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Project-Based Learning Conceptual Framework for Integrating Soft Skills Among Students of Technical Colleges

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ABSTRACT In most professions, the value of soft skills has been recognized and many companies make decisions on employment and performance assessment based in part on the soft skills of workers. Project-Based Learning (PjBL), in its nature as a pedagogical method, has the capability of harnessing the potential of students in soft skills. The purpose of this study was to develop a PjBL conceptual framework for integrating soft skills among students of technical colleges. The population goal for the study was made up of 372 technical teachers from 22 government technical colleges across the sample area. Considering the heterogeneous complexity of the population from which the survey is extracted, the stratified technique of random sampling was used to choose the 295 participants for the study. Through Confirmatory Factor Analysis (CFA) models the chi-square values, modification indices, and standardized estimates were developed using Analysis Moment of Structures (AMOS). Structural Equation Modeling (SEM) was used to check the model's causal relationship by the application of AMOS version 20. The study findings revealed PjBL preparation (planning), application, commitment, and assessment techniques each to have a positive significant impact on soft skill improvement among students of technical colleges. On the other hand, the study found that facilitation in project-based learning has a significant yet negative relation to integrating soft skills among students at the technical colleges. Interestingly, the outcome of this research suggests that PjBL in technical colleges will have a substantial positive impact on the integration of soft skills among the students. Based on the finding of the study, the government should provide adequate facilities for appropriate PjBL activities to enhance the integration of soft skills. Technical teachers should employ the PjBL identified elements in the teaching and learning of at technical colleges for effective incorporation of soft skills among the students.

INDEX TERMS Soft skills, technical colleges, project-based learning, technical vocational education and training.

I. INTRODUCTION

Soft skills, also known as transferable or generic skills have now been regarded to be rudimentary to the advancement of graduates' employability [1]. Soft Skills could be referred to all the skills or competencies that are not directly related to a particular task but are vital in any role because they contribute primarily to the relationships amongst people participating in

an establishment [2]. The enhanced interpersonal relationship through the application of soft skills has the capability of improving the success of an organization [3].

Enhancing the employability of students has therefore continued to draw a great deal of attention from various investors in the education sector and the industry worldwide [2], [3]. As a consequence of globalization and the transformation from production and technology-based economy to a knowledge-based economy, workers' demands for skills required in the 21st-century workplace have changed.

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The achievement of only technical skills in the graduate career has been reported to be inadequate for graduates to obtain jobs and to be effective at work [4], [5]. Besides that, employers are currently facing difficulties with graduates due to inadequate soft skills such as problem-solving skills, leadership, ICT abilities, communication skills, resource management skills among others [6]–[8]. Hence, in addition to hard skills, graduates ought to acquire soft skills. Consequently, the emphasis now is laid on instructional approaches that encourage learners' active participation in teaching-learning processes for the incorporation of soft skills.

One of the main challenges of TVET institutions in Nigeria is the development of employable graduates with soft skills that will render indigenous graduates more productive for employers [9]. Regrettably, in Nigeria, technical colleges are accused of making little or no effort to cultivate soft skills among the students, and, as a result, the development of work-ready graduates is rarely possible [10]. Besides, in the study of Ayonmike and Okeke [11], it was found that Nigerian learning institutions mostly emphasized the teaching of technological skills and underrated the importance of soft skills. Many scholars traced the problem to the program's existing content, which placed more importance on knowledge of technical content to the detriment of soft skills [11]. The statement was verified by [12] who acknowledged that soft skills are not being adequately trained in Nigeria's technical colleges. Besides that, some researchers suspect educators of adopting teacher-centric teaching methods rather than learner-centric teaching methods [11], [12].

Technical colleges are among the establishments of TVET which are responsible for incorporating knowledge and skills to produce students for the field of work. Therefore, these institutions are meant to help improve students' opportunities for employment, healthy life, personal prosperity, and socio-economic growth for the nation [13]. A research carried out by Farooq [14] indicated that most technical college graduates do not possess the employability skills required to succeed in a contemporary workforce. In addition, Usoro and Ogbuanya [10] reported that the prominence of graduates from Nigeria's technical colleges is decreasing rapidly, mainly in terms of soft skills such as; teamwork skills, problem-solving skills, organizational skills, leadership skills, knowledge management skills, logical and analytical ability. Among the goals of Nigeria's technical colleges is to provide training and the required skills for students who will be economically employable or self-reliant [13].

Unfortunately, unemployment in Nigeria is increasing annually with the youth at the most receiving end as a result of inadequate employability skills. In their separate studies, Playfoot and Hall [15] and Inti *et al.* [16] observed that the disparity between the skills learned by graduates and the skills required in a multifaceted working world of the 21st remain one of the significant reasons for the high unemployment rate among graduates. Therefore, there should be no contention about the fact that this trend of unemployment is the result of constant degree output without productive

skills (soft skills). This, therefore, calls for active teaching and learning methods that effectively develop relevant skills among students.

