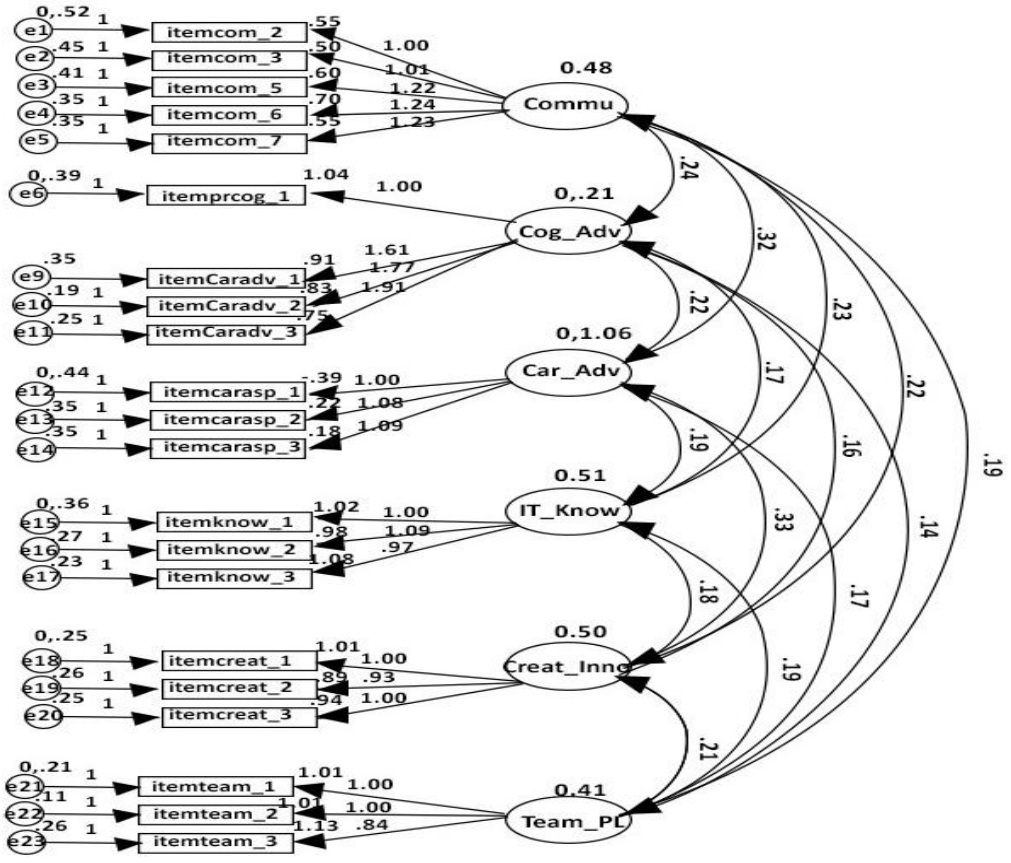

Figure 2: Path Diagram for the JSST* (source: authors)

Table 6: Validity Measures and Model Fitness of the JSST* (source: authors)

Validity Measures										
Constructs	**CR**	**AVE**	**MSV**	**MaxR(H)**	**Commu**	**Tme_cogm&Carr_Adv**	**Carr_Asp**	**IT_Know**	**Creat&Inn**	**ITSS7**
Communication	0.882	0.600	0.573	0.889	**0.775**					
Time Pressure & Cognition Overload & Career Advancement	0.867	0.624	0.573	0.897	0.757***	**0.790**				
Career Aspiration	0.902	0.754	0.212	0.904	0.449***	0.461***	**0.869**			
IT Knowledge	0.848	0.651	0.279	0.851	0.455***	0.538***	**0.255*** **	**0.807**		
Creativity & Innovation	0.850	0.654	0.236	0.851	0.447***	0.486***	0.456***	0.363***	**0.809**	
Team Player	0.852	0.659	0.235	0.871	0.429***	0.485***	0.253***	0.404***	0.470***	**0.812**

