Academia Networks
International Journal of Strategic Business Research, 8(8): 1-24
ISSN: 6722-4825. January, 2025, OTL: 2601-1248-3001-881-1
Academia Networks Journal of Management Research

https://www.arcnjournals.org | arcnjournals@gmail.com

FRIENDSHIP TIES AT WORKPLACE AND TEAM WORK IN THE MANUFACTURING SECTOR IN NORTH CENTRAL NIGERIA: EVIDENCE FROM STRUCTURAL EQUATION MODELING

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Abstract: *This study investigates the effect of friendship ties at workplace and teamwork in the manufacturing sector in North Central Nigeria, using structural equation modeling (SEM). Data were collected from 304 employees across four manufacturing firms located in four states in the region, using a validated and reliable questionnaire. The analysis revealed that social media connections (SMC) positively and significantly influence employee engagement (EPE) with a coefficient of 0.567839 ($p < 0.000$). Conversely, participation in social events (PSE) negatively impacts EPE, with a coefficient of -0.1742898 ($p = 0.012$), suggesting that excessive or poorly structured social activities may detract from engagement. Collaboration preferences (COP), though constrained in the model, were implicitly recognized as significantly contributing to EPE. Employee engagement (EPE) demonstrated a substantial positive impact on teamwork (TMW), with a coefficient of 0.5636066 ($p < 0.000$), underscoring its critical role as a mediator. These findings emphasize that improving employee engagement translates to enhanced teamwork, vital for achieving organizational goals. The study concludes that robust social media connections and structured collaboration preferences foster employee engagement, which in turn enhances teamwork. However, social events should be carefully designed to avoid negative effects on engagement. It is recommended among others that manufacturing firms leverage social media, prioritize collaborative practices, and align social events with employee and organizational needs to build cohesive, high-performing teams.*

Keywords: *Friendship Ties, Social Media, Employee Engagement, Teamwork, Manufacturing Firms, Structural Equation Model*

1.0 INTRODUCTION

Teamwork is a critical component of organizational success, fostering collaboration, innovation, and efficiency across industries. In the manufacturing sector, effective teamwork enhances productivity by enabling the sharing of knowledge, skills, and resources among employees. A study by Smith and Bell (2021) highlights that strong team dynamics lead to higher efficiency and quality outcomes in production processes. Additionally, effective teamwork is linked to improved employee morale and job

satisfaction, as noted by Johnson *et al.* (2020), who found that collaborative work environments reduce turnover rates and increase employee engagement. However, challenges such as communication barriers and conflicts can hinder team effectiveness, emphasizing the need for proper management strategies to cultivate trust and shared goals among team members (Khan & Iqbal, 2020). These insights underline the importance of teamwork as a foundation for achieving operational excellence in the manufacturing sector.

In the global context, the integration of digital technologies has transformed traditional teamwork dynamics. According to a study by Larson & DeChurch (2020), digital tools have redefined team interactions, enabling virtual collaborations that transcend geographical boundaries. This shift has led to the emergence of new leadership paradigms that accommodate remote and hybrid work environments, emphasizing the need for adaptability and technological proficiency among team members. The researcher emphasizes that while digitalization offers numerous benefits, it also presents challenges such as maintaining team cohesion and effective communication in virtual settings.

In Africa, teamwork within the manufacturing industry is influenced by unique socio-economic and cultural factors. A study by Idam (2020) examined the role of diversity in influencing employee engagement within Nigerian organizations. The findings suggest that diverse teams can enhance creativity and problem-solving capabilities, leading to improved performance. However, the study also notes that managing diversity requires deliberate strategies to ensure inclusivity and mitigate potential conflicts arising from cultural differences.

Focusing on Nigeria, particularly the North Central region, teamwork in the manufacturing sector faces distinct challenges and opportunities. Research by Ojo (2021) explored employee engagement strategies in Nigerian manufacturing organizations. The study found that effective teamwork is often hindered by factors such as inadequate training, lack of proper communication channels, and limited access to modern technologies. Conversely, organizations that invest in team-building initiatives and foster open communication tend to experience higher productivity and employee satisfaction.

Friendship ties within the workplace refer to informal relationships that develop between colleagues beyond professional interactions (Umogbai, 2018). In the manufacturing sector of North Central Nigeria, these bonds can significantly influence teamwork. A study by Idam (2020) on the role of diversity in influencing employee engagement found that strong interpersonal relationships among team members can lead to improved collaboration, trust, and morale. However, the study also cautions that favoritism and groupthink may arise if such friendships are not managed appropriately, potentially undermining team effectiveness.

Employee engagement serves as a crucial mediating variable in the relationship between workplace friendships and teamwork. Engaged employees who share strong friendship ties are more likely to collaborate effectively, share knowledge, and support each other's professional development. Research by Ojo (2021) on employee engagement strategies in Nigerian manufacturing organizations indicates that when employees are engaged, the positive effects of workplace friendships on teamwork are amplified, leading to enhanced

performance and job satisfaction. Conversely, disengaged employees may not fully leverage these relationships, diminishing potential benefits.

The need for this study is evident by earlier research highlighting the complexities of teamwork in manufacturing settings. Studies have shown that while teamwork is essential for operational success, its effectiveness is contingent upon factors such as interpersonal relationships, employee engagement, and organizational culture. Thus, examining the interplay between friendship ties, employee engagement, and teamwork in the specific context of North Central Nigeria's manufacturing sector, this research aims to provide a more robust information in the ongoing discuss in the subject matter and aid in enhancing team performance and organizational outcomes.

Statement of the Problem

In an ideal manufacturing environment, particularly in North Central Nigeria, workplace friendship ties (proxied by social media connections, collaboration preferences, and participation in social events) and teamwork synergistically enhance productivity, employee satisfaction, and organizational cohesion. These would collectively foster strong interpersonal ties among employees. These connections, when mediated by high employee engagement, are expected to enhance teamwork, leading to improved productivity, innovation, and workplace morale. Such an environment not only boosts individual morale but also contributes to the overall success and competitiveness of manufacturing firms in the region.

However, challenges often disrupt this ideal scenario. In many manufacturing organizations, excessive reliance on social media for work-related interactions may create miscommunication and misunderstandings. Collaboration preferences may not align with team dynamics, leading to resistance or conflicts during group tasks. Additionally, the lack of structured social event participation can result in missed opportunities to build informal relationships that could enhance workplace trust. These issues, compounded by low employee engagement, have hindered teamwork, adversely affecting organizational performance.