PjBL is an indispensable teaching approach often described as an excellent substitute for inactive learning and rotary memorization [17], [18]. Project-based learning is an activity-based way of training in which learners develop knowledge and skills by focusing on real, challenging, and complicated problems for a long period of time to explore and react to issues encountered [19]. The traditional method of actively studying and rehearsing out-of-scope material is outdated and not successful in preparing students properly for success in today's work environment [20]. Project-based learning thus focuses on training learners for a successful life in a knowledge-based environment, in particular in the fields of problem-solving abilities, teamwork skills, communication skills, resource management skills and personal skills [21]. Teachers usually present challenges in a PjBL classroom which students need to address the issues together in teams together [21]. Numerous researchers have found that PjBL is highly successful in the following ways: integrating learning with training [22]; cultivating the opportunity to analyze, categorize and develop the expertise and skills required to address realistic scenarios [21]; enhancing leadership abilities, listening skills, and coordination and strategic thinking skills [23], [24]; teaching students to be analytical [25].

While teaching for the integration of soft skills, teachers must first conceptualize the task or plan, this is more complicated than it sounds [22]. Important PjBL elements to recognize include practical problems, student autonomy, and selection, including a dynamic, detailed process over time, where students ask questions, find and use tools, and advance their approaches [25]. Teachers must then decide the modules; what kits and materials should be accessible to the students? Which elements are to be investigated and discovered by the students? How does an educator reconcile freedom and selection by providing adequate tools without destroying them when engaging students? Where can such resources be found by a student?

Generally, PjBL is believed to be a vital instructional approach that enables students to develop skills necessary for future success and to tackle life's and the world's challenges. PjBL remains one of the optimum examples of constructivist-learning. Social constructivist methodologies have been used for learning by educational methods such as collaborative thinking, project-based learning, problem-based learning, and peer-teaching clusters [26]. Learning is transferable, so, because of the transferability of constructivist thinking, students use their knowledge to solve real problems. Students work with their colleagues within the small group in PjBL to solve complex and relevant problems that help develop their understanding, problem-solving, reasoning, communication, and self-evaluation abilities. Based on the constructivist view, learning should be structured around events that facilitate the development of knowledge and skills rather than pure information diffusion [27]. Hence, the constructivism

theory formed the theoretical framework for this study.

Aksela and Haatainen [28] conducted a qualitative study to determine active teachers' views of the advantages and challenges of PjBL so as to use the findings for the promotion of PjBL implementation in the general teaching practice. In the background, data was obtained using e-survey with some open-ended questions. The collected data was analyzed using data-driven content analysis. The study found that students' learning was enhanced; teamwork and a sense of community at school level were enhanced, and flexibility for their teaching was improved. The teachers, therefore, consider the PjBL's challenging aspects to include group management, student-related problems, instructor concerns, and collaboration. In the same vein, Pasha [22] conducted a study to develop a PjBL model for integrating soft skills among prospective teachers. The study embraced the preparation, application, facilitation, commitment, and assessment as components of activity-based learning which could enhance the soft skills development of students. The outcome of the study points out that the suggested model is effective in integrating the soft skills of potential teachers.

Sadrina *et al.* [29] carried out a descriptive study to analyze students' and supervisors' views of PjBL at a Malaysian Polytechnic. A survey of 118 respondents represented a population of 170 students, and 43 supervisors partook in the analysis. The study considered PjBL knowledge, supervision, collaboration, communication and creativity as elements of PjBL. The result found that the most significant aspects to be considered in PjBL are effective supervision. However, the study also established from the results that some supervisors did not have PjBL competency skills. A new structure for PjBL has been proposed for the Polytechnics in Malaysia, based on the empirical evidence obtained from the study.

The current study adopted the Pasha's components of the PjBL model that adequately portrayed the characteristics of PjBL for achieving the objectives of enhancing the incorporation of soft skills among technical college students. Besides that, the five criteria (preparation, application, facilitation, commitment, and assessment) were chosen as a necessary starting point for providing students access to high-quality PjBL because they are an essential baseline, but they are not all-encompassing [30]. Preparation (PRP) includes the compilation of learning goals, instructional resources, guidance for tasks, evaluation approaches and guidance for academic integrity; ii) Facilitation (FCT) encompasses the assortment of motivation & counselling strategies, creation of online and social networking sites, planning of formal meetings and seminars, assembly of resource personnel, coordination of field research resources, and planning of commonly asked questions; iii) Application (APP) emphasizes on the growth of the soft skills of the participants; iv) Commitment (CMT) includes emotional commitment, continuity of mission, functional progression, and the responsibility to accomplish the aim of the group; and v) Assessment (ASM) encompasses individual and group presentation, reports and assessment,

discussion and seminars, logbook and portfolio and participation.