Model Fitness			
Measure	**Estimate**	**Threshold**	**Interpretation**
CMIN	337.331	…	…
DF	174.000	…	…
CMIN/DF	1.939	Between 1 and 3	Excellent
CFI	0.952	>0.95	Excellent
SRMR	0.048	<0.08	Excellent
RMSEA	0.058	<0.06	Excellent
PCLOSE	0.069	>0.05	Excellent

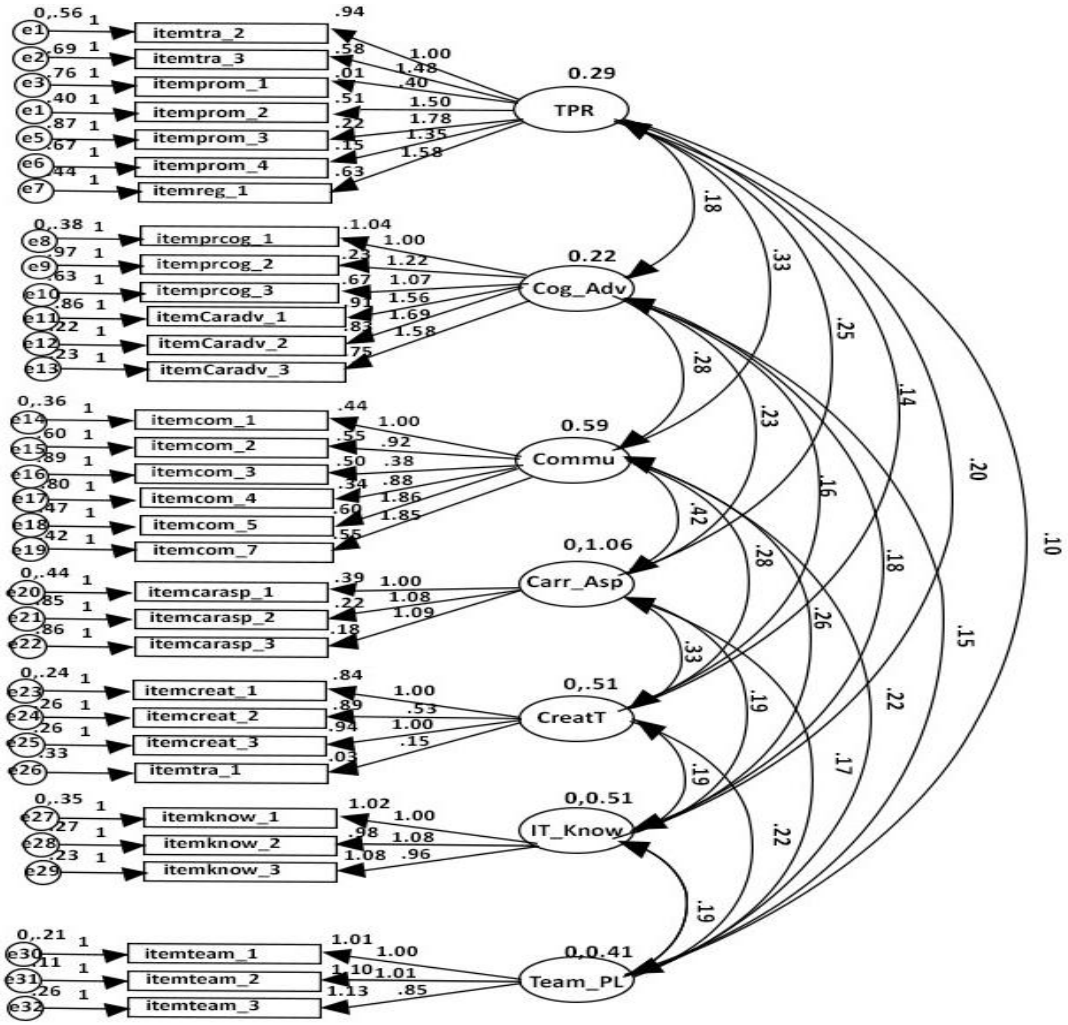

Figure 3: Path Diagram for the SJSST (source: authors)