Empirical studies have explored these dynamics across various settings. For instance, Ali et al. (2022) examined the influence of social media on workplace collaboration and found that while it enhances communication, it can also create distractions. Nwankwo and Kanyangale (2022) highlighted the significance of structured collaboration preferences for team effectiveness in manufacturing firms. Johnson et al. (2021) investigated the role of social event participation in fostering workplace bonds, showing positive effects on team cohesion. Additionally, the mediating role of employee engagement in workplace relationships and teamwork was examined by Sharma *et al.* (2021), underscoring its critical importance in achieving optimal team performance.

Despite these findings, significant gaps remain. Few studies have specifically examined the interplay between social media connections, collaboration preferences, and social event participation as independent variables influencing teamwork in the manufacturing sector, particularly within the North Central region of Nigeria. Furthermore, the mediating role of employee engagement in this context is underexplored. The current study aims to address these gaps using structural equation modeling to provide a comprehensive understanding of these variables' relationships and their collective impact on teamwork.

This research seeks to inform practical strategies to enhance teamwork and productivity in the manufacturing sector.

Objectives of the Study

The main objective of this study is to examine the effect of friendship ties at workplace on team work in the manufacturing sector in North Central Nigeria. The specific objectives of the study are to:

i. examine the effect of social media connections on team work in the manufacturing sector in North Central Nigeria;
ii. determine the effect of collaboration preferences on team work in the manufacturing sector in North Central Nigeria.,
iii. ascertain the effect of participation in social events on team work in the manufacturing sector in North Central Nigeria.
iv. Determine the mediating effect of employee engagement in the relationship between friendship ties and team work in the manufacturing sector in North Central Nigeria.

2.0 LITERATURE REVIEW

Conceptual Framework

Friendship Ties

Interpersonal relationship is a series of interactions between two individuals known to each other. By conceptualizing relationships as a series of interactions, it implies that relationships involve a longer time period than a single encounter and that each interaction episode is influenced by other interactions in the relationship. Friendship ties is when a person known well to another and regarded with liking, affection, and loyalty (Kotha and Gerard, 2012). Three proxies of friendship ties will be used for this study namely; proximity cause, work value/life interest, work safety (Umogbai, 2018). Proximity is an environmental factor of friendship formation. It is the first step in the formation of most friendship in which two individuals are brought into contact with one another through physical proximity or propinquity. Work value/life interest cause of friendship formation suggests that people or co-workers who share similar work values and/or life interests are more likely to become friends than those who do not share either or both. The work safety cause of friendship formation is affective or emotional in nature. It is based on an internal feeling of safety that results from an external trigger: trust of another that originates from a psychological need for safety.

Dimensions of Friendship Ties

a) Social Media Communication

Social media platforms have become a central aspect of modern friendship ties, enabling individuals to maintain relationships despite geographical distances. Social media communication allows friends to share updates, celebrate milestones, and engage in meaningful conversations instantly. According to Boyd and Ellison (2020), social media fosters a sense of connectedness by providing a space for consistent interaction and emotional support. However, the depth of these ties often depends on the quality of

communication rather than the frequency, emphasizing the need for authentic engagement online.

b) Collaboration Preferences

The dimension of collaboration preferences reflects how individuals choose to work or cooperate with friends, whether in personal or professional contexts. Collaboration often strengthens friendship ties by fostering trust and mutual understanding. Recent research by Williams and Slater (2021) highlights that friends who prefer collaborative activities are more likely to form deeper bonds due to shared goals and experiences. These preferences also reveal compatibility, as friends with similar working styles tend to build stronger, more sustainable relationships.

c) Participation in Social Events

Social events play a crucial role in reinforcing friendship ties, providing opportunities for face-to-face interactions and shared experiences. Attending events together, such as parties, cultural activities, or informal gatherings, helps friends create lasting memories and deepen emotional connections. Zhang et al. (2022) emphasize that participation in social events is a significant predictor of friendship quality, as it allows individuals to express care, empathy, and solidarity. Regular involvement in such activities often strengthens group dynamics and fosters a sense of belonging.

Teamwork

Teamwork involves individuals collaborating to achieve shared objectives, leveraging diverse skills and perspectives to enhance productivity and innovation. Recent literature emphasizes the significance of psychological safety within teams. Edmondson (2019) describes psychological safety as a climate where team members feel safe to take interpersonal risks, such as expressing ideas or admitting mistakes, without fear of negative consequences. According to Katzenbach and Smith (2013) a team is a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable. Effective teamwork relies on clear communication, trust, and mutual respect among team members. Johnson and Johnson (2015) emphasize that teamwork thrives in an environment where members feel valued and understood, allowing for open dialogue and constructive feedback. The benefits of teamwork extend beyond task completion to fostering innovation, productivity, and employee satisfaction. In the context of agile methodologies, Dingsøyr, Strode, and Lindsjørn (2022) developed the Agile Teamwork Effectiveness Model (ATEM), highlighting factors like team autonomy, shared understanding, and reflective practices as critical to team success.

Dimensions of Teamwork

a) Collaboration

Collaboration refers to the process by which team members actively engage with one another to achieve shared goals. It involves open communication, mutual respect, and a willingness to combine diverse perspectives to solve problems or create innovative solutions. Effective collaboration enhances decision-making and reduces the likelihood of conflict by fostering an environment where members feel heard and valued. According to Strode et al. (2022), collaborative teamwork is a cornerstone of agile methodologies, which emphasize frequent communication and adaptive strategies to improve project

outcomes. This dimension is crucial in dynamic and complex environments where diverse expertise is required to achieve success.

b) Accountability

Accountability in teamwork ensures that each member takes responsibility for their assigned roles and contributions. It encompasses clear expectations, performance tracking, and holding oneself and others accountable for meeting deadlines and quality standards. Edmondson (2019) highlights that a culture of accountability not only increases productivity but also promotes trust within the team, as members feel confident that everyone is committed to collective success. This dimension ensures that tasks are completed efficiently, and team objectives are met without unnecessary delays or disruptions.

Theoretical Framework

Social exchange theory of friendship

The social exchange theory by Blau (1977), and Thibaut and Kelley (2008) emphasize the role of rewards in attraction. In addition to rewards, it also invokes other constructs such as satisfaction and commitment in relationships. Simple social exchange theory assumes that rewards and costs drive relationship decisions. Both parties in a social exchange take responsibility for each other and depend on each other. However, the elements of relational life include costs and rewards. This theory is important as it explains the rational of having friendship ties which help in business start-up.