Improvement of informal learning, retention, and examination results as opposed to traditional teaching approaches are the most widely researched subjects of PjBL knowledge [31]. Various kinds of literature on PjBL outcomes and soft skills are accessible from business programmes focused mainly on PjBL pedagogy at the graduate level [32]. In technical and vocational programmes, PjBL evaluations are contained mainly in one course compared to traditional instruction in various regional contexts [33]. On the one hand, Kubiak and Vaculová [34] found many findings in favour of project-based learning for increasing knowledge retention in graduate programs in Science, Economics and Business compared with traditional instruction [35].

Three other research indicated that students through project-based learning scored lower in the basic sciences or displayed a worse test outcome while the impact size was limited and unreproducible [36]. On the other hand, Oktay and Oktay [37] find a little discrepancy in their study and there is no consensus as proof to justify the superiority of PjBL over conventional approaches of acquiring knowledge and skills. Several reports did not consider that students at PjBL had better developed some cross-curricular abilities than peers taught conventionally. Garnjost and Brown [38] cited the findings of the research on the growth of knowledge-building skills by [39] and conducted ten field studies, eight of which examined the use of project-based learning to determine the relationship between techniques and abilities. According to the authors, the students at PjBL earned lower grades in basic sciences compared to the group under the conventional teaching system, thus the students did not enjoy the usage of PjBL for the constructive learning of the basic concepts.

Incidentally, there is a need to help TVET institutions to develop soft skills among the students through the application of activity-based instructional methods [40], [41]. The ample literature review showed that there was no significant research aimed at establishing a PjBL framework to integrate soft skills among Nigerian technical college students. Hence, the study to develop a PjBL conceptual framework to incorporate soft skills among technical college students. The research is driven by the following objectives: i) to determine PjBL practices suitable for improving the integration of soft skills among technical college students; ii) determine the relationship among the PjBL constructs that formed the structural model, and iii) determine the suitable framework for incorporating soft skills among Technical College students.

The following formulated hypotheses present the expected relationship between the independent and dependent variable of the study: i) There is a significant relationship between preparation and soft skills integration among technical college students; ii) there is a significant relationship between application and soft skills integration among technical college students; iii) there is a significant relationship between facilitation and soft skills integration among technical college students; iv) There is a significant relationship between

commitment and integration of soft skills among students of technical colleges, and; v) there is a significant relationship between assessment and soft skills integration among technical college students.

II. THE METHODOLOGY OF THE STUDY

Technical teachers at technical colleges in the Northwest geographic zone of Nigeria formed the target population for this study. The data collection took place in August 2019 during the academic session from the aforementioned technical colleges. The population for the study was 372 technical teachers throughout the sample field, drawn out from 22 public technical colleges. Based on the sample size determination table [42], the correct sample size of 295 participants was chosen. Having acknowledged the varied nature of the population from which the sample is derived, stratified random sampling methodology was used to pick the 295 participants for the study. This method was used primarily because of its many benefits over simple random sampling as it provides greater precision than a simple random sample of the same scale [43]. Upon analyzing the completed questionnaires, 250 were held for missing data and other defects, suggesting a response rate of 84.7 percent. Three objectives were developed to guide the study and five hypotheses were tested at 0.05 level of significance.

Technical and vocational education specialists scrutinized the structured questionnaire of 31 items for both face and content validity before it was used to collect data from the respondents. The six exogenous variables: preparation, application, facilitation, commitment, assessment, and soft skills integration, each contained 5-items of questions with the exception of facilitation construct with 6-items. A 5-point Likert scale type of one to five (1-5), one being the lowest and five being the highest was adopted. Cronbach's alpha reliability technique was used to determine the internal consistency of the questionnaire items at 0.87. The survey research design is ideal for this study because data were collected via a questionnaire on the activities required to improve soft skill growth among technical college students. Structural equation modeling (SEM), a multivariate statistical analysis technique that is used to analyze structural relationships was employed using Analysis Moment of Structures (AMOS) version 20 [44]. AMOS used many goodness-of-fit indices between the data and the defined model to derive Maximum Likelihood Estimation (MLE) from a covariance matrix. Hair *et al.* [45] proposed a range of goodness-of-fit metrics for evaluating a hypothesized model that was adopted in this study. The model fit evaluation depended on multiple parameters, including total misfit as well as relative fit indices. The actual misfit indices included the estimated root mean square error (RMSEA) [45], and the relative performance indices such as the Tucker Lewis index and the cumulative match indexes: CFI, TLI, IFI [46]. Khine [47] noted that a model is acceptable where the indices display (i) the CMIN/df value is between 1 and 5, deemed acceptable or appropriate fit between model and results, (ii) the CFI, IFI and TLI indices

TABLE 1. Initial fitness indexes of latent constructs of the study.