Table 7: Validity Measures of the SJSST (source: authors)

Validity Measures⁺											
Constructs	**CR**	**AVE**	**MSV**	**MaxR(H)**	**TP&R**	**Tme_cog &Carr_ Adv**	**Commu**	**Carr_ Asp**	**Creat & Inn**	**IT_ Know**	**Team _Pl**
Training, Promotion and Recognition	0.874	0.502	0.625	0.892	**0.708**						
Time Pressure & Cognition Overload & Career Advancement	0.853	0.504	0.615	0.901	0.712***	**0.710**					
Communication	0.878	0.548	0625	0.885	0.790***	0.784***	**0.740**				
Career Aspiration	0.902	0.755	0.276	0.904	0.450***	0.468***	0.525***	**0.869**			
Creativity & Innovation	0.759	0.492	0.253	0.851	0.363***	0.483***	0.503***	0.453***	**0.702**		
IT Knowledge	0.848	0.651	0.292	0.851	0.516***	0.540***	0.470***	0.255***	0.367***	**0.807**	
Team Player	0.852	0.659	0.245	0.871	0.300***	0.495***	0.436***	0.252***	0.472***	**0.404*****	**0.812**

⁺Validity Concerns

Descriminant Validity: the square root of the AVE (Average Variance Extracted) for the 1st factor is less than its correllation with the 2nd factor

Descriminant Validity: the square root of the AVE for the 1st factor is less than its correllation with the 3rd factor.

Descriminant Validity: the square root of the AVE for the 2nd factor is less than its correllation with the 1st factor.

Descriminant Validity: the square root of the AVE for the 2nd factor is less than its correllation with the 3rd factor.

Descriminant Validity: the square root of the AVE for the 3rd factor is less than its correllation with the 1st factor.

Descriminant Validity: the square root of the AVE for the 3rd factor is less than its correllation with the 2nd factor.

Convergnt Validity: the AVE for 5 is less than 0.50.

Discussion

Table 1 shows the demography of Tech workers engaged in the self-report of their job satisfaction in the various work places. Evident from Table 1 is that the respondents for this study are cross-cultural, and of diverse work experience, exposure, competency, and work in different Tech firms. This implies that the self-report data from the Tech workers is universal. As evident in Table 2, each of the KMO of the self-report data for JSST, SJSS, and SJSST scales exceeded 0.8, and each of their sig value was less than 0.05. The implication of the KMO > 0.8 is that based on the responses, the number of items for the construct is excellently sufficient. A sig value of 0.000 < 0.05 signals a sufficiently high correlation of the items based on the responses enough to commence the Confirmatory Factor Analysis (CFA) in AMOS. However, we could not proceed with the CFA of SJSS because the scale could not form a valid construct structure. This indicates that SJSS is not a practical universal scale for measuring the job satisfaction of Tech workers. Thus, H1 and H3 failed and are rejected. From this point, it is evident that SJSS is off for discussion.

This study employed similar procedural remedies in Ehigbochie and Ekuobase (2024) for controlling common method bias (CMB). Podsakoff et al. (2024) recommended the use of such procedural remedies. Also, from Tables 3 and 4, it is evident that Harman's single element test (Harman, 1976) showed that none of the factors of JSST and SJSST individually explained more than 50% of the total variance. The implication of these is that CMB was not an issue in the data used for the CFA.