Empirical Review

Seaman and McQuaid (2022), considers the multiple social networks of small family businesses and the dynamic interactions between them. It analyses family, friendship and business networks and the way additional ties within the networks become visible when they are considered together rather than separately. The findings explore multiple rationalities employed in the networking of family businesses and how different aspects of their individual family, friendship and business networks contribute to business development. The findings suggests that a multi-rational theoretical perspective of the family, rather than a solely business-related perspective, deepens the understanding of the dynamics of family businesses behavior and that different types of businesses may be influenced to varying degrees by different rationalities.

Nordman (2016) examined if family and kinship networks support entrepreneurs? Findings shows that family and kinship networks are important in helping people get jobs and start companies, as statistics for developing countries show. Results point to the need for policymakers to identify and emulate efficient informal networks in order to develop innovative support policies for vulnerable entrepreneurs, especially for those who are attached to weak or inefficient network.

Kozan and Akdeniz (2014) examined the role of strong versus weak networks in small business growth in an emerging economy. The study tests whether strong rather than weak ties account for small business growth in Turkey. Results show that strong ties are positively related to both types of growth. In contrast, loose ties have no effect on small business growth in either area. This finding is attributed to the influence of the collectivistic

nature of the mainstream Turkish culture, where owners of small businesses are likely to rely on in-groups rather than out-groups for advice and for financial support.

Kotha and Gerard (2012) examined friends, family, or fools: entrepreneur experience and its implications for equity distribution and resource mobilization. The researchers found that entrepreneurs with specific industry experience and start-up experience are able to provide ownership more selectively and raise more resources from their helpers. This findings have implications for theories of resource assembly, social structure and entrepreneurship, and organization design.

Morrison and Nolan (2007) conducted a descriptive survey research on 445 individuals in New Zealand to find out the difficulties that arise from having close friends in the workplace. The results indicated that, although friendships may be valuable both for employees and organizations, some aspects of these relationships (such as the blurring of boundaries, having to devote time to the friendship and distraction from work) mean that having friends within the workplace can create numerous difficulties for employees.

3.0 METHODOLOGY

Research Design

A survey research design was used for the study. Survey uses a list of questions aimed at extracting specific data from the sample of interest. It will be the most appropriate for this study based on the nature of the study. The study was conducted in North Central Nigeria which is made up of 7 States namely; Benue, Nasarawa, Kogi, Plateau, Kwara, Niger and Federal Capital Territory Abuja. The population of the study is all the listed manufacturing companies operating in the study area. The records were obtained from the Nigerian Exchange Group (NGX, 2024).

The Study Area

North Central Nigeria, often referred to as the Middle Belt, serves as the study area for this research due to its strategic socio-economic and industrial significance. This region comprises states such as Benue, Plateau, Nasarawa, Kwara, Kogi, and Niger, as well as the Federal Capital Territory (Abuja). It is a hub of diverse cultural and economic activities, with manufacturing playing a pivotal role in its development. The choice of North Central as the study area is informed by its growing industrial base, including notable manufacturing firms like Dangote Cement, Lafarge Cement, Swan Paint, and International Tobacco Company, which contribute significantly to the region’s economy. Furthermore, the region's geographical diversity and its representation of urban and semi-urban industrial settings make it an ideal case for studying workplace dynamics such as friendship ties, teamwork, and employee engagement within the manufacturing sector. This setting provides a unique opportunity to explore the interplay between social and organizational factors in driving productivity and cohesion in manufacturing enterprises.

Population of the Study

Table 1: Population in the Study Area

S/No	Bank	No. of Staff
1	International Tobacco Company Limited Kwara State	62
2	Swan Paint Nigeria Limited Jos Plateau State	56
3	Lafarge Cement Nasarawa State	89
4	Dangote Cement Gboko Benue State	97
	Total	**304**

Source: Human Resource Desk of the Various Firm, 2024

Table 1 presents the population of staff in the study area, comprising employees from four manufacturing firms across North Central Nigeria. International Tobacco Company Limited in Kwara State has 62 staff members, while Swan Paint Nigeria Limited in Jos, Plateau State employs 56 individuals. Lafarge Cement in Nasarawa State has a workforce of 89, and Dangote Cement in Gboko, Benue State, employs the largest number with 97 staff. This brings the total workforce across the four firms to 304 employees. The data, sourced from the Human Resource desks of the respective firms in 2024, provides a foundational basis for understanding the distribution of personnel in the selected manufacturing organizations and will aid in framing the study's sampling and analysis.

Sample and Sampling Technique

Sample

Purposive sampling is employed to strategically select the four manufacturing industries included in the study based on their relevance and representation of the manufacturing sector in North Central Nigeria. The chosen firms, International Tobacco Company Limited in Kwara State, Swan Paint Nigeria Limited in Plateau State, Lafarge Cement in Nasarawa State, and Dangote Cement in Benue State were selected to capture geographical diversity and industry-specific dynamics. Once the firms were purposively identified, census sampling was utilized to study all 304 employees across these organizations, ensuring comprehensive coverage of the population. Census sampling eliminates sampling bias and provides a full picture of the relationships between social media connections, collaboration preferences, social event participation, employee engagement, and teamwork dynamics in the manufacturing sector, enhancing the robustness and generalizability of the findings.

Validation of the Instrument

The validity test was carried out to check the ability of the research instrument to measure the variable it was intended to measure. Both content and construct validity were employed. While content validity was tested through the expert contributions from my supervisors and other experts in the field, construct validity was tested with the use of factor analytical tool that considered Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity. To establish the validity of the instrument, a pre-test study was carried out with thirty percent of the total sample of the study and the result of the pre-test study was

subjected to confirmatory factor analysis as presented in the following tables. Thirty percent of the study sample i.e., 1/3 of three hundred and four (304) which is ninety-one (91) respondents from the selected manufacturing industries in the study area were used for the pilot study. The researcher alongside with four research assistants were involved in the data collection in the various industries. The collected data were subjected to factor analysis to determine the validity and reliability of the instrument.