Construct	Parsimonious Chi Sq/Df	Incremental Fit			Absolute Fit	
		CFI	IFI	TLI	NFI	RMSEA
Preparation	1.444	1.000	1.001	1.003	.997	.000
Application	3.498	1.000	1.002	1.004	.995	.000
Facilitation	42.702	.978	.979	.964	.973	.123
Assessment	20.710	.976	.976	.952	.969	.112
Commitment	40.358	.953	.953	.905	.947	.169
Soft Skills Integration	24.596	.972	.972	.944	.965	.125

are approximately 1.00, and (iii) the RMSEA index of 0.08 or less suggests a fair error and may be acceptable.

III. DATA ANALYSIS

It is important to determine the measurements of the structures before implementing SEM, in particular, the unidimensionality of the scale while the items are in a separate framework [48]. The study obtained and applied the results of exploratory factor analysis (with varimax rotation) for the 30 observed variables. The loading factor of each of the 30 indicators was above 0.5 therefore, it was deemed successful and statistically relevant [49]. Babin and Anderson [46] identified loadings such as ± 0.30 =minimal, ± 0.40 =important and ± 0.50 =essentially substantial using another thumb rule. Furthermore, the validity of the data and the adequacy of the sampling using Kaiser-Meyer-Olkin (KMO) and Bartlett's test also indicates a KMO value of 0.808 that fits the proposed KMO value of > 0.5 , while Bartlett's test ($\text{Chi}=5786.575$, $p<0.05$) was found optimal for a complete variable study [46].

SEM has been used to determine the influence of the exogenous variables on the study's endogenous variable. SEM was employed in this study because of its advantages of taking a confirmatory approach to data analysis by specifying relationship among variables; its procedures of incorporating both unobserved and observed variables, and its capability of modeling multivariate relations and estimating of direct and indirect effects of variables of the study [47], [50].

A. CONFIRMATORY FACTOR ANALYSIS (CFA)

CFA is a critical part of the SEM calculation process, which is used before designing the structural model in order to ensure the proper fit of the construct [50]. CFA is meant to determine whether the data fit a hypothesized measurement model [51]. So both the original/initial and modified CFAs of the test structures were calculated in this study. The revised CFAs models have been applied since the initial CFAs of the structures did not satisfy the requirements specified. The outcome of the initial CFA fitness indices of all the constructs of the study is presented in table 1.

Table 1 above indicates the outcome of initial CFA fitness indices of all the constructs: Preparation (PRP), Facilitation (FCT), Application (APP), Commitment (CMT), and

TABLE 2. Modified fitness indexes of latent constructs of the study.

Construct	Parsimonious	Incremental Fit			Absolute Fit		
		Chi Sq/Df	CFI	IFI	TLI	NFI	RMSEA
Preparation	1.296	.999	.999	.997	.998	.035	
Application	12.507	.991	.991	.986	.984	.066	
Facilitation	5.534	.999	.999	.997	.995	.039	
Assessment	2.357	.998	.998	.995	.996	.074	
Commitment	5.121	.994	.994	.981	.990	.079	
Soft Skills Integration	6.977	.993	.993	.989	.983	.055	

Assessment (AST) and soft skills integration (SSI) of the study. Though before modification, all constructs have CFI, IFI, TLI, and NFI values higher than 9.0, not all constructs have RMSEA values less than 0.80. This implied that Absolute fitness for all the constructs has not been achieved. Therefore, it can be inferred that not all the fitness needed for the modeling was attained.

Table 2 displays the outcome of modified CFA fitness indices of all the constructs of the study. The models were revised to boost the indices of modifications in accordance with the criteria of SEM. The redundant items: FCT5, ASM1, CMT2, and SSI1 were deleted, while the items PRP1 and PRP2, APP1 and APP5, FCT1, and FCT3, ASM1 and ASM4 were constrained respectively to resolve the issue. After the modification, all constructs have CFI, IFI, TLI, and NFI (Incremental Fit) values higher than 9.0 and RMSEA (Absolute Fit) values less than 0.80, implying that all fitness necessary in modeling has been attained.

B. HYPOTHESIS MODEL OF RELATIONSHIP BETWEEN THE STUDY CONSTRUCTS

Compared to the structural model, the measurement model reflects an essential stage taken to analyze data efficiently using AMOS [44]. Awang considered the measurement model to be discriminant validity which generally means the construct’s validity. Therefore, in order to ensure the validity of the constructs, the items in each construct must be well-related, such that all the unnecessary items in the constructs should either be erased or constrained for the problematic observed variables. The measurement model encompasses some essential elements of the standards for goodness-of-fit structure. Table 3 defined the constructs involved in the model.