Discussion on JSST

The summary of the outcome of the factor analysis and α test for JSST is shown in Table 3. Table 3 shows that two factors of JSST were merged into one (i.e., Time pressure and Cognitive overload merged with Career Advancement), and two items were lost under the communication factor (items 1 and 4 under communication in the seven-factor JSST) as in Ehigbochie and Ekuobase (2024). The eighteen-month interval between our data collection period and when Ehigbochie and Ekuobase (2024) collected theirs may account for the loss of these two items (Hughes, 2018). Eighteen months in the life of a Tech worker is a long time, considering the capricious nature of the Tech Industry (Femi et al., 2020; Xavier et al., 2020). The six-factor JSST' ($N = 6$, $\alpha > 0.8$, $\lambda > 1$) and associated items ($N = 23$, $\delta > 0.3$) signal a good job satisfaction scale for Tech workers (Hair et al., 1995; Williams et al., 2010). The Eigenvalue (λ) defines the worth of each factor, and where the worth of a factor is less than one, such a factor is tagged worthless and thus rejected. Hence, only the six factors with $\lambda > 1$ survived (i.e., are presently universally and significantly helpful for measuring Tech worker job satisfaction in the workplace) with 23 items. These six factors addressed 63.25% of the variance explained, exceeding the minimum threshold of 60% (Hair et al., 2012). This signals that the 23 items sufficiently represent the six factors.

Figure 1 shows the CFA Path diagram for the six-factor JSST. The load of each item on the emergent path diagram in the CFA analysis ranged from 0.84 to 1.91 > 0.6, as shown in the path coefficients in Figure 1, signaling an excellent fit of the six-factor JSST (Fornell & Larcker, 1981; Hair et al., 2019). This suggests that the relationship among its factors and associated items is well understood and accurately represented. Table 5 holds the six-factor JSST validity measure and model fitness. The validity measure threw up a discriminant validity concern, as shown in Table 5. The model fitness segment of Table 5 is self-interpretative signaling a good fit of the JSST for measuring the job satisfaction of Tech Workers in the workplace across the globe (Hu & Bentler, 1999; Gaskin & Lim, 2016). For the internal consistency of the construct, each of the six factors has $\alpha > 0.8$ (see Table 3), and overall, $\alpha = 0.9$, meaning the standard threshold $\alpha > 0.8$ held for the six-factor JSST (Nunnally, 1978; Carmines & Zeller, 1979). These results imply that the six-factor JSST is reliable, internally consistent, and stable for Tech workers globally to use as a job satisfaction scale.

The convergent and discriminant validity of the six-factor JSST was assessed to expose the degree of correctness and cohesiveness of the items and their associated factors in estimating the job satisfaction of Tech workers in the workplace across the globe. Three attributes viz factor loading, composite reliability, and average variance extracted (AVE), as recommended by Fornell & Larcker (1981) and Hair et al. (2009), were considered to assess the convergent validity of this scale. For the items of the six-factor JSST, the factor loading (δ) ranged from 0.311 to 0.902, which satisfies the minimum threshold $\delta > 0.3$ (Hair et al., 1995; Williams et al., 2010). The six-factor JSST's composite reliability (CR) ranged from 0.848 to 0.902, as shown in Table 5. 0.7 is the minimum threshold for CR (Wasko & Faraj, 2005; Hair et al., 2009). The average variance extracted (AVE) of the six-factor JSST ranged from 0.504 to 0.754, as shown in Table 5. AVE > 0.50 is the minimum threshold for convergent validity (Fornell & Larcker, 1981). Therefore, the six-factor JSST exhibits convergent validity as the three conditions were met.

The maximum shared variance (MSV) ranged from 0.219 to 0.593, as shown in Table 5. The MSV for all the factors is less than their corresponding AVE as required for discriminant validity except for the "Time Pressure, Cognition Overload, and Career Advancement." Besides, as evident in Table 5, the diagonal values in the square matrix whose column is

defined by ITSSi ∀ i =1(1) 6 in the validity measures section of Table 5 are all higher than the values in their roles and column in the square matrix except for the "Time Pressure, Cognition Overload, and Career Advancement" as also required for discriminant validity (Fornell & Larcker, 1981). From the CFA Path diagram (Figure 1), it is evident that there was no cross-loading of items. Although convergent validity was established for the six-factor JSST, it could not satisfy the conditions for sound discriminant validity (Fornell & Larcker, 1981; Bagozzi & Philips, 1982). Therefore, the six-factor JSST though a good fit and reliable, is not a valid universal job satisfaction scale for Tech workers due to the validity concern exposed.