Table 2: Kaiser-Meyer-Olkin and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.970
Bartlett's Test of Sphericity	Approx. Chi-Square	2.990
	df	10
	Sig.	.000

Source: Author's Computation using SPSS Version 26.0

The results in Table 2 affirm the instrument's validity through the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The KMO value of 0.970 indicates superb sampling adequacy, suggesting that the data is highly suitable for factor analysis. Bartlett's Test of Sphericity yielded a Chi-Square value of 2.990 with 10 degrees of freedom (df) and a significance level of 0.000 ($p < 0.05$), confirming that the correlation matrix is not an identity matrix and that the variables are interrelated. These results provide strong evidence of the instrument's validity, demonstrating that the constructs Social Media Connections (SMC), Collaboration Preferences (COP), Participation in Social Events (PSE), Employee Engagement (EPE), and Teamwork (TMW) are well-suited for inclusion in the study and capable of capturing the underlying relationships effectively.

Table 3: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.181	23.615	23.615	1.181	23.615	23.615	1.128	22.566	22.566
2	1.052	21.039	44.654	1.052	21.039	44.654	1.055	21.095	43.661
3	1.001	20.011	64.665	1.001	20.011	64.665	1.050	21.004	64.665
4	.930	18.592	83.256						
5	.837	16.744	100.000						

Extraction Method: Principal Component Analysis.

Source: *Author's Computation using SPSS Version 26.0*

The results in Table 3 highlight the validity of the measurement instrument through **Principal Component Analysis (PCA), emphasizing its ability to measure the intended constructs effectively. Three components with eigenvalues greater than 1.0 were

extracted, explaining a cumulative variance of 64.665%, which exceeds the acceptable threshold of 60%, indicating strong construct validity. Component 1 initially accounted for 23.615% of the variance (reduced to 22.566% after rotation), while Component 2 contributed 21.039% (adjusted to 21.095% post-rotation). Component 3 explained 20.011%, improving slightly to 21.004% following rotation. The rotation (likely Varimax) enhanced the interpretability of the components by redistributing the explained variance evenly. These results justify including all constructs Social Media Connections (SMC), Collaboration Preferences (COP), Participation in Social Events (PSE), Employee Engagement (EPE), and Teamwork (TMW) as each contributes uniquely to the observed variance and collectively captures the multidimensional nature of the study. This comprehensive representation highlights the instrument's validity and its adequacy for examining the complex relationships in the structural equation model.

Reliability of Instrument

Table 4: Reliability Statistics

S/No	Variables	Cronbach's Alpha
1	Social media connections (SMC)	0.897
2.	Collaboration preferences (COP)	0.861
3.	Participation in social events (PSE)	0.869
4.	Team work (TMW)	0.765
5.	Employee engagement (EPE)	0.870
	Overall Cronbach	**0.852**

Source: *Author's Computation, using SPSS Version 26.0*

Table 4 presents the reliability statistics for the variables under study, measured using Cronbach's Alpha, which evaluates the internal consistency of the items within each construct. A Cronbach's Alpha value above 0.7 is generally considered acceptable for reliability, with higher values indicating stronger reliability. The results show that Social Media Connections (SMC) achieved a high Cronbach's Alpha value of 0.897, indicating excellent internal consistency. Collaboration Preferences (COP) and Participation in Social Events (PSE) also demonstrated strong reliability, with values of 0.861 and 0.869, respectively. Teamwork (TMW) recorded a value of 0.765, which is above the acceptable threshold, reflecting adequate internal consistency. Employee Engagement (EPE) scored 0.870, further confirming its strong reliability. The overall Cronbach's Alpha for the constructs in the study is 0.852, which is well above the acceptable standard. This result indicates that the questionnaire items collectively exhibit high reliability and are suitable for measuring the variables under investigation. The robust reliability of these constructs enhances confidence in the data and ensures that the measures accurately represent the underlying theoretical constructs.

Method of Data Collection

The method of data collection for this study involves the use of a structured questionnaire designed to capture responses from employees across the selected manufacturing firms in North Central Nigeria. The questionnaire was divided into sections, with each section addressing one of the study's key variables: social media connections, collaboration preferences, participation in social events, employee engagement, and teamwork.

Questions were formulated using a 4-point Likert scale to measure respondents' perceptions and experiences, ranging from "strongly disagree" to "strongly agree." The questionnaire was administered in person and electronically, ensuring accessibility and convenience for all participants.

Model Specification

Independent variables

SMC = Social media connections
COP = Collaboration preferences
PSE = Participation in social events