Figure 1 describes the hypothesized initial measurement model (pooled CFA model) of the interaction between the research constructs, project-based learning elements (preparation, application, facilitation, commitment, and assessment) and soft skills integration. For the initial measurement model, the values produced are: Chi-Square=818.467, DF=287, Ratio=2.852, P<0.01, CFI=.882, IFI=.883, TLI=.886, RMSEA=.086. Consequently, the model did not satisfy the corresponding goodness of fit criterion based on the values

TABLE 3. Description of constructs of the model.

S/NO	Construct	Variable Type	Description
1	Preparation (PRP)	Independent Variable	Encompasses the selection of learning objectives, learning material, activity guidelines, assessment methods, and academic integrity guidelines
2	Facilitation (FCT)	Independent Variable	Involves selection of motivation & counseling techniques, setting up social networking and on-line forums, planning of formal discussions & lectures, development of resource persons, organization of field-work resources, and preparation of frequently asked questions
3	Application (APP)	Independent Variable	Centers on the development of participants’ soft skills and hard skills
4	Commitment (CMT)	Independent Variable	Covers emotional attachment, a continuation of purpose, practical involvement and obligation to group’s goal
5	Assessment (ASM)	Independent Variable	Encompasses individual and group presentation, reports and assessment, discussion and seminars, logbook and portfolio and participation
6	Soft Skills Integration (SSI)	Dependent Variable	Integration of teamwork skills, communication skills, problem-solving skills, and resource management skills

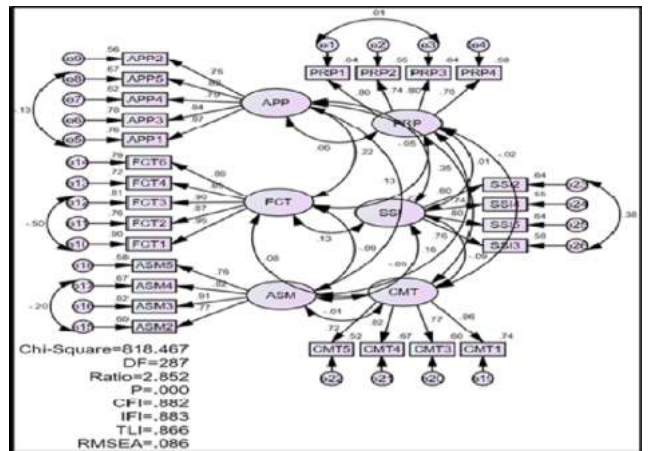


FIGURE 1. Hypothesized initial measurement model (Pooled CFA) of association between the constructs of the study.

obtained. Therefore, modification was required to upgrade the model to satisfy the specifications of match functionality.

The model could be further modified to enhance the quality of fit of the model based on the indexes of modifications (Figure 1). The following values: Chi-Square=553.599, DF=240, Ratio=2.307, P<0.01, CFI=.917, IFI=.918, TLI=.905, RMSEA=.072 were achieved after trimming items CMT3 and FCT4 in Figure 2. The specifications obtained in Figure 2 are in accordance with the standards laid down [50], thereby satisfying the corresponding goodness of fit criterion. To test the fit and validity of the measurement model, it has been evaluated through CFA.

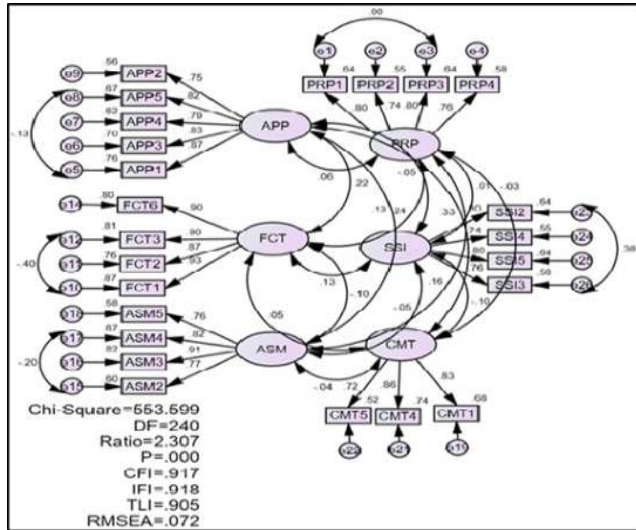


FIGURE 2. Hypothesized modified measurement model (Pooled CFA) of association between the constructs of the study.

TABLE 4. Correlation matrix for the constructs of the study.

	PRP	APP	FCT	ASM	CSM	SSI
PRP	0.78					
APP	0.06	0.81				
FCT	0.24	0.22	0.90			
ASM	0.16	0.13	-0.10	0.82		
CSM	-0.03	0.33	0.05	-0.04	0.80	
SSI	0.01	-0.05	0.13	-0.05	-0.01	0.87

In order to mitigate the problems of multicollinearity, the discriminant validity of the study latent constructs was tested. Discriminant validity shows to what degree measurement model constructs are free of redundant items. Furthermore, a model is said to gain discriminant validity when the correlation between exogenous constructs does not surpass 0.85 [52]. According to Babin and Anderson [46], the AVE values in the diagonal axis of the correlation matrix for the constructs of the study should be greater than those in the column and rows in order to obtain discriminant validity. Consequently, as described in Table 4, the discriminant validity of these constructs have been attained.