Discussion on JSST*

Resolving the validity concern of the six-factor JSST reduced its number of items from 23 items to 21 items (removing Time_Pr2 and Time_Pr3 from the "Time Pressure, Cognition Overload and Career Advancement" factor) as evident in Figure 2. This form of the six-factor JSST is christened JSST*. Figure 2 shows the CFA Path diagram for the six-factor JSST*. The load of each item on the path diagram in the CFA analysis ranged from 0.84 to 1.91 > 0.6, as shown in the path coefficients in Figure 2, signaling an excellent fit of the six-factor JSST* (Fornell & Larcker, 1981; Hair et al., 2019). This suggests that the relationship among its factors and associated items is well understood and accurately represented. Table 6 holds the six-factor JSST*'s validity measure and model fitness. The model fitness segment of Table 6 is self-interpretative, signaling an excellent fit of the six-factor JSST* for measuring the job satisfaction of Tech Workers in the workplace across the globe (Hu & Bentler, 1999; Gaskin & Lim, 2016). Similar internal consistency values and conclusions for the constructs of JSST obviously hold for JSST*.

The convergent and discriminant validity of the six-factor JSST* was assessed to expose the degree of correctness and cohesiveness of the items and their associated factors in estimating the job satisfaction of Tech workers in the workplace across the globe. Three attributes viz factor loading, composite reliability, and average variance extracted (AVE), as recommended by Fornell & Larcker (1981) and Hair et al. (2009), were considered to assess the convergent validity of this scale. For the 21 items of the six-factor JSST*, the factor loading (δ) ranged from 0.515 to 0.902, which satisfies the significant threshold δ > 0.5 (Hair et al., 1995; Williams et al., 2010). The seven-factor model's composite reliability (CR) ranged from 0.848 to 0.902, as shown in Table 6. CR≥ 0.7 is the minimum threshold for CR (Wasko & Faraj, 2005; Hair et al., 2009). The average variance extracted (AVE) of the six-factor JSST* ranged from 0.600 to 0.754, as shown in Table 6. AVE > 0.50 is the minimum threshold for convergent validity (Fornell & Larcker, 1981). Therefore, the six-factor JSST* model exhibits significant convergent validity as the three conditions for convergent validity have been met.

The maximum shared variance (MSV) ranged from 0.212 to 0.573, as shown in Table 6. The MSV for all the factors is now less than their corresponding AVE, as required for discriminant validity. Besides, as evident in Table 6, the diagonal values in the square matrix whose column is defined by ITSSi ∀ i =1(1) 6 in the validity measures section of Table 6 are all higher than the values in their roles and column in the square matrix as also required for discriminant validity (Fornell & Larcker, 1981). Again, from the CFA Path diagram (Figure 2), it is evident that there was no cross-loading of items. With convergent validity already established, satisfying these conditions shows sound discriminant validity of the six-factor JSST* (Fornell & Larcker, 1981; Bagozzi & Philips, 1982). Therefore, the six-factor JSST* is of excellent fit, reliability, and validity as a universal job satisfaction scale for Tech workers. We should not forget too quickly the task and information over-load pressure on Tech workers, particularly during and immediately after the Covid-19 pandemic period, which had now subsided in

June 2024 (the heart of this study's data collection) compared to November 2022 (the heart of Ehigbochie and Ekuobase (2024) data collection) when humanity was pulled into accepting the new normal of virtualization (Pinnington & Ayoko, 2021; Stocker et al., 2023). This may account for why Time_Pr2 and Time _Pr3 ("I do not feel pressed for time" and "There is much information available on topics of interest to me. But, I don't have trouble choosing what is important and what's not") caused validity concern. This study, therefore, affirms H2, albeit loss of four items.