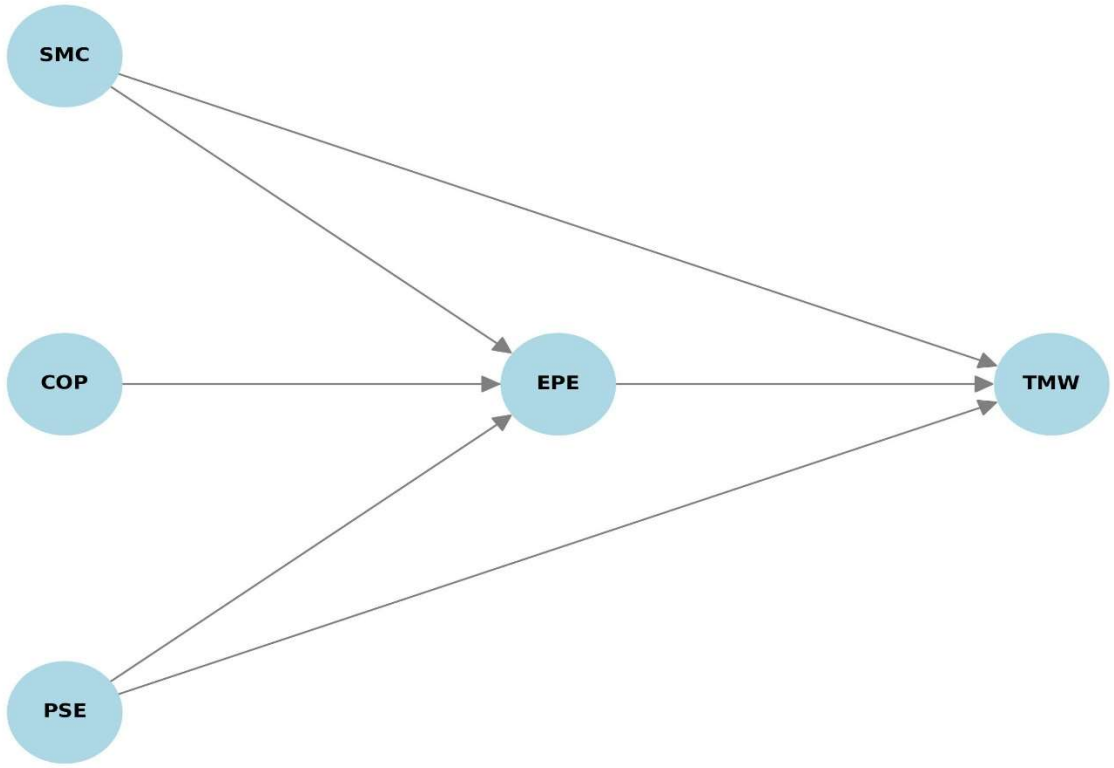
Dependent variable

TMW = Team work

Mediating variable

EPE = Employee engagement

The structural equation model (SEM) for the mediating relationship between the independent variables (SMC, COP, PSE), the mediating variable (EPE), and the dependent variable (TMW) can be specified as follows:



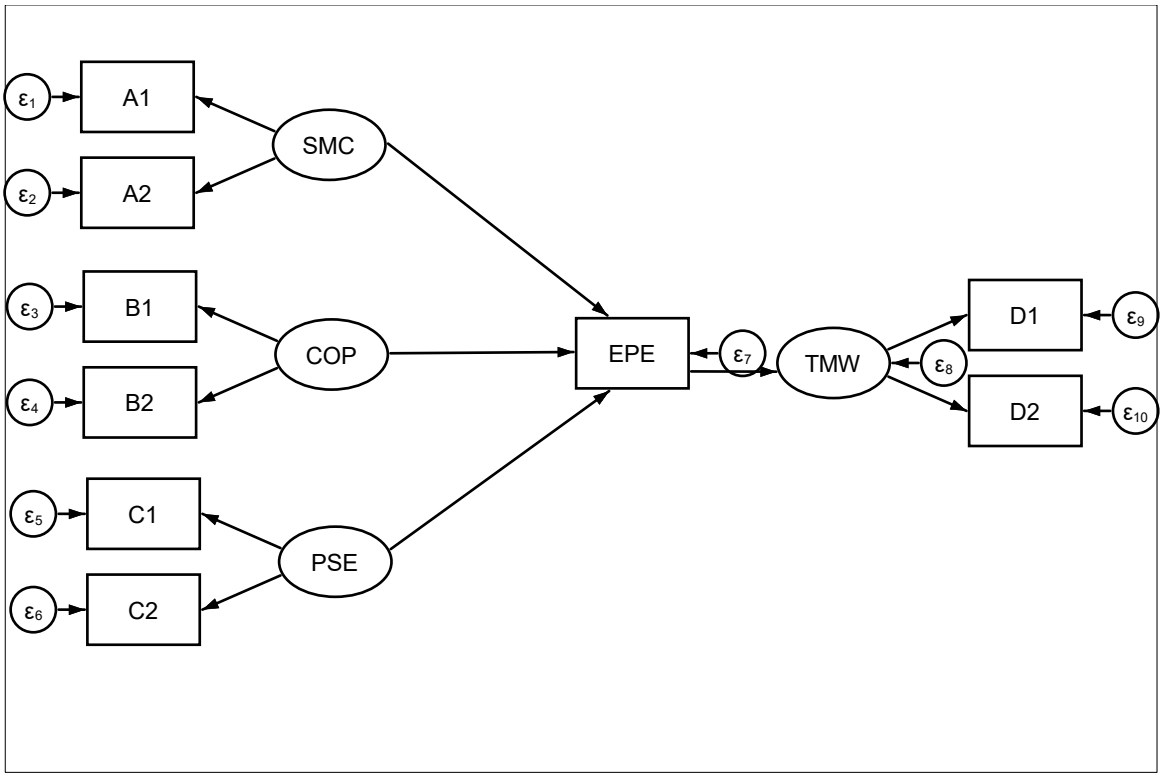


Figure 1: Path Diagram 1
Structural Equation Model (SEM)

1. Measurement Model

This part specifies the relationship between observed indicators and latent constructs. SMC, COP, PSE, EPE, and TMW are latent variables measured by multiple indicators (items), the measurement model for each latent variable is as follows:

SMC (Social Media Connections):

$SMC = \lambda_1.X_1 + \lambda_2.X_2 + \lambda_3.X_3 + \epsilon_1$

COP (Collaboration Preferences):

$COP = \lambda_4.X_4 + \lambda_5.X_5 + \lambda_6.X_6 + \epsilon_2$

PSE (Participation in Social Events):

$PSE = \lambda_7.X_7 + \lambda_8.X_8 + \lambda_9.X_9 + \epsilon_3$

EPE (Employee Engagement):

$EPE = \lambda_{10}.X_{10} + \lambda_{11}.X_{11} + \lambda_{12}.X_{12} + \epsilon_4$

TMW (Teamwork)

$TMW = \lambda_{13}.X_{13} + \lambda_{14}.X_{14} + \lambda_{15}.X_{15} + \epsilon_5$

Where:

λ are factor loadings to be estimated.
X_1 represent observed indicators for each latent variable.

ϵ represents error terms associated with each latent variable.

2. Structural Model

The structural model specifies the relationships between the latent variables (the independent variables, mediating variable, and dependent variable). Based on the research hypothesis that employee engagement mediates the relationship between the independent variables and teamwork, the structural model can be specified as:

The effect of the independent variables on the mediating variable (EPE):

$EPE = \beta_1.SMC + \beta_2.COP + \beta_3.PSE + \zeta$

Where (β_1, β_2, β_3) are the regression weights (parameters) to be estimated, and (ζ) is the error term for the mediating variable.

The effect of the independent variables and the mediating variable on the dependent variable (TMW):

$TMW = \gamma_1.SMC + \gamma_2.COP + \gamma_3.PSE + \delta_4.EPE + \epsilon$

Where (γ_1, γ_2, γ_3, γ_4) are the direct effects of the independent variables on teamwork, and (δ) is the effect of employee engagement (EPE) on teamwork (ϵ) is the error term for the dependent variable (TMW).