C. FACTORS LOADINGS, COMPOSITE RELIABILITY, AND AVERAGE VARIANCE EXTRACTED

AVE is the dimension to be calculated which reflects the cumulative total of the variance of the measured variables and is responsible for the significant measurement error of the latent variable [53]. In other terms, AVE is the average amount of variation that a construct is able to describe in the indicators. The CR and AVE of all reflective structures which are obtained by screening the data via exploratory factor analysis (EFA) are presented in table 4. The AVE of all reflective variables is between 0.60-0.81, much greater than 0.50, the suggested value [48]. Additionally, all reflective structures have CR values ranging from 0.85-0.95,

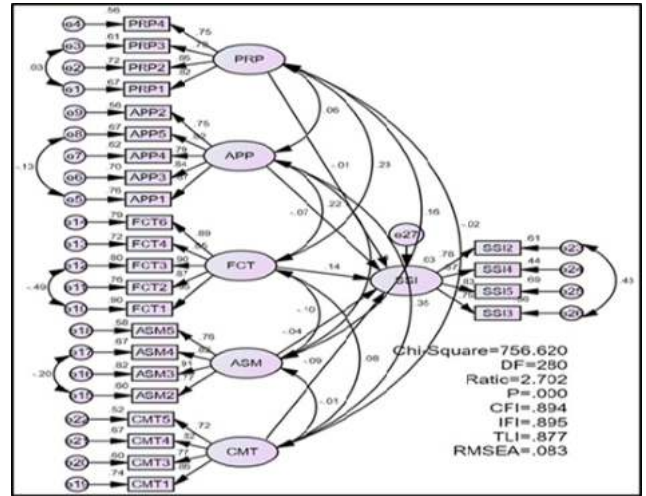


FIGURE 3. Initial structural modeling of the effect of exogenous variable (PjBL) on endogenous variable (soft skills integration).

greater than the recommended value of 0.6 [46], [44] and are thus appropriate for exploratory studies. Accordingly, the measurement model’s outcome described in Table 5 indicates that the structures at $p < 0.05$ are statistically important based on their parameter estimates.

D. HYPOTHESIZED MODEL OF THE EFFECT OF EXOGENOUS (PjBL) VARIABLE ON ENDOGENOUS VARIABLE (SOFT SKILLS)

In accordance with the study hypothesis, mounting the structural model requires the use of structural equation modeling techniques to demonstrate the relation between the constructs. Figure 3 demonstrates the initial structural modeling of the impact of exogenous variables on the endogenous variable. It displays the fitness indices in the model for the latent constructs. However, after reaching the constructs’ reliability and validity, the original model has the following values: Chi-Square=756.620, DF=280, Ratio=2.702, $P < 0.001$, CFI=.894, IFI=.895, TLI=.877, and RMSEA=.083. Modification of the model has become necessary as it did not fulfill the quality of fit criterion based on the values obtained.

Figure 4 shows the study’s updated structural model. The factor loading must be greater than or equivalent to 0.5 [54] for a newly established scale. Therefore, in accordance with the SEM/AMOS specifications, the model has been updated to improve the goodness of fit indices. To fix the problem, items in a construct with factor loading less than 0.5 were dropped one at a time (starting from the lowest value) until parsimonious unidimensionality was reached. Items with modification indices greater than 15 needed to be deleted or constrained to avoid multicollinearity. Accordingly, items APP1, APP4, FCT3, FCT4, and CMT3 were removed in this study, while items CMT1 and CMT 5 were constrained for having values of modification indices more than 15. The following values were obtained after the model’s modification: Chi-Square=338.872, DF=171, Ratio=1.982,

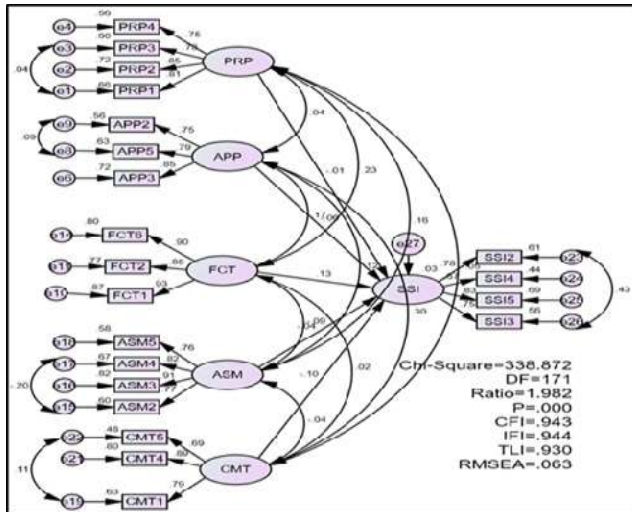


FIGURE 4. Modified structural modeling of the effect of exogenous variable (PjBL) on endogenous variable (soft skills integration).