Discussion on SJSST

The summary of the outcome of the factor analysis and α test on SJSST is shown in Table 4. Table 4 shows that the entire SJSS factors were merged into one factor of eight items. Three SJSS factors (pay, Supervisor, and Security) were dropped with all their items, and the remaining three factors (Training, Promotion, and Recognition) of SJSS dropped one and two items, respectively, in Training and Recognition (i.e., Time pressure and Cognition overload). The JSST component of SJSST only lost an item (under communication) but merged two factors (Cognition overload and time pressure with career advancement) into one. The resultant seven-factor hypothetical scale ($N = 7$, $\lambda > 1$) and associated items ($N = 32$) could only address 58.92% of the total variance explained, defiling the minimum threshold of 60% (Hair et al., 2012). Notwithstanding the above defilement, the belief that a minimum of 58% of the total variance explained is a good enough property of a psychometric scale. With a KMO of $0.915 > 0.8$ and a sig value of $0.000 < 0.05$, we commenced CFA in AMOS on SJSST. However, the result was an abysmal failure of SJSST as a universal job satisfaction scale for Tech workers with its compounded validity concerns, as evident in Table 7 and the poor loading of some of its items on the path diagram in the CFA analysis, as shown in the path coefficients in Figure 3, that defiled the minimum threshold of 0.6 (Fornell & Larcker, 1981; Hair et al., 2019). Invariably, SJSST is not a practical scale for measuring the job satisfaction of Tech workers. Thus, we affirm H4 since

(i) SJSS could not form a factor structure,
(ii) SJSST, though it managed to form a factor structure, failed when examined for reliability, convergent and discriminant validity, and
(iii) No other psychometric scale (real or hypothetical) validated explicitly for measuring the job satisfaction of Tech workers exists outside those considered in this study.

CONCLUSION

For global peace, safety, inclusivity, and organizational effectiveness as enshrined in Sustainable Development Goal 16, SDG-16; individuals' psychological (mental) health should earn similar attention to the epidemic than a mere human right. This is particularly pertinent when this individual works in a pervasive frontline industry such as the Tech industry. Job satisfaction in the workplace remains a crucial indicator of the psychological health of the working adult. However, scales for diagnosing or monitoring the job satisfaction of working adults in the workplace have yet to go through the rigor and formality of trials before adoption and use. As with other health products, this study advocated for the pivotal trials of health-related psychological scales such as job satisfaction scales and has demonstrated the efficacy of a pivotal trial of the *Job Satisfaction Scale for Tech Workers*. It made evident that the continuous change in human society demands the continuous re-validation of psychometric scales for guaranteed effectiveness. A pivotal trial of the *Job Satisfaction Scale for Tech Workers* has been performed, and its effectiveness has been empirically established as the most accurate universal psychometric scale for measuring the job satisfaction of Tech workers, albeit with the loss of four items.

This study has contributed the following expose to literature and practice (i) job satisfaction scales are health diagnostic devices, (ii) the need to demonstrate the effectiveness of health-related psychometric scales empirically through pivotal trial post-validation, (iii) the need for continuous psychometric scale re-validation for guaranteed effectiveness, and (iv) internal re-validation of psychometric scale is necessary and sufficient to establish its effectiveness post-validation.

This study was conducted only in the English Language, limiting its linguistic coverage. This is worrisome as individual responses to psychometric scales can be influenced by linguistic competence. We are, however, consoled with the fact that the English Language remains the dominant language of cyberspace (Abdullahi & Ekuobase, 2024), without which there is no Tech worker. Again, though the self-report study had a global spread; it could not explicitly show this across tribes, religions, nations, and specific types of IT firms due to their large numbers in the global context and the controversies that may result from (unintentionally) excluding any. More pivotal trials on JSST can also be carried out in the high-resource languages, to broaden the linguistic coverage of JSST as a universal Psychometric scale.

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