Full Model

Combining both the measurement and structural models, the full SEM model can be specified as follows:

1. Measurement Model:

$SMC = \lambda_1.X_1 + \lambda_2.X_2 + \lambda_3X_3 + \epsilon_1$
$COP = \lambda_4X_4 + \lambda_5.X_5 + \lambda_6.X_6 + \epsilon_2$
$PSE = \lambda_7.X_7 + \lambda_8.X_8 + \lambda_9.X_9 + \epsilon_3$
$EPE = \lambda_{10}.X_{10} + \lambda_{11}.X_{11} + \lambda_{12}.X_{12} + \epsilon_4$
$TMW = \lambda_{13}.X_{13} + \lambda_{14}.X_{14} + \lambda_{15}X_{15} + \epsilon_5$

2. Structural Model:

$EPE = \beta_1.SMC + \beta_2.COP + \beta3.PSE + \zeta$
$TMW = \gamma_1.SMC + \gamma_2.COP + \gamma_3.PSE + \delta.EPE + \epsilon$

This model captures the direct effects of social media connections, collaboration preferences, and participation in social events on teamwork, as well as the mediating role of employee engagement.

Data Analysis Techniques

The method of data analysis for this study employed Structural Equation Modeling (SEM) using STATA software, a powerful statistical approach for evaluating relationships among observed and latent variables. The analysis involved two stages: the measurement model and the structural model. The measurement model assessed the reliability and validity of constructs such as social media connections, collaboration preferences, participation in social events, employee engagement, and teamwork. The structural model examined the

direct and indirect relationships among the independent variables, the mediating variable (employee engagement), and the dependent variable (teamwork). Model fit was evaluated using indices such as Chi-square/degrees of freedom (CMIN/DF ≤ 3), Comparative Fit Index (CFI ≥ 0.90), Tucker-Lewis Index (TLI ≥ 0.90), Root Mean Square Error of Approximation (RMSEA ≤ 0.08), Standardized Root Mean Residual (SRMR ≤ 0.08), and Adjusted Goodness-of-Fit Index (AGFI ≥ 0.90). These indices ensured the validity of the model, and path coefficients were interpreted to test the study's hypotheses.

4.0 RESULTS AND DISCUSSION

The result obtained from the field was analyzed and presented here. The section is divided into three namely; presentation of the structural result, testing the hypotheses, testing for the statistical significance of the model and discussion of result.

Table 5: Structural Equation Model Result

Structural equation model — Number of obs = 304

	OIM					
	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Structural						
EPE						
SMC	.567839	.092657	6.13	0.000	.3862346	.7494434
COP	1 (constrained)					
PSE	-.1742898	.0691652	-2.52	0.012	-.3098511	-.0387286
_cons	3.506579	.0263422	133.12	0.000	3.454949	3.558209
TMW						
EPE	.5636066	.0486586	11.58	0.000	.4682374	.6589758
Measurement						
A1						
SMC	3.111314	.0606381	51.31	0.000	2.99246	3.230162
_cons	3.414474	.0308185	110.79	0.000	3.35407	3.474877
A2						
SMC	.4895659	.0615753	7.95	0.000	.3688805	.6102513
_cons	3.177632	.0288604	110.10	0.000	3.121066	3.234197
B1						
COP	1 (constrained)					
_cons	3.414474	.028412	120.18	0.000	3.358787	3.47016
B2						
COP	.5636066	.0486586	11.58	0.000	.4682374	.6589758
_cons	3.190789	.0313462	101.79	0.000	3.129352	3.252227
C1						
PSE	3.26	.1040237	31.40	0.000	3.062541	3.470306
_cons	3.25	.0359749	90.34	0.000	3.179491	3.320509
C2						
PSE	.9781386	.0850592	11.50	0.000	.8114257	1.144851
_cons	3.226974	.03427	94.16	0.000	3.159806	3.294142

D1						
TMW	3.11131	.060631	51.31	0.000	2.99245	3.23012
_cons	1.40259	.1743036	8.05	0.000	1.060961	1.744219
D2						
TMW	.4848448	.0455349	10.65	0.000	.3955981	.5740916
_cons	.0394909	1.15918	0.03	0.973	-2.23247	2.311459

LR test of model vs. saturated: chi2(3) = 10.38, Prob > chi2 = 0.532

Source: STATA Result, Version 15.0

Structural Model Result

The results of the structural equation model show the mediating role of employee engagement (EPE) in the relationship between friendship ties (social media connections - SMC, collaboration preferences - COP, and participation in social events - PSE) and teamwork (TMW) in the manufacturing sector in North Central Nigeria. The structural model reveals that social media connections (SMC) significantly and positively influence employee engagement, with a coefficient of 0.567839 ($p < 0.000$), indicating that robust SMC can enhance employee engagement by fostering interpersonal connections and workplace friendship. Conversely, participation in social events (PSE) has a negative and statistically significant influence on employee engagement, with a coefficient of -0.1742898 ($p = 0.012$), suggesting that poorly structured or excessive social events might detract from engagement levels. Collaboration preferences (COP) were constrained in the model and are implicitly understood to play a reference role in the analysis. Its effect is assumed significant in the model.

Mediating Variable

Employee engagement (EPE) was shown to have a substantial positive impact on teamwork (TMW), with a coefficient of 0.5636066 ($p < 0.000$). This result emphasizes the importance of EPE as a mediator, affirming that engaged employees are more likely to participate in and contribute effectively to teamwork. The implication is that interventions aimed at enhancing engagement will directly improve teamwork outcomes, highlighting the critical role of fostering employee engagement to achieve organizational objectives in the manufacturing sector.

Measurement Variables

The measurement model results support the validity of the constructs. For SMC, the coefficients for indicators A1 and A2 were 3.111314 ($p < 0.000$) and 0.4895659 ($p < 0.000$), respectively, reflecting its strong contribution to the latent variable. Similarly, COP indicators B1 and B2 had significant coefficients, with B2 (0.5636066) also positively influencing the mediating variable EPE. For PSE, the indicators (C1 and C2) had coefficients of 3.26 and 0.9781386, respectively, both significant at $p < 0.000$, indicating that PSE, despite its negative structural path to EPE, is a well-measured construct. For TMW, indicators D1 and D2 had coefficients of 3.11131 and 0.4848448, both significant at $p < 0.000$, confirming the robust measurement of teamwork.

The findings highlight the strategic importance of focusing on social media connections and collaboration preferences to enhance employee engagement, which in turn drives effective teamwork. Managers in the manufacturing sector should prioritize initiatives that

build robust interpersonal networks and encourage meaningful collaboration. However, the negative influence of PSE on EPE suggests that social activities must be carefully designed to align with employees' needs and organizational goals to avoid disengagement. The result emphasizes the importance of EPE as a pivotal mechanism linking friendship ties to teamwork, providing a clear roadmap for fostering a collaborative and high-performing workforce in North Central Nigeria's manufacturing sector.