$P < 0.001$, $CFI = .943$, $IFI = .944$, $TLI = .930$, $RMSEA = .063$. The updated model's output suggests all of the fit indexes were achieved.

IV. HYPOTHESES TESTING

SEM/AMOS version 20 was used to determine the hypothesized relationship between the exogenous variable (PjBL) on the endogenous variable (Soft Skills Integration). Hair et al. [48] suggested a basic judgment rule for a significant relational relationship such as: (t-value at 1.96 and p-value at 0.05). Therefore, this was used here to determine the importance of the coefficient of the path between exogenous and endogenous variables. The path analysis outcome indicates that: 1) there is less than 0.001 likelihood of reaching an absolute value of a crucial ratio as high as 0.126 as revealed in the AMOS assessments in Table 6. In other terms, there is a significant positive association between the preparation that is inherent in PjBL and the integration of soft skills among students of technical colleges. In the same vein, 2), the likelihood of achieving a crucial ratio at an absolute value as high as 0.150 is less than 0.038, as seen in the AMOS calculations in Table 6; indicating that implementation, a tenet of project-based learning concepts, has a significant positive relationship with the incorporation of soft skills among students at technical colleges. Nevertheless, 3), as seen in Table 6 of the AMOS estimates, the probability of achieving a crucial ratio as high as -0.121 in absolute value is less than 0.049; indicating that facilitation activities in PjBL have a significant yet negative correlation with the incorporation of soft skills among students of technical colleges in Nigeria. However, 4), as seen in the calculations of the AMOS in Table 6, there is less than 0.001 probability of reaching a critical ratio as high as 0.115 in total value; suggesting that assessment strategies in project-based learning have a significant association with soft skills development among

TABLE 5. Factors loadings, composite reliability, and AVE.

Code	Construct Items	Factor Loading	CR	AVEs
	Preparation		0.86	0.60
PRP 1	Selection of appropriate activities in PjBL enhances soft skills integration	0.80		
PRP 2	Appropriate guidelines in PjBL enhance soft skills integration	0.74		
PRP 3	Selection of appropriate learning objectives in PjBL enhances soft skills integration	0.80		
PRP 4	Determination of evaluation techniques in PjBL enhances soft skills integration	0.76		
	Application		0.91	0.66
APP 1	Hand-on-training in PjBL enhances soft skills integration	0.87		
APP 2	Solving real problems in PjBL boosts soft skills integration	0.83		
APP 3	Gainful interactions in PjBL enhance soft skills integration	0.79		
APP 4	Collaboration in PjBL increases soft skills integration	0.82		
APP 5	Thought-provoking challenges in PjBL enhance soft skills integration	0.75		
	Facilitation		0.95	0.81
FCT 1	Motivation resources in PjBL enhance soft skills development	0.93		
FCT 2	Fieldwork resources in PjBL enhance the incorporation of soft skills	0.87		
FCT 3	Systematic organization in PjBL enhances the development of soft skills	0.90		
FCT 6	Systematic support in PjBL enhances the incorporation of soft skills	0.90		
	Assessment		0.89	0.67
ASM 2	PjBL log booking enhances soft skills integration	0.77		
ASM 3	PjBL presentation enhances soft skills integration presentation	0.91		
ASM 4	PjBL peer assessment enhances soft skills integration	0.82		
ASM 5	PjBL self-assessment enhances soft skills integration	0.76		
	Commitment		0.85	0.65
CMT 1	Adequate observation in PjBL enhances the development of soft skills	0.83		
CMT 4	Regular attendance in PjBL enhances soft skills development	0.86		
CMT 5	Adequate supervision in PjBL enhances the incorporation of soft skills	0.72		
	Soft Skills Integration		0.86	0.61
SSI 2	PjBL is effective for integrating Teamwork skills	0.80		
SSI 3	PjBL is effective for the development of communication skills	0.74		
SSI 4	PjBL is effective for the incorporation of problem-solving skills	0.80		
SSI 5	PjBL is effective for integrating resource management skills	0.76		

TABLE 6. Standardized regression weight and its significance in the model for the whole path.

		Estimate	S.E.	C.R.	P	Label
SSI	<-- PRP	0.126	0.065	11.43	***	Significant
SSI	<-- APP	0.15	0.072	1.91	0.038	Significant
SSI	<-- FCT	-0.121	0.056	-1.91	0.049	Significant
SSI	<-- ASM	0.115	0.063	15.53	***	Significant
SSI	<-- CMT	0.152	0.063	12.9	***	Significant

technical college students. Nevertheless, 5) the probability of achieving a crucial ratio as high as 0.152 in absolute value as shown in the AMOS assessments in Table 6 is less than 0.001; suggesting that there is a significant positive correlation between the commitment activities of students and teachers in PjBL and the integration of soft skills among students of technical colleges in Nigeria.