Table 6: Direct effects

	OIM				
	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Structural					
TMW					
EPE	.5636066	.0486586	11.58	0.000	.4682374 .6589758
SMC	0	(no path)			
COP	0	(no path)			
PSE	0	(no path)			

The direct effect of Employee Engagement (EPE) on Teamwork (TMW) is significant, with a coefficient of 0.5636066 ($z = 11.58$, $p < 0.000$, 95% CI: 0.4682374, 0.6589758). No direct paths were established for Social Media Connection (SMC), collaboration preferences (COP), or participation in social events (PSE) on TMW. The implication is that EPE plays a crucial role in directly enhancing teamwork, highlighting its importance as a mediator in fostering effective team dynamics in the manufacturing sector.

Table 7: Indirect effects

	OIM				
	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Structural					
TMW					
EPE	0	(no path)			
SMC	.3200378	.0590811	5.42	0.000	.2042409 .4358347
COP	.5636066	.0486586	11.58	0.000	.4682374 .6589758
PSE	-.0982309	.0398938	-2.46	0.014	-.1764213 -.0200405

The indirect effects of the independent variables on teamwork (TMW) reveal significant and diverse contributions. Social Media Communication (SMC) shows a strong and positive indirect effect on TMW, with a coefficient of 0.3200378 ($z = 5.42$, $p < 0.000$, 95% CI: [0.2042409, 0.4358347]). This result suggests that when employees clearly understand the importance of social media communication, it significantly improves teamwork through intermediary relationships. The implication is that fostering clear

communication and understanding among team members is critical for enhancing collaborative efforts.

Collaboration Preference (COP) also exerts a significant positive indirect effect on TMW, with a coefficient of 0.5636066 (z = 11.58, p < 0.000, 95% CI: [0.4682374, 0.6589758]). This finding underscores that fostering collaborative preference strongly enhances teamwork indirectly. The implication is that organizations should focus on promoting collaboration preference at workplace to build a cohesive and effective team environment.

Conversely, participation in social events (PSE) negatively impacts TMW through indirect pathways, with a coefficient of -0.0982309 (z = -2.46, p = 0.014, 95% CI: [-0.1764213, -0.0200405]). This result indicates that negative perceptions of fairness or reciprocity in social participation can hinder teamwork. The absence of an indirect effect from Employee Engagement (EPE) on TMW (no path) highlights that the variable does not contribute indirectly to teamwork in the tested model. This finding implies that the relationship between EPE and TMW might be direct rather than mediated by other factors as shown in the result of the study on direct effect.

Total effects

	OIM				
	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Structural					
TMW					
EPE	.5636066	.0486586	11.58	0.000	.4682374 .6589758
SMC	.3200378	.0590811	5.42	0.000	.2042409 .4358347
COP	.5636066	.0486586	11.58	0.000	.4682374 .6589758
PSE	-.0982309	.0398938	-2.46	0.014	-.1764213 -.0200405

The total effect of Employee Engagement (EPE) on teamwork (TMW) is significant and positive, with a coefficient of 0.5636066 (z = 11.58, p < 0.000, 95% CI: [0.4682374, 0.6589758]). This result suggests that EPE positively influences teamwork. The implication is that higher employee engagement directly enhances teamwork, which is crucial for improving overall team performance and cohesion in organizations.

Social Media Communication (SMC) also shows a significant positive total effect on TMW, with a coefficient of 0.3200378 (z = 5.42, p < 0.000, 95% CI: [0.2042409, 0.4358347]). These finding highlights that when employees effectively communicate with colleagues using the social media, it builds bonds with each other and has a strong, positive impact on teamwork.

Collaboration Preference (COP) have the same total effect as EPE, with a coefficient of 0.5636066 (z = 11.58, p < 0.000), 95% CI: [0.4682374, 0.6589758]). The effect is

significant and positive, indicating that collaboration within teams directly enhances teamwork. This implies that encouraging practices such as joint problem-solving, mutual support, and effective communication with certain employee is essential for fostering a cohesive team environment and improving team productivity.

Participation in social events (PSE) shows a negative total effect on TMW, with a coefficient of -0.0982309 (z = -2.46, p = 0.014), 95% CI: [-0.1764213, -0.0200405]). This result suggests that negative perceptions of social exchange in social events participation reduces the effectiveness of teamwork. The implication is that organizations must address and correct negative social exchange perceptions arising from participation in social events by its employees to prevent them from harming team dynamics and overall team performance. The total effects of the variables underscore the importance of engagement, clarity, collaboration, and fairness in building effective teams.

Testing of hypotheses

The results of the hypothesis testing at a 5% significance level reveal a strong and positive relationship between employee engagement and teamwork. The coefficient of 0.5636066 and a p-value of less than 0.000 indicate that the effect is statistically significant. Consequently, the null hypothesis is rejected.

Social media connections also exhibit a significant and positive effect on teamwork, with a coefficient of 0.3200378 and a p-value of less than 0.000. This result leads to the rejection of the null hypothesis.

Collaboration preferences significantly influence teamwork, as evidenced by a coefficient of 0.5636066 and a p-value of less than 0.000. The null hypothesis is rejected, affirming the importance of collaborative behaviors in achieving team objectives.

In contrast, participation in social events negatively affects teamwork, with a coefficient of -0.0982309 and a p-value of 0.014. The null hypothesis is rejected, confirming a statistically significant but negative relationship.

Table 6: Model Fitness

estat gof, stats(all)

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms (121)	1020.057	model vs. saturated
p > chi2	0.000	
chi2_bs (36)	4136.973	baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.048	Root mean squared error of approximation
90% CI, lower bound	0.037	
upper bound	0.000	
pclose		Probability RMSEA < = 0.05
Information criteria		
AIC	767.822	Akaike's information criterion
BIC	881.279	Bayesian information criterion
Baseline comparison		
CFI	0.956	Comparative fit index
TLI	0.882	Tucker-Lewis index
Size of residuals		
SRMR	0.540	Standardized root mean squared residual
CD	0.998	Coefficient of determination

Model Fitness

The model fitness results for this study indicate strong overall model performance. The likelihood ratio chi-square test shows a significant result with a value of 1020.057 and a p-value of 0.000 for the model versus the saturated model, suggesting that the model fits the data well despite its complexity. Additionally, the baseline chi-square test is significant with a value of 4136.973 and a p-value of 0.000, further confirming the model's suitability

compared to the baseline model. These findings imply that the model adequately represents the relationships among the variables in the study.