V. FINDINGS AND DISCUSSION

The relationship between the research variables was determined on the basis of the hypothesis tested, thereby identifying the effect of PjBL on the integration of the soft skills among students of technical colleges. The results showed a significant positive correlation between the preparation (planning) in PjBL and the integration of soft skills among students of technical colleges. Diverse projects need different materials and facilities to be used in the process of PjBL. In designing a project, the considerations of the availability of consumables and machine facilities owned by the school are paramount to the successful implementation of PjBL [55]. Therefore, this finding is in agreement with Pasha [22] who asserted that adequate preparation in project-based learning which covers making available the learning materials, activity guidelines, and selection of learning objectives, is critical for the incorporation of soft skills.

The view of the technical teachers on the application in project-based learning was identified from the data analysis as having a significant positive association with the integration of soft skills among technical college students. Application in PjBL provides an opportunity for hand-on training, solving real problems, gainful interaction, and collaboration/teamwork for the integration of soft skills among students. Consequently, this finding is in line with [56] who asserted that planning an environment in which teamwork can flourish enhances effective teaching and learning for the development of skills.

A significant yet negative association between facilitation in PjBL and the incorporation of soft skills among technical college students in Nigeria has been identified. Facilitation in PjBL involves organization, motivation, and supporting learners toward effective teaching and learning for the development of skills. The view of the technical teachers in this regard could be perhaps they had most of their experiences

from instructors who had hard time expressing how and why they arrange to practice and appropriate their facilitation in different settings. Besides that, the view of technical teachers in this regard could also be as a result of the cumbersome number of students they managed per class within the study area. One of the general challenges of educational institutions in Nigeria is the inadequacy of infrastructures which has led to an outrageous number of students to be managed in a classroom [57], [58]. This finding supports the assertion by [21] who stated that giving support to a large number of students and monitoring their progress during the process of PjBL is hard, hence, facilitation is usually argued to be extremely complex [59]. This therefore, has the tendency of affecting the efficiency of facilitation in PjBL.

A significant positive association between commitment in PjBL and the integration of soft skills among Technical College students was discovered. Commitment in PjBL encompasses emotional attachment, a continuation of purpose, and an obligation to the group's goal. Teachers' and students' commitment to the problem solving of PjBL selected real problems to afford opportunities for students' zealotness and dedication toward their development of soft skills. This is therefore, in line with the finding of [60] who verified in their research the importance of commitment inherent in PjBL for supporting the learning and motivation of students and teachers towards the incorporation of skills amongst students.

In addition, the research showed that the PjBL assessment has a significant positive connection with the growth of soft skills among technical college students. Assessment in PjBL involves individual and group presentations, reports and assignments, discussion and seminars, and logbook and portfolios. Assessment is widely acknowledged by scholars for its effectiveness in enhancing effective teaching and learning among students. The evaluation process of learners' exertion is crucial, as unevaluated learning causes less motivation, absence of feedback and therefore discourage learners from effective participation. This finding is compatible with the findings of [61], [62] and [63] who affirmed the importance of assessment techniques in the integration of skills in their separate reports. Additionally, White *et al.* [64] reported that assessment methods are of the most important effects on how students learn, the extent of the study, and how successfully they perform. Obviously, the outcomes of the current study indicate that PjBL will have a significant positive impact on the integration of soft skills among Nigerian students of technical colleges.

VI. CONCLUSION

The aim of this study was to develop a project-based learning conceptual framework for the integration of soft skills among students of technical colleges in Nigeria. CFA methods were employed in the data analysis process. In this case, redundant elements were either deleted or constrained in the model to obtain unidimensionality from the analysis that had been performed for the SEM system. Convergent validity, internal reliability, and constructs reliability of all constructs had been

reached at the end of the operations. Furthermore, based on the correlational values, the model's discriminating validity has been achieved. In the path analysis, the type of relationship between structures was defined and re-specified to obtain the real significant structural model. The SEM analysis showed that: preparation, application, commitment, and assessment have each a significant positive relationship with the integration of soft skills among technical college students. These findings validate PjBL's efficacy as an instructional tool for the integration of soft skills among technical and vocational students. The study results would provide curriculum designers with the knowledge required to update the technical colleges' curriculum to accommodate the PjBL elements found important for the successful incorporation of soft skills among the students. Based upon the outcomes of the study: i) Government should provide the adequate enabling environment for appropriate PjBL activities to enhance the integration of soft skills; ii) For effective development of soft skills, technical teachers should employ the PjBL identified elements in the teaching and learning of technical subjects at technical colleges.

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