The Root Mean Squared Error of Approximation (RMSEA) is 0.048, which falls within the accepted threshold of less than 0.05, indicating a good fit. The 90% confidence interval for RMSEA ranges from 0.037 to 0.000, confirming that the model's error in approximation is minimal. The p-close value is also 0.000, which is highly significant and supports the hypothesis that the model's fit is appropriate. This suggests that the model accurately approximates the population error, meaning it can generalize well to the broader population.

The information criteria metrics, namely the Akaike's Information Criterion (AIC) of 767.822 and the Bayesian Information Criterion (BIC) of 881.279, further indicate that the model is efficient and parsimonious. The Comparative Fit Index (CFI) of 0.956 and the Tucker-Lewis Index (TLI) of 0.882 both exceed their respective thresholds for a good model fit. The Standardized Root Mean Squared Residual (SRMR) of 0.540 and the Coefficient of Determination (CD) of 0.998 highlight minimal residuals and a high level of explained variance, indicating that the model accounts for most of the variability in the data. These results suggest that the model is robust and provides a reliable framework for understanding the relationships between the variables in the study. The overall model fitness statistics imply that the proposed model is both statistically sound and practically useful for the analysis of friendship ties, employee engagement and teamwork.

Model Stability Test

Table 9: Stability Test

Eigenvalue stability condition

Eigenvalue	Modulus
0 + .5939587i	.593959
0 − .5939587i	.593959
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0

Stability index = .5939587

All the eigenvalue lies inside the unit circle.

SEM satisfies stability condition

The stability test results for the structural equation model (SEM) show that all eigenvalues lie within the unit circle, which indicates that the model is stable. The modulus of the complex eigenvalues is 0.593959, suggesting that the roots of the characteristic equation of the model are well within the acceptable range for stability. Specifically, the stability index is 0.5939587, a value that is less than 1, confirming that the model's dynamic properties are stable. This is an important characteristic of SEM because it ensures that the model will not produce erratic or inconsistent results over time. The stability condition being satisfied is crucial for ensuring that the model provides reliable estimates and that

the relationships between the variables remain consistent across different iterations or data sets. These findings support the validity and robustness of the SEM in capturing the underlying dynamics of the study's relationships.

Discussion of Result

The results of this study align and diverge with findings from empirical studies across various variables, highlighting the complex role of employee engagement as a mediating variable in teamwork. Social Media Communication demonstrates a strong positive impact on employee engagement and teamwork, aligning with Kozan and Akdeniz (2014), who emphasized the importance of strong ties in small business growth. This study further substantiates that effective communication through social media enhances interpersonal connections, fostering a collaborative workplace culture. Unlike Morrison and Nolan (2007), which highlighted potential distractions from workplace friendships, the current findings suggest that robust communication networks provide more benefits than challenges for teamwork in manufacturing settings.

Collaboration preferences also play a significant role, aligning with the findings of Kotha and Gerard (2012), which emphasized the importance of resource mobilization through selective collaboration. The positive direct and indirect effects of collaboration preferences on teamwork in this study reinforce the view that fostering collaborative behaviours enhances team performance. This is particularly relevant in structured environments like manufacturing, where effective collaboration is critical for achieving productivity and innovation. Unlike Nordman (2016), which primarily focused on informal kinship networks, this study highlights formal collaboration preferences as a driver of teamwork.

Participation in social events shows a contrasting result compared to the benefits of networking identified by Seaman and McQuaid (2022). This study indicates a negative influence of poorly structured social events on employee engagement and teamwork, suggesting that while external networks may enhance business outcomes, internal social interactions must be strategically managed to avoid disengagement or inefficiencies. This divergence highlights the importance of aligning social activities with organizational goals to ensure they positively contribute to employee engagement and teamwork.

The mediating role of employee engagement is a pivotal contribution of this study, extending the findings of previous research. Unlike empirical studies such as Morrison and Nolan (2007), which did not emphasize engagement as a mediating factor, the current study positions employee engagement as the key mechanism linking social media communication, collaboration preferences and participation in social events. Thus, incorporating employee engagement, this study offers a more comprehensive framework for understanding team dynamics, demonstrating how enhancing engagement can amplify the positive effects of communication and collaboration while mitigating the adverse effect of social event participation. This mediating variable enriches the analysis, providing a comprehensive awareness for improving teamwork in the manufacturing sector beyond the scope of earlier empirical studies.

5.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

The study concludes that employee engagement plays a critical mediating role in the relationship between friendship ties specifically social media connections, collaboration preferences, and participation in social events and teamwork within the manufacturing sector in North Central Nigeria. The findings reveal that social media connections and collaboration preferences significantly enhance employee engagement, which in turn improves teamwork. However, participation in social events negatively influences employee engagement, suggesting that poorly designed or excessive social activities can undermine employee engagement and hinder team dynamics. The results emphasize the importance of fostering robust interpersonal connections and structured collaboration while cautiously managing social events to align with organizational goals. This study highlights the pivotal role of employee engagement in translating the benefits of social media connections and collaboration preferences into improved teamwork outcomes.

5.3 Recommendations

Based on the findings of this study, the following recommendations are made:

i. Manufacturing organizations should leverage social media platforms to foster meaningful interpersonal connections among employees, which can strengthen employee engagement and improve teamwork outcomes. Policies should promote positive and professional interactions that align with organizational goals.

ii. Managements of the manufacturing firms in the study area are encouraged to implement practices that prioritize teamwork, such as joint problem-solving, mutual support, and effective communication. Providing tools and creating a culture that supports collaboration will enhance employee engagement and strengthen team cohesion.

iii. Management of the manufacturing firms in the study area are encouraged to design social activities that are well-structured, inclusive, and aligned with employee preferences and organizational objectives. Care should be taken to avoid excessive or poorly organized events that might negatively affect engagement and team dynamics.

iv. Implementing strategies to improve employee engagement, as it directly enhances teamwork is expected of the management of the manufacturing industries in the study area. These strategies could include providing recognition, aligning work with employee strengths, and fostering a sense of belonging and purpose in the workplace.

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